July / August 2000

VECTOR

Pointing to Safer Aviation

FIXED-WING ACCIDENTS AND INCIDENTS

TIPS FOR WINTER OPERATIONS

HAND-SWING STARTING

CAA
CIVIL AVIATION AUTHORITY OF NEW ZEALAND

VECTOR

Managing Editor, Cliff Jenks

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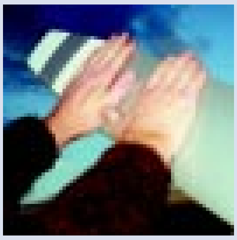

If hand-swinging your aircraft engine is necessary, for whatever reason, it should be attempted only by someone who is conversant with the correct procedures. This article discusses those procedures.

The 1998 CAA Ministerial Inquiry recommended that the CAA investigate the hazards posed by icing to aircraft in the New Zealand operating environment. An icing education programme was part of these recommendations. This article introduces a series of educational initiatives that the CAA will undertake over the next three years.

Jules Tapper is an experienced commercial pilot based in Queenstown. Jules talks about the importance of passing on knowledge and experience gained over the years so that other pilots may benefit from it.

The winter months can bring many extra challenges to aviation. *Tips for Winter Operations* reminds us of some of the basics.

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Cover Photo:
Merv Falconer lands a Pilatus Porter on the Tasman Glacier in 1985. Merv has recently joined the CAA as Manager, General Aviation Fixed-Wing Operations. Photogragh courtesy of Merv Falconer.

Fixed-Wing Accidents and Injuries

This article is the second in a series of *Vector* articles, compiled by Dr David O'Hare of Otago University, which looks at the inherent risks and types of injuries associated with the operation of different aircraft types. This article deals with operating fixed-wing aircraft, and offers ways to improve one's chances of survival.

Humans have been walking the earth for well over a million years. We have been flying above it for less than 100 years (or 0.0001% of our evolution). This fact alone suggests that we ought to be more awed and humbled by our ability to artificially levitate than we generally are. All our physical and psychological capacities have evolved to fit our role as terrestrial creatures. Being airborne is not our natural environment.

Cheerfully ignoring the wonder of it all, we do the equivalent of less than two working weeks training (70 hours or so) in direct 'hands-on' flight training to get an initial license, and consider ourselves equipped to undertake aerial adventures across, what is sometimes, extremely inhospitable terrain – an environment in which we were never designed to operate! While optimism and positive attitudes are generally beneficial to human well-being, a dose of realism is required for survival in the skies. As Leonardo da Vinci observed, "He who fears dangers will not perish by them."

This article continues the process of describing the findings recently obtained by researchers at the University of Otago from their detailed study of air crashes and associated injuries. More specifically, it will discuss findings from the largest segment of the study – crashes involving fixed-wing aircraft.

Fixed-Wing Study Findings

The study obtained information about every reported crash, and resulting fatal or hospitalisable injury, that occurred between 1988 and 1994. During this period, 55 people were killed in fixed-wing aircraft crashes and 38 others hospitalised. This is an average of just over nine deaths and six hospitalisations each year. Not large by road traffic standards, but more than enough for those and their families involved. The study also involved calculating annual flight hours for each category of aircraft (fixed-wing, rotary, glider, etc) from a survey of pilot logbook flight times. We were thus able to calculate fatal and hospitalisable injury rates per 100,000 flight hours. For fixed-wing aircraft these were 1.6 and 0.9 respectively. The hospitalisable injury rate was the lowest for any aircraft category, and the fatal injury rate was the second lowest after gliders.

"…pilots of twins were three times more likely to be killed in a crash than were pilots of single-engine aircraft."

Size does matter – the crash rate decreases markedly in the higher weight-group brackets. The large majority of the injuries came from crashes involving smaller fixed-wing aircraft below 2,721 kg MCTOW. One important caveat should be noted; while the overall crash rate reduces for twin-engine aircraft compared to single-engine aircraft, the fatal crash rate is actually slightly higher for twins. This has been noted overseas, and our data confirmed it – pilots of twins were three times more likely to be killed in a crash than were pilots of single-engine aircraft. This suggests that there are certain factors associated with the impact and its aftermath that can markedly change outcomes – the chances of surviving without serious injury.

What Happens in Fixed-wing Crashes?

Figure 1 and Figure 2 summarise the basic facts about injuries sustained in fixed-wing crashes. Figure 1 shows the body regions most likely to be affected. The lower extremities (ie, the legs)

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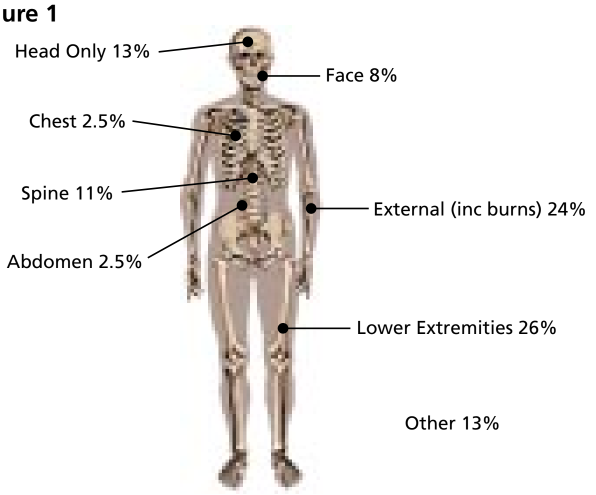
are the most vulnerable, followed by external injuries. Injuries to the head, spine, and face are the next most common. Figure 2 shows the exact nature of the injuries involved: fractures to the lower limbs are the most common type of injury, followed by fractures of the neck, trunk, and skull. Next most common are other head injuries and open wounds to the upper body. The majority of these injuries (60%) were either minor or moderate.

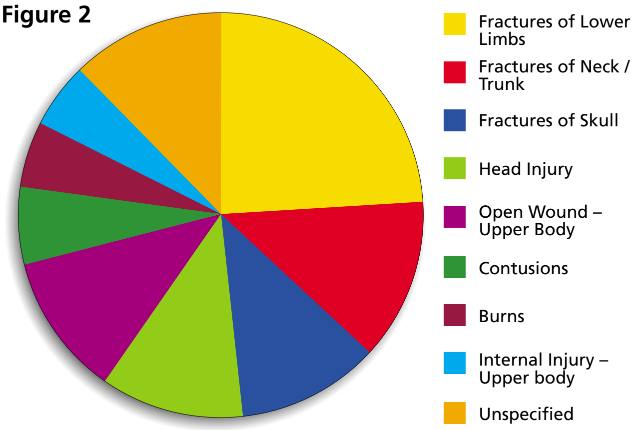
Body Region Most Affected in Fixed-Wing Accidents

Figure 1



Type of Injuries in Fixed-Wing Accident Hospitalisations

Figure 2



So what can be learnt from this catalogue of woe?

The most obvious common factor is that fractures and wounds occur when the fragile human body comes into contact with more rigid materials and structures. Anything that lessens the likelihood of such contact will decrease the chances of injury and improve the chances of survival. First and foremost is to ensure that the human occupants are as well restrained as possible. This means wearing any available harnesses. All occupants should ideally be restrained by a full shoulder harness. Full aerobatic four-point harnesses and double over-the-shoulder harnesses provide the maximum protection. Our data showed that the tiny minority (2.5%) of pilots who were not wearing some kind of restraint were more than four times as likely to be injured in the impact than those who were wearing a harness.

Where to Crash

It pays to choose your crash site as carefully as possible! This comes down first and foremost to pre-flight planning, and secondly to the decision-making associated with a forced landing. The question of carefully choosing routes that will optimise the ability to survive a crash landing has been touched on in a previous *Vector* article in 1998, Issue 7 and is well worth referring back to. *Vector* 1998, Issues 3, 4 and 6 are also worth reading.

The most significant risk factor in our study was whether the crash occurred on an airfield or elsewhere. Crashing on an airfield is considerably safer for a variety of reasons, including the proximity of rescue services and the lack of obstructions. The New Zealand data showed that crashes involving any of the following factors are much more likely to result in fatal or other serious injuries:

- crash site above 2500 ft amsl
- crash site in bush
- crash site on a steep incline (> 20 degrees)
- crash in bad weather

Careful route planning can minimise exposure to these risks by avoiding such terrain as far as possible. An alternative route that avoids the worst terrain, but adds ten minutes to the flight time, could be seen as a sensible insurance policy against known risks. If you are prepared to take out a home insurance policy against a small, but foreseeable risk, why not do the same thing when flying?

Once a crash landing has become inevitable, it is important to 'fly the aeroplane all the way'. Some excellent advice on this can be found in a very recent article on crash survival at the following web address: **http://www.avweb.com/articles/lounge/tpl0023.html**. The key is to remember, 'The difference between a landing and a crash is simply the distance over which the aeroplane can decelerate'. Flying 'all the way' means not stalling above the ground. The advice is sound, but it is acknowledged that we rarely get to practise this.

What You Should be Wearing

Generally come-as-you-are informal attire is to be recommended as long as it is made of natural (eg, wool or cotton) materials. Polyester clothing is to be avoided. All the research in this area has shown that the single greatest threat to survival in a crash is fire. If the worst comes to the worst, you do not want to have molten lumps of nylon or polyester stuck to you. Fortunately, not many of the New Zealand fixed-wing fatalities were caused by burns in the period under study. Nevertheless, this remains the single most potent risk factor for fatal injury in all New Zealand aviation crashes.

Summary

Thinking about the possibility of a crash and how to survive it can appear, at first glance, to be negative or 'defeatist' – after all, as a competent pilot you don't expect to have a crash in the first place! Nevertheless, the unexpected does occur, and if we are going to manage the risks of flight successfully it will pay to have thought about the factors that affect survival and injury in the type of aircraft we operate. Having a plan is always a good idea. The information presented in this article is unique in that it came from the experiences of other New Zealand pilots. There is a wealth of good advice available, including the excellent recent Internet article on Crashworthiness and the *Vector* articles mentioned above.

Be prepared! ■

Hand-Swing Starting

We have not covered this topic in detail since 1980. For ordinary general aviation aircraft, the techniques are really only needed in emergency circumstances, but, to cover that possibility, and with the increasing interest in vintage aircraft and microlight types, we feel it is timely to focus on the topic.

In the early days of flying, many types of aircraft, and certainly all ab initio training aeroplanes, had to be started by hand. The tasks of flying and propeller handling were inseparable, and the seemingly dangerous task of swinging the propeller was taken for granted as a normal everyday aspect of operating a light aeroplane.

Learning the technique of propeller swinging was part of every pilot's training, and as a result it was accorded the respect it deserved.

Today, with the luxury of electric starting being almost universal, starting by hand is only rarely attempted on most aircraft types. Even though aircraft with electric starting have been with us for a long time now, propeller swinging was included in the syllabus in the front of pilot logbooks until relatively recently, and student pilots were taught an appreciation of the hazards involved and the correct techniques to use (even though they may never need to use them).

It is important that if hand-swinging is necessary, it should be attempted only by someone who is conversant with the correct procedures.

First, consider whether it is necessary. If the reason for hand-swinging is a mechanical one, such as a flat battery, is an external start, battery replacement or battery recharge a better option?

Second, is it possible? Some engines are too big to hand-swing. Some are in such a position as to preclude a safe hand-start, eg, a high-wing aircraft with wing-mounted engines, or a seaplane.

General Rules for Hand-Starting

- The aircraft should be positioned so that the person swinging the propeller can obtain a firm foothold with both feet.
- Only a person trained in hand-swinging should be permitted to start an aircraft engine by this method. Since the prop-swinger will be in a more dangerous position than the person at the controls, he or she should assume command of the situation.
- A qualified person (preferably a pilot or maintenance engineer) should occupy the pilot's seat.
- The propeller must not be touched until the person in the cockpit and the person swinging the propeller are certain that the ignition switches are in the OFF position. An aircraft with a mag switch ON is as lethal as a loaded rifle with the safety catch not applied.
- Prior to starting, the parking brake (if fitted) must be firmly applied. Push the aircraft to make sure the brakes are holding. If at all in doubt, chock the wheels or tie the aircraft's tail securely.
- Ensure there is good visual and verbal contact between the person in the cockpit and the one at the propeller.
- Ground rules should be established so that both persons clearly understand the procedure to be followed. The person at the propeller must insist that their commands and/or signals are repeated by the person in the cockpit. (Both should speak loudly and clearly).

Hand-Starting Drills

It cannot be overstressed that the person in the cockpit and the person swinging the propeller should always repeat each other's instructions to ensure there is no misunderstanding. This may not be easy with a closed cockpit aircraft, or if there is another aircraft engine running nearby, or a strong wind blowing. A cockpit side window or DV (direct vision) panel should be left open so that both the person inside and the one outside can shout their challenge and response commands. Never assume an instruction or answer has been given without positive verification.

The following verbal instructions and accompanying actions are typical of those which should occur during a hand-starting operation. ("Prop" is the person swinging the propeller, "Pilot" is the person in the cockpit).

Prop – *"Switches off, throttle closed?"*

Pilot – Checks the position of the ignition switches and throttle setting, then repeats *"Switches off, throttle closed."*

Prop – *"Prime."* (Often omitted if the engine is hot from previous running).

Pilot – Applies priming, then responds *"Primed."*

Prop – *"Brakes?"*

Pilot – Physically checks parking brake applied, then responds *"Brakes set."*

Prop – Physically checks that brakes are holding by pushing against the aircraft, then calls *"Throttle set, contact?"*

Pilot – Sets appropriate throttle position for starting, turns ignition switches on then responds *"Throttle set, contact."*

Prop – Starts engine, using the correct hand-swinging technique as described over.

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If the engine fails to start:

Prop – *"Switches off."*

Pilot – Turns off ignition switches and responds *"Switches off."*

Prop – Repositions propeller for another start attempt, then calls *"Contact."*

Pilot – Turns ignition switches on and responds *"Contact."*

Prop – Repeats hand-swinging procedure.

Hand-Swinging Technique

Firstly, ensure the propeller is installed correctly. On a four cylinder engine it should stop in the 11 o'clock position (from the prop swinger's point of view). If the engine is not coming up on compression in this position, the propeller has been installed incorrectly and will be difficult and dangerous to hand-start. The propeller should be removed and installed properly.

On some engines, such as Gipsy Majors, or Volkswagen engines in homebuilt aeroplanes, the propeller should stop at about the two o'clock position on compression stroke.

On a six-cylinder engine, the propeller will have to be turned through several times until a cylinder is found where the compression stroke is occurring when the propeller is in the eleven o'clock position. Ensure switches are off when re-positioning between attempts.

Any time the propeller is gripped, treat it as though the magnetos are alive. The engine can, and will start, even with the switch in the OFF position.

Never grip both blades at the same time. If the engine should start, you are likely to be wound around the blades, with dire consequences.

The propeller blade should be gripped near the tip with no more than the tips of the fingers around its trailing edge. Ensure that you have removed any loose items of clothing such as neckties (can be tucked into shirt to secure), jackets, and baggy jerseys – getting any of these caught in a rotating propeller does not bear thinking about. Wrist-watches should not be worn (unless well protected under clothing), particularly those with metal wrist straps, as the catch could unfasten during the downward swing allowing the loose strap to become caught by the prop tip. Rings can be a danger also, as the propeller could kick back and catch the ring finger against the trailing edge, probably ripping off the whole finger.

The blade should be gripped near the tip with no more than the tips of the fingers around its trailing edge.

"Ensure there is good visual and verbal contact between the person in the cockpit and the one at the propeller."

With American engines (rotating anti-clockwise when viewed from the front) stand with the weight of the body on the left foot, which should be slightly forward of the right. The propeller is then pulled 'down and away' at the same time, combining the downward pull with a backward step (as pictured below). This ensures positive clearance from the propeller arc.

With a Gipsy engine such as on a Tiger Moth (rotating clockwise when viewed from the front) weight is transferred from the right to left foot and the prop-swinger walks away to the left (as pictured below).

Further Considerations

Impulse Coupled Magnetos

Many modern light aircraft engines are fitted with at least one magneto incorporating an impulse coupling. This generates a 'fat' spark at the spark plug points, even though the engine may only be turning over at a very low rpm.

If the mixture is right, even a small jarring or bumping may start the engine; on such engines it is not necessary to exert superhuman efforts when hand-swinging.

Many engines have the impulse coupling fitted on only one magneto – normally the left. In this case, only the left magneto need be used when starting, but don't forget to turn the other on after start-up.

From Front or Rear?

Some aircraft can be hand-swung from behind the propeller. There is, however, the danger of the wing pushing the hand-swinger into the propeller if the aircraft moves forward.

In many modern light aircraft there is often no outside access to the cockpit controls other than through the DV panel. Also, there is nothing on the airframe to grasp on to with the free hand. Although control accessibility is better with open cockpit aircraft, the confined space between the prop and the wing leading edge leaves little room for balanced hand-swing manoeuvres.

Hand-starting an aeroplane from the rear is not generally recommended unless it is of a type that allows direct and immediate access to the cockpit controls, is powered with a small engine requiring little physical effort to swing the prop with one hand, and has adequate, unencumbered space between prop and wing.

Clearing A Flooded Engine

It is very easy to reach an over-prime situation when hand-starting, particularly with a hot engine. This is mainly due to the reduced mass airflow through the engine, compared with electric starting.

If flooding should occur, clear or purge the cylinders as follows:

- Turn magneto switches to OFF.
- Close mixture control to IDLE CUT-OFF.
- Open throttle fully.
- Pull the propeller through at least once for each cylinder.
- Return to normal starting procedure (not forgetting to reset the throttle).

On some older engines that lack an idle cut-off mixture setting, over-primed or flooded cylinders are 'blown out' or cleared by winding the propeller backwards. However, if the engine is fitted with a vacuum pump to drive gyroscopic instruments, check with an engineer first, as some types of pumps can be damaged by reverse rotation.

Bystanders

Interested bystanders – adults or children – must **never** be allowed to touch, turn, or interfere in any way with an aircraft propeller. Personal friends or visitors should be cautioned on the dangers of propellers.

Aircraft propellers seem to have a strange fascination for onlookers, and this is one of the first things they like to feel or push. **Any** pilot witnessing such innocent affection should be quite firm in warning people against this practice. And pilots should remember to avoid being photographed holding, or leaning on, the propeller!

In addition, try to keep spectators from standing in the plane of rotation of an aircraft propeller. Small stones can be picked up by prop tip vortices and hurled out with considerable force, at head height.

Slippery Ground

Icy surfaces, wet greasy clover, frosty ground and wet mud or clay can be hazardous areas for hand-swinging propellers. Common sense dictates that when hand-starting aeroplane engines, the aircraft must be positioned on a reasonably flat, stable area, where the person doing the hand-swinging will not lose their footing and overbalance into the propeller arc.

Solo Hand-Starting

The following points are musts when hand-starting without cockpit assistance:

- Chock the main wheels.
- If no chocks are available and no park brake is fitted, tie down the aircraft securely.
- On tail wheel types, tie the control column hard back.
- Set the parking brake full on.
- Set the throttle only very slightly. Ensure this is done **after** leaving the cockpit since it is all too easy to knock the throttle open wider with a knee or elbow when climbing out.
- Turn the fuel off before swinging the propeller. On most aircraft types, there will be plenty of time to turn it on again (don't forget) after the engine is running. If by chance the aircraft did run away, it shouldn't get far with the fuel selector off.

Conclusion

The foregoing is intended as a general guide on the basic principles and safety techniques of hand-starting aircraft engines. Any pilot not familiar with or practised in the procedures is recommended to seek the assistance of an instructor or other pilot who is thoroughly conversant with hand-swinging. Practise the drills several times until you are both satisfied that you have grasped the techniques involved. Not only will you be more safety conscious regarding the potential dangers associated with propellers, but you will feel more confident and competent in dealing with the situation should the occasion arise. ■

Never forget the golden rule –
always treat a propeller as live.

Icing Study Recommendations

Background

Ice and aeroplanes don't mix well – especially when combined in flight. The effects of icing on flight can be lethal and include: increased aircraft weight, increased drag, loss of lift, loss of thrust/engine power, erroneous instrument readings, and loss of control – to name but a few.

The possibility of icing-related accidents occurring in New Zealand are very real indeed – especially when you consider how difficult it can be to forecast the icing conditions accurately within our changeable weather systems. In fact, there have been two fatal accidents in this country over the last 13 years where icing was a factor. In 1987 a Cessna Caravan crashed off the coast of Kaikoura killing both occupants (the pilot had reported icing), and in 1997 a Beech Baron crashed into the Tararua Ranges in forecast icing conditions killing the pilot.

The 1998 CAA Ministerial Inquiry (as a result of the Beech Baron accident) recommended that the CAA investigate the hazards posed by icing to aircraft in the New Zealand operating environment. More specifically, the Inquiry recommended that, "The CAA initiate a thorough analysis regarding icing issues in New Zealand, including assessment of historical accident and incident data and an assessment of the potential dangers inherent in the New Zealand operating environment. The study should consider means to better educate pilots on the hazards and the methods of mitigation."

Icing Study

The CAA adopted this recommendation and commissioned an independent report into icing hazards in New Zealand. The study (*New Zealand Aircraft Icing Hazards*) found that there was generally a low level of awareness of icing among general aviation pilots in particular, a lack of icing incident reporting, a lack of understanding of aircraft icing certification levels, some company Operations Manuals contained poor advice as to flight within icing conditions, and questionable pilot/operator attitudes towards flying in icing conditions (in some cases). It went on to make the following recommendations:

- That an Icing Paper, based on one published in the Flight Safety Foundation's *Flight Safety Digest*, be developed as a comprehensive reference for pilots.
- That the CAA implements an icing education programme aimed at pilots – particularly general aviation pilots.
- That existing licensing syllabi be amended with reference to the Icing Paper.
- That existing training texts be compared against the requirements of such an amended syllabi.
- That all company Operations Manuals be reviewed with regard to their icing content.
- That the CAA includes icing as a topic on its database.
- That improvements in icing fore-casting be investigated.
- That certification requirements for IFR and night freight operations be reviewed.

Icing Campaign

The CAA has adopted all of these recommendations and is currently working with a number of bodies to implement them. The first recomm-endation has been completed and the *Aircraft Icing Handbook* is now available (preliminary format only) on the CAA web site under **Publications – Good Aviation Practice**. It is intended that the Handbook will become a primary

reference for pilots and be a catalyst in raising industry awareness of aircraft icing hazards.

Vector, as part of this educational campaign, will run a series of articles on icing and its effects. Articles are likely to cover topics such as: the effect of ice on aircraft performance; understanding New Zealand's meteorological system; pilot interpretation of weather forecasts (identification and avoidance of icing conditions); identifying in-flight airframe icing; actions to be taken in the event of inadvertent entry into moderate/severe icing conditions; the importance of PIREPs and incident reporting; flight crew awareness as to the types of aircraft icing certification levels; and the importance of adhering to Standard Operating Procedures.

Watch out for these, and advice of a number of other products and initiatives in forthcoming issues of this magazine. ■

What's Wrong Here?

Answer on page 11

Pass It On – Others May Benefit

SHARE YOUR EXPERIENCE

The aviation industry involves many people with a tremendous range of experience. The problem is that within this wide spectrum are many who could offer sage advice that could assist those coming through the system but who, for reasons known only to themselves, do not put anything back into the system that may have supported them for, in some cases, several decades. It never ceases to amaze me that people will see an unsatisfactory situation either occurring or developing, and yet will say or do nothing till after the event, and then will be the first to criticise those involved with 'I told you so' attitudes.

I well remember a winter's day in 1963 at the back of the old Southern Scenic hangar at Queenstown, when the famous bush pilot Tex Smith came out to speak to me as I prepared to leave for Invercargill in my recently acquired Tiger Moth. "Done much flying in it?" he enquired. Proudly I admitted to having done about five hours at that time. "Much time in the mountains?" he countered. I had to admit that my time in a Tiger in this type of country was very limited. "Watch your attitude and airspeed" was all he said as he walked away puffing on his famous cheroot. Tex was a man of few words.

I was mystified. What was wrong with my attitude? Did he think I was a bit of a cheeky bugger? I went into the hangar to ask another senior pilot what Tex had meant. He laughed. "No," he explained, "all Tex was telling you succinctly was that as you have done most of your flying down in the flatlands of Southland, you may not realise that in a low-powered slow aircraft such as a Tiger Moth you have a lot of drag built in, and it was important to cross refer the aircraft's attitude with the airspeed and balance needle, constantly looking inside and outside the cockpit. In such a machine with a long nose and restricted forward visibility, there is a tendency to either climb or tighten a turn when flying in the hills without a visual horizon as a reference. Airspeed, in either case, is lost and depending on the room you have to manoeuvre in you may find yourself in an irretrievable situation very quickly."

I have never forgotten these few words. They were given not as a lecture but as a thinking point if I was to continue flying in some of the nation's most beautiful but unforgiving country. Thirty-six years later I can tell you those words have saved my hide on many occasions as I developed my aviation business in Fiordland and on the West Coast.

> ***"Aviation is a game in which we are taught something initially, and then we practise on our own."***

Recently a visiting turbine helicopter arrived with a flourish in our area when a strong westerly was blowing. He arrived into wind and quickly turned downwind, went out of translational lift, and finished with a rapid rate of descent to his landing spot with very low airspeed. An arrival was an understatement! How the tailboom was not damaged and the skids did not end up in the cabin is beyond me.

I sauntered over as two slightly subdued individuals climbed out of the cockpit. In the course of a general conversation, I mentioned his arrival looked a bit of a dumb act to those of us watching, and the general consensus was he was lucky not to have a bent machine or worse. The pilot was quite sheepish in his explanation, but he couldn't understand what had happened, as he was light and had stacks of power available. He also had quite a reasonable amount of time in the machine.

Further discussion brought realisation that he had in fact been caught in power-settling, and with a tailwind and little airspeed he was descending in his own rotor downwash and, in the confined situation he had placed the machine in, all he could do was hope. It all happened very quickly! The point is that we all learned something from the incident. I doubt that pilot will ever get caught like that again, and from my perspective I have seen at first hand a graphic example of full power-settling viewed from the ground.

The point I am coming to is that there are many people who can assist in a positive and/or mentoring way. The helicopter industry ran a very successful mentoring programme a short time ago to try to counter the poor accident statistics. It did assist, and I believe it is incumbent on all of us who are active in aviation to offer the benefit of our advice (much of which has been hard won) to those less experienced than ourselves.

Aviation is a game in which we are taught something initially, and then we practise on our own. As experience builds, we try other things, which may or may not be safe. We may get away with it safely. We may, however, bend the aircraft or injure or kill ourselves or those close to us. Let us not neglect to pass on that hard won experience we all have; it may save someone from ending up in the latter category.

Fly safely!

Jules Tapper is an experienced commercial pilot based at Queenstown. He holds licences in several countries and is qualified in both fixed-wing and helicopters. Over 38 years he has flown nearly 70 different types of aircraft and holds multi-engine instrument, turbine, night and instructor ratings. ■

Tips for Winter Operations

*Winter is with us again, and there are some particular aspects to think about with our flying. We note just a few here – check the GAP booklet on **Winter Flying** for further information.*

Frost

Jack Frost is out and about in many parts of the country, particularly in inland areas in the south. If your aircraft is parked outside, don't plan on an early morning takeoff after a cold clear night.

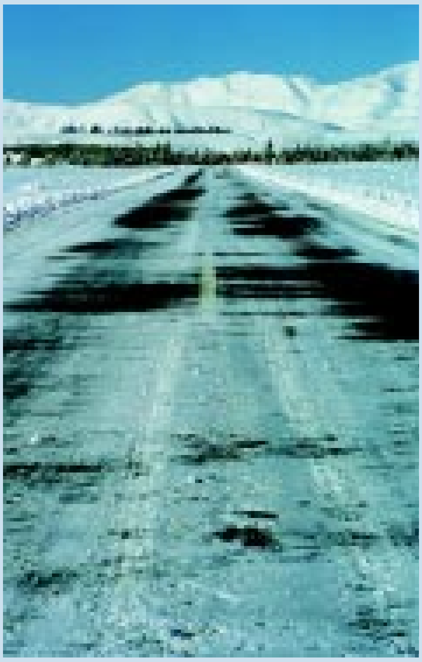
Even a light layer of ice or frost on the wings will result in higher stall speeds and lower stall angles of attack. The frost imposes a greater degree of surface roughness, which increases skin friction and reduces the kinetic energy of the boundary layer, causing incipient stalling of the wing.

The aircraft may get airborne in ground-effect, but when the nose is raised to climb away an incipient stall may result at an angle of attack considerably less than normal for the particular weight.

Any takeoff with frost or ice on the wings and tail surfaces can be fraught with danger, so why take the risk when only a minimum of time and effort is required to clear it away beforehand. The exercise will help warm you up!

For small aircraft, hand-brushing will clear what is not stuck to the surface. Patches of solid ice can then be removed by 'sawing' backwards and forwards over the surface with a length of material or hemp rope. Hard-edged tools must not be used. Plastic cards are particularly good for windscreens.

Snow, ice and frost should be completely removed from helicopters. Even a small amount of ice remaining on a portion of the rotor blades could set up a vibration that leads to loss of control.



"Fog can be prevalent in certain places in winter. Pay special attention to temperature and dew point values in forecasts and reports."

Surface Conditions

As frost thaws, a grass runway will have a slippery layer on a hard base. Braking action will be reduced with the danger of skidding, particularly if the brakes lock, with possible loss of directional control. Do not brake harshly; use intermittent brake application.

Snow, slush, mud and wet grass will all adversely affect takeoff and landing distances and possibly affect directional control.

Heating and Defrost Systems

Check that heating and defrosting systems are working correctly.

Misting on the inside of the windscreen can reduce visibility markedly. The problem can be accentuated when warm bodies in damp clothing climb on board. If your demister doesn't work well, make sure you have a cloth handy to keep the windscreen clear.

Winter temperatures mean we are more likely to use the heater, so check for any signs of leaks in the system that may allow carbon monoxide (CO) gas into the cabin. A carbon monoxide detector can be cheap insurance – most types consist of a small sensitive spot that will darken when CO is present.

Starting Your Aircraft

A fully charged battery is essential for winter operations. Low temperatures mean harder starting due to low engine oil viscosity and reduced battery performance. This generally imposes high loads on the battery and electrical system.

In winter, starting requires more priming in both fuel-injected and carburetted engines. Carburetted engines can be particularly hard to start. There is an increased chance of additional fuel igniting during the start, particularly if incorrect priming techniques are used. Brush up on fire-during-start procedures.

If you come from the far north and are planning a winter holiday in the south, make sure you are well briefed before you leave on how your engine should be treated in cold-weather situations.

Weather and Daylight

Although we can have some brilliant clear days in winter when navigation is easy and the colder temperatures enhance aircraft performance, there are many days when flying conditions are less favourable and sometimes downright impossible.

Obtain thorough weather briefings before flight. Allow for the shorter daylight hours in winter, remembering that when cloud cover is present, it will become dark earlier. For VFR operations, plan to arrive at your destination at least 30 minutes before Evening Civil Twilight (and remember that it will get noticeably darker as you descend).

Fog can be prevalent in certain places in winter. Pay special attention to temperature and dew point values in forecasts and reports. If the wind is forecast to be light, and the gap between the temperature and dew point is already small, there is a good chance that fog may form as the temperature drops. Be careful when planning flights towards the end of the day in areas where fog may form – this applies to airfields near water sources such as lakes, rivers or the sea, and also in hilly or mountainous terrain where valley fog may develop.

Late afternoon light with long shadows and possibly haze or the beginning of mist can affect visibility and perspective, making an airfield look different from normal, and this can be a problem for inexperienced pilots.

Carburettor Icing

Last, but not least, be alert to the dangers of carburettor icing. Winter (also autumn and spring) conditions are generally more conducive for the formation of carburettor ice. Carb icing can occur at various combinations of air moisture and air temperature.

It can occur in flight or on the ground. It is most likely to occur at low power settings. The air temperature can be anywhere between +25 degrees C and around –10 degrees C, depending on the amount of moisture in the air – with a wider range still at lower power settings.

Be aware of potential carb icing conditions, monitor and recognise the symptoms, and know the correct preventive and remedial actions.

A final word – make sure you have suitable clothing and equipment on board for a potential survival situation (or a less dire circumstance such as hanging around in the cold while sitting out the weather or waiting for a malfunction to be fixed). ■

Strap Sense

Answer for What's Wrong Here? on page 8.

The photograph on page 8 shows three men in a Schweizer 300* helicopter, preparing for a flight. The right door has been removed, because the flight will involve some photography.

The centre-seat occupant is not wearing a shoulder harness. "So what?" you may ask. This is quite a common occurrence. So is the investigation of accidents involving this helicopter type, in which it is found that the centre-seat occupant has not been wearing a shoulder harness.

If you check the Flight Manual for this helicopter type, you will find in the Limitations (Section II) that a shoulder harness is required for the centre-seat passenger. If you check CA rule 91.109, you will find that "No person shall operate an aircraft unless it is operated in compliance with the operating limitations specified in the aircraft flight manual". Getting the picture now?

In years gone by, several Schweizer 300 accident investigations found that the centre-seat occupant had not been wearing a shoulder harness. The main reason for this? There was no such shoulder harness fitted. Although the point was made in several reports, this seems to have been missed by a number of operators.

The message? If there is no shoulder harness for the centre seat, you may not carry a passenger in that seat. ■

Our friends above seem to have got the message!

*Prior to 1983, the type was known as the Hughes 269, or more popularly as the Hughes 300. Schweizer took over the production and product support in July 1983.

Don't Forget the Supplements!

During a recent investigation into an accident involving a helicopter with a sling load, it was found that none of the three Supplements relating to cargo hook operations were in the aircraft Flight Manual. Thus, critical information on limitations and performance was not available to the pilot, and the pilot attempted to take off with the helicopter overloaded for the conditions.

The helicopter had supposedly undergone an ARA (Annual Review of Airworthiness) only a few months previously, although the record keeping was found to be somewhat vague in this respect. One item in the ARA (required by Civil Aviation Rule 43.153) is "to ensure that the Flight Manual is the current version for the aircraft". It is reasonable to expect that such a check will include the Flight Manual Supplements.

How do you know if you have all the Flight Manual Supplements applicable to your aircraft? Check the aircraft Maintenance Logbook to see what modifications have been made to it (this includes auxiliary equipment such as spray gear and cargo hooks for example) and whether they have Supplements associated with them. Then cross-check that all these Supplements are contained within the Flight Manual. If you are uncertain about whether there is a Supplement associated with a particular modification, contact the engineer who installed the modification and ask them to provide any relevant details. Remember, as an aircraft operator it is your responsibility to ensure that Flight Manuals are keep up to date in this regard.

(Note that the CAA used to list all Approved Supplements in the New Zealand portion of each Flight Manual. You need only, however, to insert those Supplements that are applicable to your aircraft's particular configuration.)

If you are in any doubt as to whether a Flight Manual is complete, telephone the CAA flight manual specialist Jutta Pearson on 0-4-560 9545 and she should be able to help. ■

Don't be Diffident

The accident files contain numerous examples of forced landings and ditchings where the failure of the pilot in command to make an accurate, clear, and complete distress call, has significantly hindered Search and Rescue efforts to locate the survivors. In some cases this may ultimately have cost lives.

A recent example was the ditching of a Cherokee just east of Amberley Beach late last year with the loss of its two occupants. A successful ditching was made several miles offshore, but Search and Rescue efforts to locate the survivors were hampered by the pilot's RTF transmissions not conveying any sense of urgency. The Flight Information Officer (FIO) monitoring the FISCOM frequency in use did not become aware that the pilot was in the process of ditching until approximately five minutes after it was first established that the aircraft was experiencing engine problems (the FIO was under the impression that the aircraft was operating over land at the time). The pilot did make a transmission that commenced with one word "MAYDAY", but this was very indistinct and the FIO did not hear it. Valuable information and time were lost as a result.

"Set your transponder to 7700 as soon as possible before radar coverage is lost."

A standard distress call commences with the word "MAYDAY", preferably spoken three times. We would ignore the word "preferably" and recommend that the message begin, "MAYDAY, MAYDAY, MAYDAY". There is nothing diffident about the phrase; it is designed to instantly alert ATS personnel to the distressed nature of a flight and initiate immediate emergency and search and rescue procedures.

Study, and practise, getting the rest of the distress message in the standard format, but if you do no more than get out MAYDAY, MAYDAY, MAYDAY followed by your call-sign, then you've maximised your chances of help.

Knowing exactly what to do, and in what order, can make a big difference to the outcome of the situation. Let's therefore look at some of the reasons why pilots sometimes fail badly in this area, and review the basics of handling an emergency.

Pilot Reluctance

There has been reluctance by some pilots to make a MAYDAY or PAN call when faced with a significant problem. There are a variety of reasons for this.

Perhaps a macho attitude prevails where they believe that they can handle the situation on their own and are of the mindset that outside assistance is not required.

Perhaps there is a reluctance to 'make a fuss' and be the centre of attention – when this is exactly what you need to be!

Maybe the thought of having to report the incident to authorities may deter. This is especially true when the reason for the emergency is due to something the pilot has or has not done, eg, fuel exhaustion, getting lost, pushing on unnecessarily in poor weather.

Some may simply be too embarrassed over what occurred and want to keep the whole incident quiet, while others might fear a loss of face or credibility amongst their colleagues.

These behaviours are not appropriate and can cost lives.

A 1995 Transport Accident Investigation Commission report on a similar type of accident highlighted the significance that these kinds of hazardous attitudes can have on how a pilot handles an emergency. In its analysis it stated, "This is a frequent aspect of emergency situations in which there is a reluctance to use the specific pro-words, perhaps in the belief that the emergency does not warrant it, or the hope that the situation might improve. This is generally false optimism, which is likely to prejudice appropriate responses by those able to assist."

We would like to stress that you should **never** try to play down or conceal an in-flight problem that might jeopardise the safety of you and your passengers. It is absolutely essential that you **speak up** immediately when faced with a problem using PAN, PAN, PAN, or MAYDAY, MAYDAY, MAYDAY as appropriate – you can always cancel a distress call if things improve and you no longer have the problem.

Prioritising Your Actions

When faced with a problem or emergency, it is critical that you are familiar with the RTF distress phraseology (this should be a response well learned from your pilot training) and know how to prioritise your actions. Refer to the Emergency section of the *VFG* or the Operations section of the AIP *Planning Manual* for examples of distress phraseology. Our advice when confronted with an in-flight problem is to prioritise your actions in the following order:

Aviate

Fly the aircraft first and foremost. Maintain control and assume a safe airspeed, heading, and height (if possible).

Navigate

Identify the nature of the problem and decide on an appropriate course of action without delay. Note that a higher priority may need to be given to making a distress call and squawking 7700 if you are about to lose radio coverage – it may be your lifeline once on the ground or in the water.

Communicate

Once you have the aircraft under control and a plan of action, tell **someone** what has happened. Transmit the distress signal:

- MAYDAY, MAYDAY, MAYDAY (or PAN, PAN, PAN, whichever you think is warranted)
- Name of station addressed (if time permits)
- Your callsign
- Nature of the problem (persons on board can be useful information)
- Your intentions
- Present position, level, and heading

Distress calls should preferably be made on the appropriate ATC or FISCOM frequency. If there is insufficient time to do this though, or a lack of radio coverage, then transmit blind on the unattended frequency you have selected at the time – chances are that someone will hear your call, especially if you are near an unattended aerodrome.

Set your transponder to 7700 as soon as possible before radar coverage is lost. Doing so (assuming you are within radar coverage) will change the status of the target representing your aircraft on the controller's radar display, alerting them to the fact that you have a problem.

Upon squawking 7700, the radar control system automatically attaches a special flashing 7700 label to your target. It will continue to flash until the controller acknowledges your emergency status. The controller can then filter out other labels associated with traffic in your immediate area, to accurately determine your position and heading. The controller will then try to establish radio contact with you to determine the nature of your problem and activate Emergency and Search and Rescue services if required.

"Distress calls should preferably be made on the appropriate ATC or FISCOM frequency."

If the controller is unsuccessful in making contact, they will alert a FIO to your emergency status, who will in turn endeavour to make contact with you. All this without you having to say a word!

It was interesting to note that the pilot of the Cherokee ditching appears not to have selected 7700 on the transponder until he was below radar coverage. Had he done so shortly after the engine failed, and given an unmistakeable MAYDAY call, the SAR action would not have been delayed by the need to replay the audio and radar recordings.

If the emergency situation results in a forced landing where Search and Rescue services are required, it is important to confirm that the aircraft ELT has activated by arming it manually – you may have made such a good job of the forced landing that the deceleration forces were insufficient to automatically activate it! It would be tragic to survive the forced landing and think that Search and Rescue were homing in on your ELT signals, when in fact it had not activated itself upon impact or touchdown.

Summary

Failing to state clearly the nature of a problem using the correct phraseology, and failing to squawk 7700, not only prevent ATC or another station providing in-flight assistance, but also can severely hinder Search and Rescue efforts to locate you should you be forced down. Likewise, poor prioritisation of in-flight emergency actions can result in a situation where the distress call is left too late, and radio and transponder coverage are lost.

If it has been a while since you last practised the drills and RTF procedures associated with an emergency, then you should revise them. Some dual forced-landing or precautionary-landing practice can be useful to simulate coping with the pressure of flying the aircraft and handling the emergency at the same time.

If you ever find yourself in a situation where there is some doubt as to you and your passenger's safety, **do not hesitate to declare an emergency** – don't be diffident and think that it's 'not that big a deal'. Trying to handle it on your own may cost lives.

Copybook MAYDAY

The pilot of a light aircraft made a clear and unambiguous distress call shortly after his aircraft suffered a catastrophic engine failure while on an IFR night cross-country. The controller was immediately able to pinpoint the location of the aircraft, give the pilot a bearing and distance to the nearest airfield, and advise the minimum safe altitude with reference to terrain. The controller was also able to advise the National Rescue Coordination Centre of the aircraft's last known position and heading as soon as it disappeared from radar coverage.

A search was mounted at first light and the aircraft found a short time later near its last known radar position. Unfortunately, there were no survivors due to the severity of the impact into rugged terrain.

Although this night cross-country ended in tragedy, the pilot did exactly the right things when it came to making a distress call – showing that good preparation and training are effective in a pressure situation. ■

Got a Hang-up?

The pilot of a Piper Malibu (PA-46-310P) declared an emergency due to an unsafe nosegear indication and failure of the flaps to extend when selected. Ground staff confirmed, after a flypast, that the gear had not extended. Emergency extension procedures were carried out, which failed to rectify the problem. A call was made to the aircraft owner, who had previously experienced this problem. He suggested carrying out a stall to assist the gear extension spring. This idea worked and the aircraft was landed safely.

Further investigation revealed that the hydraulic motor had a dead segment preventing its operation. The manufacturer was advised of this problem and recommended that the emergency extension spring be replaced every two to three years and that the hydraulic accumulator pressure be checked every six months.

Vector Comment

This incident provides a good opportunity for us to point out that inducing an aerodynamic stall, or other manoeuvre, can be an effective method of extracting hung-up landing gear when normal emergency extension procedures have been ineffective. The owner's advice to stall the aircraft probably saved a wheels-up landing in this case.

Bringing the aircraft to the stall (making sure there is plenty of height) reduces the air pressure on the underside of the aircraft, which assists the landing gear to drop out under its own weight (particularly so with the main gear). The associated reduction in airspeed also assists this process. Reduced airflow means less resistance to the extension process – especially for aircraft whose nosegear has to be extended forward into the airflow. The absence of propeller slipstream in a power-off stall further aids this extraction process.

An alternative to the above method is to rapidly accelerate the aircraft by gradually descending it and then pulling it up into a steep climb. The increase in loading (positive G-force) may cause the landing gear to extend and lock.

Note that yawing the aircraft from side to side is generally only effective in locking landing gear that is already down, or is partially down, rather than as a method to extract it from the fuselage. ■

Safety Seminars

JUST PASSING THROUGH –
Airspace, Aerodrome, and Performance Considerations

Planning for this year's series of Av-Kiwi seminars is almost complete with all of the venues having been finalised.

Last year's series focused on the planning and decision-making involved in making a VFR cross-country flight to the other island. *Going North* and *Going South* were very well attended and it was good to see the wide range of experience levels of those participating. Attendees generally found the material covered to be interesting and useful with the practical experience and advice shared by the industry presenters being particularly well received.

This year's seminar topic entitled *Just Passing Through,* expands on this cross-country theme and will focus on the pre-flight planning and in-flight considerations associated with the arrival/departure from an aerodrome (either controlled or uncontrolled) – especially an unfamiliar one. Particular emphasis will be placed on ensuring adequate pre-flight planning, understanding airspace, correct circuit joining procedures, ATC procedures, and determining takeoff and landing performance.

Experienced instructors will provide useful tips and advice about departing from and arriving at an unfamiliar aerodrome and CAA staff will cover takeoff and landing performance considerations in general. Participants will be tasked with planning a flight to and from attended and unattended aerodromes in the group exercise portion of the seminar.

There are 24 Av-Kiwi Seminars planned nation-wide, which are scheduled to run from late August through to late October. Check the accompanying list for the date and place details of the venues, and watch out for advertising posters displayed at your local training organisation or aviation business.

These seminars are informative and popular – so we hope to see you and other pilots from your club/organisation at one soon. **See you there!**

Seminar Schedule

Saturday 26 August, 9:30 am – 12:30 pm.
Whangarei Aerodrome, at Northland Districts Aero Club.

Saturday 26 August, 9:30 am – 12:30 pm.
Ohakea Airforce Base, Educational Unit Theatrette. (See* for note.)

Sunday 27 August, 9:30 am – 12:30 pm.
North Shore Aerodrome, at North Shore Aero Club.

Tuesday 29 August, 7:00 pm – 10:00 pm.
New Plymouth Aerodrome, at New Plymouth Aero Club.

Thursday 31 August, 7:00 pm – 10:00 pm.
Kaitaia Aerodrome, at Kaitaia Aero Club.

Thursday 31 August, 7:00 pm – 10:00 pm.
Palmerston North Aerodrome, at Manawatu Districts Aero Club.

Wednesday 13 September, 7:00 pm – 10:00 pm.
Motueka Aerodrome, at Nelson Aviation College.

Thursday 14 September, 7:00 pm –10:00 pm.
Blenheim - Omaka Aerodrome, at Marlborough Aero Club.

Saturday 16 September, 9:30 am – 12:30 pm.
Hokitika Aerodrome, at Hokitika Aero Club.

Wednesday 20 September, 7:00 pm – 10:00 pm.
Wellington Airport, at Wellington Aero Club.

Thursday 21 September, 7:00 pm – 10:00 pm.
Tauranga Aerodrome, at Tauranga Aero Club.

Saturday 23 September, 9:30 am – 12:30 pm.
Taupo Aerodrome, at Taupo Aero Club.

Tuesday 3 October, 7:00 pm – 10:00 pm.
Dunedin - Taieri Aerodrome, at Otago Aero Club.

Wednesday 4 October, 7:00 pm – 10:00 pm.
Invercargill Aerodrome, at Southland Aero Club.

Thursday 5 October, 7:00 pm – 10:00 pm.
Queenstown, at Sherwood Manor Hotel.

Wednesday 11 October, 7:00 pm – 10:00 pm.
Gisborne Aerodrome, at Gisborne Pilots' Association.

Thursday 12 October, 7:00 pm – 10:00 pm.
Hastings Aerodrome, at Hawkes Bay & East Coast Aero Club.

Saturday 14 October, 9:30 am – 12:30 pm.
Masterton Aerodrome, at Heliflight Wairarapa Ltd.

Saturday 14 October, 9:30 am – 12:30 pm.
Matamata Aerodrome, at Matamata Soaring Club.

Wednesday 18 October, 7:00 pm – 10:00 pm.
Ardmore Aerodrome, at Auckland Aero Club.

Thursday 19 October, 7:00 pm – 10:00 pm.
Whitianga Aerodrome, at Mercury Bay Aero Club.

Tuesday 24 October, 7:00 pm – 10:00 pm.
Christchurch Airport, at Canterbury Aero Club.

Thursday 26 October, 7:00 pm – 10:00 pm.
Timaru Aerodrome, at South Canterbury Aero Club.

Saturday 28 October, 9:30 am – 12:30 pm.
Omarama Aerodrome, at The Country Time Resort.

*Note that it will be possible to fly in to the Ohakea seminar provided that the aircraft type, registration, and ETA are notified to Base Operations (Phone 0–6–351 5442 or Fax 0–6–351 5448) by midday Friday 25 August 2000. This offer is open only to those wishing to attend the Av-Kiwi seminar. If driving in, visitor passes and directions will be available at the main gate. A visit to ATC may be possible immediately following the seminar. Café Ohakea will also be open for lunch.

How To – Fill the gap

The CAA publishes two series of information booklets.

The How-to… series aims to help interested people navigate their way through the aviation system to reach their goals. The following titles have been published so far in the years indicated:

How to be a Pilot	*1998*
How to Own an Aircraft	*1999*
How to Charter an Aircraft	*1999*
How to Navigate the CAA web site	*1999*
How to be an Aircraft Maintenance Engineer	*1999*
How to be a Good IA	*2000*
How to Understand the Rules	*2000*
How to Get Your Licence Recognised in New Zealand (web site only)	*2000*
How to Report Your Accidents and Incidents	*2000*

The GAP (**G**ood **A**viation **P**ractice) series aim to provide the best safety advice possible to pilots. The following titles have been published so far in the years indicated:

Winter Operations	*1998*
Bird Hazards	*1998*
Wake Turbulence	*1998*
Weight and Balance	*1998*
Mountain Flying	*1999*
**Flight Instructor's Guide*	*1999*
Chief Pilot	*2000*
New Zealand Airspace	*2000*
Takeoff and Landing Performance	*2000*

How-to… and GAP booklets (but not *Flight Instructor's Guide*) are available from most aero clubs, training schools or from Field Safety Advisers (whose contact details are usually printed in each issue of *Vector*). Note that *How to be a Pilot* is also available from your local high school.

Bulk orders (but not *Flight Instructor's Guide)* can be obtained from:

The Safety Education and Publishing Unit
Civil Aviation Authority
P O Box 31-441, Lower Hutt
Phone 0–4–560 9400

*The *Flight Instructor's Guide* can be obtained from either:

Expo Digital Document Centre,
P O Box 30–716, Lower Hutt.
Tel: 0–4–569 7788, Fax: 0–4–569 2424,
Email: expolhutt@expo.co.nz

The Colour Guy,
P O Box 30–464, Lower Hutt. Tel: 0800 438 785, Fax 0–4–570 1299,
Email: orders@colourguy.co.nz

How to Get Your Licence Recognised in New Zealand

How to Get Your Licence Recognised in New Zealand is designed specifically for overseas licence holders wishing to operate in New Zealand. It offers pilots and aircraft maintenance engineers straightforward instructions on the recognition process. This booklet is available **only** on the CAA web site **www.caa.govt.nz** under **Publications / How to… / Get your licence recognised in New Zealand**. It also contains links to relevant forms and legislation.

How to Report Your Accidents and Incidents

Everyone in aviation needs to know how to report accidents and incidents. This booklet takes the confusion out of 'who should report what' and also explains why each report is so important for aviation safety.

Accident Notification

24-hour 7-day toll-free telephone

0508 ACCIDENT
(0508 222 433)

CA Act requires notification "as soon as practicable".

Aviation Safety Concerns

24-hour 7-day toll-free telephone

0508 4 SAFETY
(0508 472 338)

For all aviation-related safety concerns

Learn from the mistakes of others – you'll not live long enough to make them all yourself.

Field Safety Advisers

John Fogden
(North Island, north of line, and including, New Plymouth-Taupo-East Cape)
Ph: 0–9–425 0077 Fax: 0–9–425 7945
Mobile: 025–852 096
email: fogdenj@caa.govt.nz

Ross St George
(North Island, south of line, and including, New Plymouth-Taupo-East Cape)
Ph: 0–6–353 7443 Fax: 0–6–353 3374
Mobile: 025–852 097
email: stgeorger@caa.govt.nz

Murray Fowler
(South Island)
Ph: 0–3–349 8687 Fax: 0–3–349 5851
Mobile: 025–852 098
email: fowlerm@caa.govt.nz

Owen Walker
(Maintenance, New Zealand-wide)
Ph: 0–7–866 0236 Fax: 0–7–866 0235
Mobile: 025–244 1425
email: walkero@caa.govt.nz

OCCURRENCE BRIEFS

Lessons For Safer Aviation

The content of *Occurrence Briefs* comprises all notified aircraft accidents, GA defect incidents (submitted by the aviation industry to the CAA), and selected foreign occurrences that we believe will most benefit engineers and operators. Statistical analyses of occurrences will normally be published in *CAA News*.

Individual Accident Reports (but not GA Defect Incidents) – as reported in *Occurrence Briefs* – are now accessible on the Internet at CAA's web site (http://www.caa.govt.nz/). These include all those that have been published in *Occurrence Briefs*, and some that have been released but not yet published. (Note that *Occurrence Briefs* and the web site are limited only to those accidents, which have occurred since 1 January 1996.)

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 CAA 005 to the CAA Safety Investigation and Analysis Group.

Some accidents are investigated by the Transport Accident Investigation Commission, and it is the CAA's responsibility to notify TAIC of all accidents. The reports which follow are the results of either CAA or TAIC investigations.

ZK-ROG, Cessna T182, 11 May 99 at 1420, Te Karaka. 2 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 52 yrs, flying hours 2850 total, 1100 on type, 91 in last 90 days.

The pilot was making an approach to a private farm airstrip. Late in the approach he misjudged the rate of closure and the aeroplane landed heavily, damaging the undercarriage and surrounding structure, as well as the propeller.

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

CAA Occurrence Ref 99/1312

ZK-FMC, Gippsland GA200C, 27 May 99 at 1600, Ohau. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence CPL (Aeroplane), age 45 yrs, flying hours 8500 total, 4000 on type, 150 in last 90 days.

En route to Palmerston North, the pilot encountered worsening weather conditions to the south of Levin. Rather than turn back, he elected to land in a farm paddock. Poor braking action, due to long wet grass, resulted in the aeroplane overrunning the available landing space and colliding with the boundary fence. The propeller required replacement, the engine required a bulk strip examination, and the fuselage and one undercarriage leg required repairs.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 99/1526

ZK-FRU, Kolb Twinstar Mark-II, 10 Jun 99 at 1530, Featherston. 1 POB, injuries 1 fatal, aircraft destroyed. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours 80 total, 80 on type, 35 in last 90 days.

The microlight was seen to fall from the sky with one wing detached from the airframe. The pilot had flown the aircraft through severe turbulence throughout the last leg of the flight. Further investigation revealed a poor weld on the left wing rear attachment fitting, which was the point of initial failure.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 99/1609

ZK-GMP, Grob G102 Standard Astir III, 12 Jun 99 at 1700, Hobsonville Ad. 1 POB, injuries 1 serious, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age 55 yrs, flying hours 42 total, 1 on type, 4 in last 90 days.

While on a late final approach, the pilot noted that the airspeed was decaying (probably due to wind shear) and lowered the nose in an attempt to regain airspeed. He appeared to overcorrect, however, and did not fully retract the airbrakes. The glider made a heavy landing as a result of this and was substantially damaged.

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

CAA Occurrence Ref 99/1638

ZK-DXD, Cessna U206F, 18 Jun 99 at 1330, Parakai. 1 POB, injuries nil, damage substantial. Nature of flight, parachuting. Pilot CAA licence CPL (Aeroplane), age 25 yrs, flying hours 746 total, 5 on type, 122 in last 90 days.

On descent after the parachutists had exited at 7000 feet, the aircraft engine stopped. The pilot carried out trouble checks but was able to restore partial power only. The aircraft made a heavy landing, causing significant damage to it. The cause of the failure was not positively identified.

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

CAA Occurrence Ref 99/1651

ZK-MMC, Bushby Midget Mustang, 22 Aug 99 at 1555, Dipton West. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 27 yrs, flying hours 1005 total, 16 on type, 222 in last 90 days.

The aircraft accelerated normally during the takeoff roll from a farm airstrip. Nearing rotation speed, the aircraft encountered a wet area of the strip. The mainwheels sank into the ground causing a deceleration and the nose of the aircraft to pitch forward. Full-aft elevator was applied with no response. The propeller and spinner contacted the ground and the aircraft came to rest inverted.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 99/2760

ZK-EMB, Thunder and Colt 160A, 12 Sep 99 at 1430, nr Himatangi Beach. 6 POB, injuries 1 minor, damage nil. Nature of flight, transport passenger A to B. Pilot CAA licence CPL (Balloon), age 40 yrs, flying hours 305 total, 101 on type, 12 in last 90 days.

The balloon was configured for a stand-up landing, but the eventual landing was in fact quite hard. Despite having briefed the passengers on the stance for landing, a passenger fell sideways and broke her ankle.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 99/2694

ZK-HSH, Hughes 369D, 23 Sep 99 at 1100, Marlborough Sounds. 1 POB, injuries nil, aircraft destroyed. Nature of flight, other aerial work. Pilot CAA licence CPL (Helicopter), age 47 yrs, flying hours 12162 total, 9374 on type, 62 in last 90 days.

The helicopter had just completed sling loading a hut on to Motuara Island, and was hovering over the jetty while Department of Conservation ground staff loaded the lifting equipment into the rear cabin. The pilot's primary hover reference was the sea surface adjacent to the jetty. A strong tidal flow prevailed at the time. The helicopter drifted rearwards just before the pilot applied power to take off, and the rear of one skid snagged on the lip of the jetty. The helicopter reared up and rolled to the left, landing in the water. The pilot was assisted from the partially submerged machine by a DOC staff member.

Difficulty in maintaining a precise hover reference over a moving water surface was a factor in the accident.

Main sources of information: Accident details submitted by operator.

CAA Occurrence Ref 99/2755

ZK-CMC, Gippsland GA200, 24 Sep 99 at 0700, Awatere Valley. 1 POB, injuries nil, damage minor. Nature of flight, agricultural. Pilot CAA licence CPL (Aeroplane), age 38 yrs, flying hours 3000 total, 600 on type, 230 in last 90 days.

The aircraft landed on a sloping topdressing airstrip in calm conditions but failed to stop due to excessive dew on the grass. The righthand wing tip contacted the bank, causing minor damage to the wing and propeller tips.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 99/2833

ZK-HPN, Robinson R22 Beta, 29 Sep 99 at 0800, 19 ESE Opotiki. 1 POB, injuries 1 fatal, aircraft destroyed. Nature of flight, hunting. Pilot CAA licence CPL (Helicopter), age 45 yrs, flying hours 650 total, 629 on type, 26 in last 90 days.

The pilot and shooter were deer hunting in the Motu River catchment, and had shot two deer near the top of a large slip above the river. The pilot hovered close to the slip face to allow the shooter to disembark. Immediately after the shooter left the helicopter, the main rotor blades struck the steep face. The pilot was unable to maintain control, and the helicopter struck the ground and rolled approximately 200 metres to the bottom of the slip. The pilot was thrown out part way down, and when the shooter was able to reach him, he found that he had died. Although the shooter confirmed that the ELT appeared to have activated, the antenna cable had been severed, meaning that no signal was received by satellite or other aircraft.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 99/2824

ZK-HUD, Westland Scout AH/1, 30 Sep 99 at 1352, New Plymouth. 1 POB, injuries nil, damage substantial. Nature of flight, other aerial work. Pilot CAA licence CPL (Helicopter), age 38 yrs, flying hours 2100 total, 240 on type, 24 in last 90 days.

The pilot was lifting a load when the engine suffered a power loss due to fuel starvation. The pilot had inadvertently allowed the fuel to run low. The aircraft suffered substantial damage in the heavy landing that ensued.

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

CAA Occurrence Ref 99/2830

ZK-HNM, Hughes 269B, 2 Oct 99 at 1730, Hastings Ad. 2 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Helicopter), age 40 yrs, flying hours 95 total, 86 on type, 4 in last 90 days.

On arrival at Hastings aerodrome, the pilot brought the helicopter to a hover, but in doing so, allowed the rotor rpm to bleed off. Tailrotor effectiveness was lost and the machine began rotating. In his attempts to rectify the situation the pilot got out of phase with control input requirements. One skid hit the ground while the helicopter was still rotating, and it rolled over.

Lack of recent experience was probably a contributing factor.

Main sources of information: Accident details submitted by operator.

CAA Occurrence Ref 99/2832

ZK-EDB, Volmer VJ-22 Sportsman, 16 Oct 99 at 1807, Motueka. 2 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 38 yrs, flying hours 354 total, 104 on type, 14 in last 90 days.

On approach to land, part of the exhaust separated from the 'pusher type' engine, striking the propeller and causing a serious imbalance. The pilot shut the engine down and made a forced landing on the water. The aircraft slid along the surface and up on to the beach at the end of its landing run.

An engineering investigation revealed that the exhaust manifold was manufactured possibly using an inferior technique.

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

CAA Occurrence Ref 99/3015

GA Defect Incidents

The reports and recommendations which follow are based on details submitted mainly by Licensed Aircraft Maintenance Engineers on behalf of operators, in accordance with Civil Aviation Rule, Part 12 *Accidents, Incidents, and Statistics*. They relate only to aircraft of maximum certificated takeoff weight of 5700 kg or less. Details of defects should normally be submitted on Form CAA 005 to the CAA Safety Investigation and Analysis Group.

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

Aerospatiale AS 355F1

Starter generator seal fails

While hot-fuelling the helicopter during a series of short tourist flights, the pilot noticed that engine oil was 'venting'.

An engineering inspection revealed that a starter generator seal had failed, causing the loss of most of the onboard engine oil. This was a one-off failure of the starter generator seal. The seal had been replaced recently but failed to properly seal the interface, either due to being damaged, incorrect procurement, or defective manufacture.

ATA 2410 CAA Occurrence Ref 98/3061

Aerospatiale AS 355F1

Throttle handle failure

During engine shutdown, while the pilot was manipulating the throttle, the whole throttle handle assembly came off in the pilot's hand.

Further investigation revealed that the throttle handle's flexible joining plate had fractured, allowing it to fall off. The design of the throttle lever is a flexi-joint type arrangement. After a high number of throttle cycles, a failure of this joint may eventually occur. TTIS 7202 hrs; TSI 25.3 hrs.

ATA 7202 CAA Occurrence Ref 98/3264

Piper PA-28-161

Engine loses compression, P/N LW 12416

On climb out from the low flying area, the engine started to make a noise consistent with a blown exhaust gasket. On approach to land back at the airfield the engine began to lose power, and it became obvious that the situation had worsened. The pilot made an urgency call to get a priority landing. A successful landing was made.

Inspection revealed a crack from the top spark plug hole to the bottom spark plug hole, causing a major compression loss. The defect was possibly due to thermal shock, as the cylinder had previously been weld-repaired. TSO 371 hrs.

ATA 7200 CAA Occurrence Ref 98/3597

Piper PA-32R-300

Damaged threads cause oil leak

An oil leak was found in the front of the engine. The leak was traced to a blanking plug fitted to the propeller governor, whose threads had been damaged at some time, possibly through overtorquing. The aircraft was a recent import.

ATA 8500 CAA Occurrence Ref 98/3737

Piper PA-44-180

Artex ELT 110-4 battery contaminated

An uncommanded activation of the Emergency Locator Transmitter occurred while the aircraft was parked.

Investigation revealed condensation and contamination in the ELT battery compartment. The unit was fitted in America just prior to the ferry flight to New Zealand. This was the possible cause of the condensation, as the weather conditions at the time were atrocious. No other fault could be found with the transmitter. TTIS 65 hrs; TSI 65 hrs.

ATA 2560 CAA Occurrence Ref 98/307

RAF 2000 GTX SE

Vacuum advance push-pull rod fails

The gyrocopter suffered a power loss while in the cruise. The pilot made a successful forced landing with no damage or injury.

The aircraft was powered by a Subaru automotive engine. The vacuum advance push-pull rod in the distributor had failed.

ATA 7400 CAA Occurrence Ref 98/3045

Robinson R22 Beta

Tailrotor chip warning light illuminates, P/N A021-1

At 1500 feet amsl the tailrotor chip warning light came on. The machine was landed as a precaution to allow the chip plug to be inspected.

Inspection revealed that the warning light was attributed to a sludge build-up. The plug was cleaned, the oil replaced, and a ground run carried out. The plug was re-inspected after 15 minutes and no further contamination was noted. The helicopter returned to service. TSO 1814 hrs; TSI 75 hrs.

ATA 6440 CAA Occurrence Ref 98/582

Rockwell 114

Alternator fails

The alternator stopped charging in flight. This was noticed when the radio and navigation lights began to fade. Radio contact with ATC was then lost. Electrical load was reduced (as per aircraft Flight Manual) and ATC was advised by mobile phone of the situation and the pilot's intention to divert to Wanganui.

The aircraft landed successfully at Wanganui, and the electrical fault was repaired by engineering staff.

ATA 2400 CAA Occurrence Ref 98/2563

Socata TB 10

Cam follower fails

A rough running engine caused vibration through the aircraft. Carburettor heat was selected to HOT, the fuel pump to ON, and the tanks changed. The fuel mixture and power settings were also checked. The pilot was able to maintain height initially, but the vibrations worsened and height and speed began to decay. The pilot continued to the aerodrome, tracking around the town to maintain safe forced-landing options. A safe landing was made.

Investigation revealed that the No 3 cylinder inlet cam follower was fractured and had seized in the follower bore.
TTIS hrs 1334.

ATA 8520 CAA Occurrence Ref 99/1010

International Occurrences

Lessons from aviation experience cross international boundaries. In this section, we bring to your attention items from abroad which we believe could be relevant to New Zealand operations.

Australia

Occurrences

The following occurrences come from the December 1998 edition of *Asia-Pacific Air Safety*, which is published by the Bureau of Air Safety Investigation (BASI), Australia.

Cessna 210N – Fuel system mismanaged

The pilot stated that when the aircraft was about 900 feet agl on approach to the runway, the engine began to lose power. She then commenced engine failure checks. The electric fuel pump was turned on; the throttle, pitch and mixture levers were moved fully forward; and the circuit breakers, master switch and magnetos were checked. As there was no response from the engine, the pilot changed from the left to right fuel tank, then subsequently back to the left. The engine still did not respond, and a forced landing was made in a cane field. All six occupants evacuated the aircraft and were not injured.

The pilot later said that the left fuel gauge read one-quarter and the right gauge read three-quarters full.

Post-flight inspection found the left fuel tank to be empty but the right tank had sufficient fuel for continued flight. The inspection also determined that both fuel tank gauges were misreading and that no fuel calibration card was available in the aircraft.

The pilot's management of the fuel system was not in accordance with the aircraft's Pilot Operating Manual, which indicates that the fuel should be managed in such a way as to balance the aircraft laterally or handling penalties will result. However, the pilot operated from the left tank for almost the entire flight. There had been approximately two hours of fuel in each tank at the commencement of the flight, with a flight plan indicating a requirement for a little under two hours of fuel.

Correct operating procedures for changing tanks also require the change to be made at the selector before the electric fuel boost pump is switched on, in order to prevent air entering the fuel line to the engine. It was probably a coincidence that the switching took place as air from the empty left tank entered the line. This would have had the effect of totally confusing the pilot, who diagnosed a fault with the half-full right tank and switched back to the empty left tank. Once the fuel-feed line to the engine contains air, it takes a considerable time for it to be purged by fuel under pressure from the electric boost pump. The pilot did not have this time available when the engine lost power at 900 feet agl.

United Kingdom

Occurrences

The following occurrences come from the Spring 2000 edition of *Flight Safety Bulletin,* which is published by the General Aviation Safety Council, United Kingdom.

ASK 13 – Glider undershoots airstrip

The instructor set up a normal approach to the hilltop site, but it became apparent that the aircraft was undershooting. He dived the aircraft to penetrate before pulling up to clear the ridge. The glider stalled into the up-sloping undershoot. The aircraft suffered minor damage, and the instructor had minor injuries.

P1 aged 53 with 1203 hrs P1; P2 aged 43 with 0 hrs P1.

ASK 13 – Launch cable destroys glider

The aircraft was winch-launched in crosswind conditions. The instructor turned right to fly a normal circuit but found he was drifting rapidly downwind. He turned back to land on the cross runway. Another glider was launched across his path. The cable from the second glider fell across the first glider, ripping the tail off.

P1 aged 61 with 443 hrs P1; P2 aged 24 with 9 hrs P1.

Cessna F152 – Nosegear fails

A student pilot was flying solo circuits when his instructor saw that the nose landing gear was bent rearwards. He passed instructions to the student to make a full-stop landing holding the nosewheel off the runway and operating the mixture cut-off just before touchdown. There was no further damage to the aircraft.

The distorted fuselage frame, which carries the nosegear and the engine mounting, had been installed as new in November 1998 to replace one which had been distorted by excessive nosegear loads. The frame involved in this latest accident was examined at Farnborough, but it was not possible to determine whether the frame damage had been caused by one severe overload or several incidents.

Student Pilot with 41 hrs total, with 17 hrs in the last 90 days.

Piper PA-28RT-201 – Insufficient takeoff distance results in over-run

The pilot, with two passengers on board, attempted to take off from Runway 06 at Cark, Cumbria with a surface wind of 260/20 knots (ie, a 19-knot tailwind component). As the aircraft became airborne, the pilot retracted the gear and used the emergency button "to retract the wheels faster". The aircraft did not climb, and the stall warning sounded, and the landing gear lowered automatically. The aircraft hit a power cable, which broke and yawed the aircraft to the left. The pilot attempted to raise the gear but the left leg remained down. The aircraft went through a hedge and came to rest against a tree and a railway embankment. Pilot and passengers escaped with minor injuries, The pilot considered the aircraft may have suffered a loss of power.

The pilot plus his two passengers weighed 602 lbs. The aircraft empty weight was 1808 lbs. Refuelling records show that, at the time of the accident, the aircraft was being operated close to the maximum allowable takeoff weight of 2,750 lbs. The required takeoff distance to 50 feet with no flap from a paved, level, dry runway in zero wind was 670 metres. The estimated required ground roll was 536 meters (80%). Runway 06 has a useable length of 400 metres of rough asphalt with a 200-metre over-run at each end. A 5-knot tailwind component would increase the distance required to 50 feet from 670 metres to 762 metres with a ground roll of 609 metres.

PPL with 114 hrs total, 2 hrs on type, with 8 hrs in the last 90 days.