May / June 2000

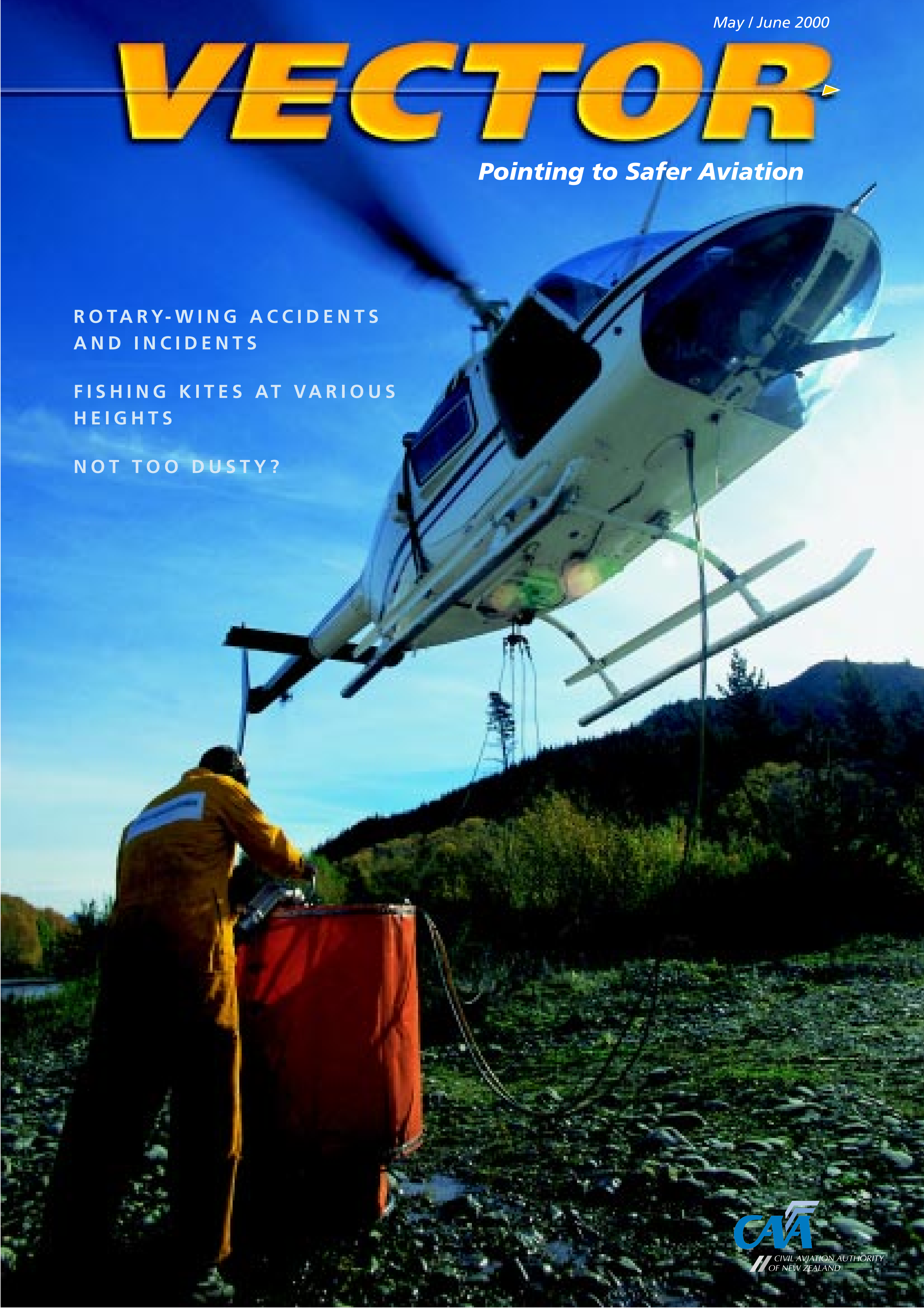
VECTOR

Pointing to Safer Aviation

ROTARY-WING ACCIDENTS AND INCIDENTS

FISHING KITES AT VARIOUS HEIGHTS

NOT TOO DUSTY?



CAA
CIVIL AVIATION AUTHORITY OF NEW ZEALAND

VECTOR

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Vector Editors, Pam Collings and Barnaby Hill.

CAA News Editors, Emma Peel and Francine Beachman.

Design, Gusto Design & Print Ltd.

Published by, Civil Aviation Authority of New Zealand, P O Box 31-441, Lower Hutt, NEW ZEALAND. Telephone +64–4–560 9400, Fax +64–4–569 2024, Managing Editor e-mail: jenksc@caa.govt.nz, CAA News Editor e-mail: peele@caa.govt.nz. Published six times a year, in the last week of every odd month.

Publication Content

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Vector is distributed automatically to New Zealand Flight Crew and Aircraft Maintenance Engineer licence holders, to most organisations holding an Aviation Document, and to certain other persons and organisations interested in promoting safer aviation. ***Vector*** articles also appear on CAA's web site at http://www.caa.govt.nz

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Vector is available on subscription only from The Colour Guy, P O Box 30–464, Lower Hutt, freephone 0800 438 785, phone +64–4–570 0355, fax +64–4–570 1299.

ISSN 1173-9614

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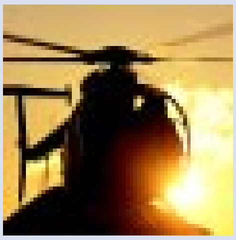
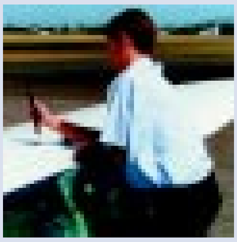


Nearly half of all rotary-wing accidents take place at elevations greater than 2500 feet amsl, where the likelihood of a fatal outcome is double that of those occurring below that elevation.

Modern fishing kites have the ability to be flown up to 90 degrees either side of the wind and can be found up to 1500 metres offshore when the wind is blowing along the coastline.

Any electrical fire in the cockpit is a very serious situation — especially when airborne — and is a pilot's worst nightmare come true.

The Rescue Coordination Centre is receiving an unacceptably large number of overdue aircraft notification calls from the National Briefing office. *Vector* is keen to help reverse this trend.



Avgas theft continues to be a problem for aircraft owners/operators at some unattended aerodromes.

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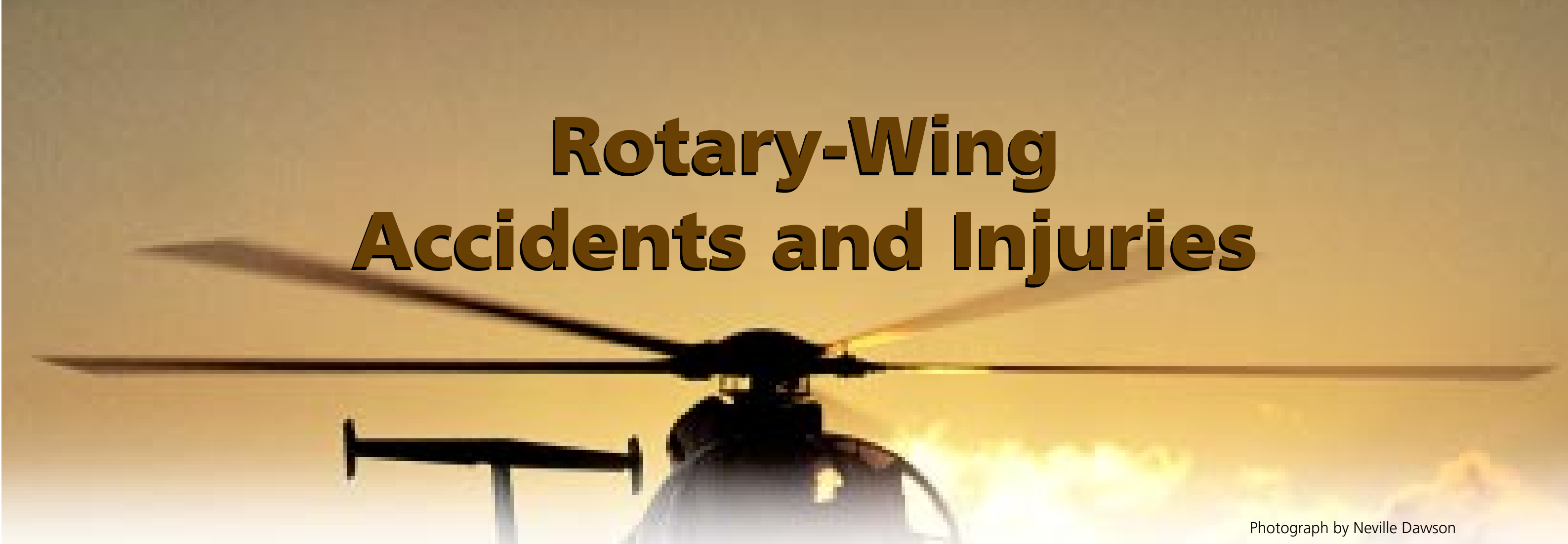
Cover Photo:
by Neville Dawson

Rotary-Wing Accidents and Injuries



Photograph by Neville Dawson

This article is the first in a series of *Vector* articles, compiled by Dr David O'Hare of Otago University, that will look at the inherent risks and types of injuries associated with the operation of different aircraft types (eg, microlights, helicopters, gliders, etc). First up, David explains how the series came about, and then for this issue he deals specifically with rotary-wing accidents and injuries.

Background

Researchers at the University of Otago have carried out the only detailed analysis of air crashes and their associated injuries ever conducted in New Zealand. This involved creating a comprehensive database covering all reported air crashes between 1988 and 1994. Information about the injuries sustained came from a national system of hospital records, and this information had to be carefully matched with the air crash information. The Civil Aviation Authority provided some support for this work, as did the Health Research Council of New Zealand. Some of the results have appeared in scientific journals, but not many pilots read these! A report on the study (*A Preliminary Study of Risk Factors for Fatal and Non-Fatal Injuries in New Zealand Aircraft Accidents)* was submitted to the CAA in mid 1996.

The aim of this series of articles is to convey some of the University's findings to the end-user – **you**!

Rotary-wing Study Findings

The saying that 'helicopters are so ugly the earth repels them' is of course untrue. Every now and again the earth manages to prematurely attract a rotary-wing aircraft, resulting in anything ranging from minor embarrassment to serious injury or worse. In fact, a recently released report *Work Related Fatal Injuries in New Zealand 1985–1994* by the University of Otago has found that helicopter pilots have the highest occupational fatality rate at **210 times** the national average!

As we know, nothing in life is risk-free. Every year people are injured or killed falling out of bed or slipping in bathtubs. Sensible people manage these risks by noting obvious hazards (eg, don't leave loose razor blades on the bedroom floor) and adapting their behaviours accordingly (eg, don't jump into bathtubs with both feet). Rotary-wing aircraft have some similarities with other heavier-than-air machines and some differences. No matter what kind of machine they fly, pilots need to be aware of potential hazards and to have thought about ways of avoiding or minimising them.

Accident Rates/Risks

Judging by the overall accident rate, helicopters may be insufficiently ugly! The overall accident rate for rotary-wing aircraft was more than double that of the worst category of fixed-wing aircraft under 2270 kg MCTOW. Both inherent aerodynamic differences and typical operational requirements put helicopters at greater than average risk. These operational requirements see helicopters being used in mountainous bush-clad areas where fixed-wing aircraft are reluctant, and are unable, to venture. While most helicopters have the ability to effect an autorotational landing with low vertical and forward velocity components, finding a suitably flat area to perform a forced landing can be extremely difficult when operating in such an environment. The chances of sustaining very serious injuries due to rotor strike and/or rolling over, when trying to autorotate onto uneven ground, are very real indeed.

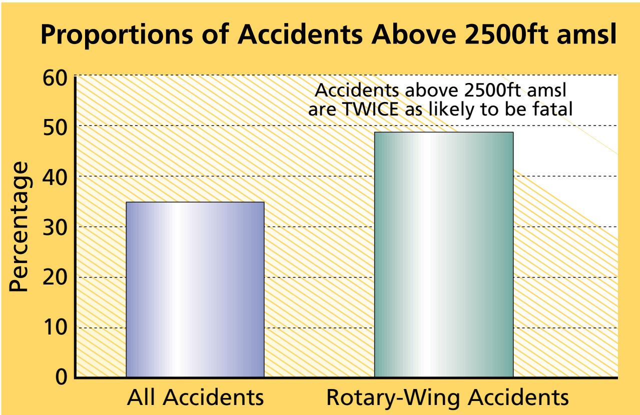


Figure 1

As can be seen from Figure 1, nearly half of all rotary-wing accidents take place at elevations greater than 2500 feet amsl, where the likelihood of a fatal outcome is double that of accidents occurring below 2500 feet amsl. We do not know for sure whether this is due to impact factors (eg, the terrain is generally more unforgiving at higher altitudes) or post-crash survival factors (eg, conditions make survival more difficult, and it takes longer to rescue people from these locations).

Types of Injuries

Rotary-wing crashes are much more likely to result in serious injuries compared to fixed-wing crashes (see Figure 2). Not correctly wearing (ie, pulled tight) whatever seat restraints are available increases the risk of injury substantially, and it is about as smart as scattering razor blades on the bedroom floor. Fortunately, very few pilots seem to do either of these, although the exact use of restraints in helicopter operations is not known.

Helicopter pilots should, however, be aware of the added hazards of survival in inhospitable conditions and should prepare themselves accordingly with survival blankets and necessary medical supplies.

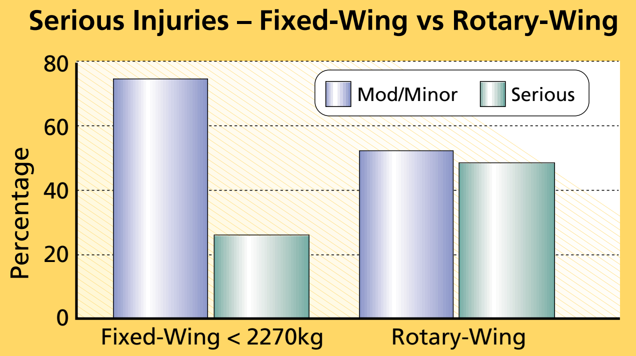


Figure 2 Source: Otago University/CAA Study, 1996

Compared to other air crashes, we find a greater likelihood of head injuries, internal chest injuries and spinal injuries in rotary-wing crashes (see Figure 3). At the same time, there is less likelihood of lower limb injuries. We don't know exactly why this is so, although there are possible differences in the force vector of a typical helicopter impact compared to a typical fixed-wing impact. There are also obvious differences in the structure and arrangement of large, heavy, rotating components above the pilot's head. Seating may also be a factor.

The single most significant factor in pilot survival in rotary-wing crashes, as in almost all aircraft crashes, is the occurrence of fire. This has also been shown in overseas research on helicopter commuter and air-taxi crashes.

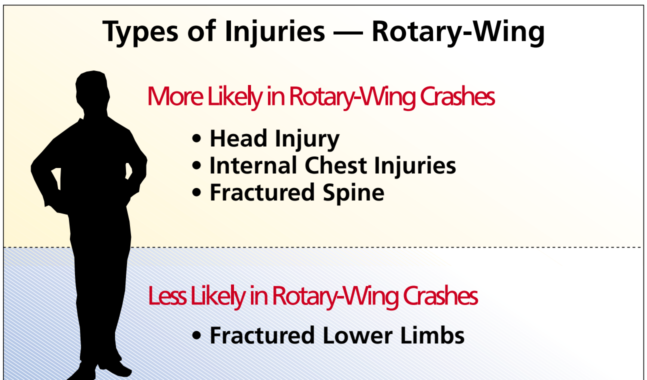


Figure 3 Source: Otago University/CAA Study, 1996

Reducing the Risks

Although it is the manufacturers and regulators who have the ultimate control over the design of structures and materials, pilots have control over the use of protective devices such as helmets, shoulder restraints, and protective clothing. The experience of the British Army Air Corps, whose pilots all wore helmets and fire-retardant clothing, proves that these actions prevent many fatal injuries from occurring. Although their helicopters were more likely to experience post-crash fire than their civilian counterparts, the fatality rate of these well-protected pilots was one-quarter that of the civilian pilots. In New Zealand conditions, the wearing of a light-weight immersion suit can provide valuable added protection during the non-summer months. All of which proves that understanding the hazards and taking simple steps to defend yourself against entirely foreseeable events makes perfect sense.

Watch this space for the next article in the series!

Survival Considerations

Your chances of surviving a helicopter accident, particularly in rugged terrain at high altitude, are strongly influenced by your level of preparedness. We suggest that the following points are worth considering – especially if you are involved in commercial helicopter operations over inhospitable terrain or water.

- Always wear natural-fibre clothing to reduce the likelihood of getting burnt in a post-impact fire. Synthetic clothing such as nylon-based garments can melt and stick straight onto the skin, causing severe burns. Modern synthetic fabrics, such as polar fleece, are becoming increasingly popular – check out the fire resistance of such fabrics before using them. Although wearing fire-retardant clothing is best, woollen garments do afford some level of protection from burns and will be superior in retaining body heat in a cold and wet alpine survival situation. Consider fitting a second fire extinguisher, or upgrading your existing one, so that you are as prepared as you can be to deal with a fire.
- Always wear, or at least carry on board, adequate clothing, footwear, food, and water appropriate to the type of terrain that you plan to operate over – no matter how short the flight. If your passengers include children or elderly persons, ensure that the footwear and clothing you carry will be suited to their particular needs.
- Charter operators should advise their passengers of the need to be sensibly dressed and equipped for the flight – promotional literature should reflect this.
- Ensure that your helicopter is equipped with comprehensive survival and first aid kits and that your passengers have been briefed on their whereabouts. For alpine operations, your survival kit should include a sleeping bag/survival blanket for each person on board and enough food and water for at least 2 or 3 days. And, of course, it goes without saying that each crewmember and passenger should have a lifejacket readily to hand for **all** over-water operations that are further than autorotational distance from the shore.
- Consider investing in a personal locator beacon (to be carried by the PIC) to supplement the helicopter's ELT. You will then have a back-up should the helicopter ELT fail to activate, or if someone is obliged to walk out for help. Personal locator beacons are available for short-term hire from the Mountain Safety Council and may be an economic option for 'one-off' trips over inhospitable terrain or water. A cellphone (with a fully charged battery) can be a useful piece of additional equipment, but be aware that coverage is likely to be a problem in mountainous areas.

It should always be borne in mind that, while investing in safety equipment may be seen as a cost, it is an extremely small cost in comparison to someone losing a life. As always, the key to a successful flight is being well prepared – make sure you are! ■

Fishing Kites at Various Heights

Kites come with strings attached. That is part of the problem. The 'strings' can be nylon with breaking strains of between 50 and 65 kg. Fishing kites can have a span of up to 2.3 metres with carbon fibre frames or be of a 'power -sled' type (like a parasail) with about 2 square metres of sail area. The weight of the most popular types is about 200 grams. Fishing kites present a small, but real, risk to aircraft at low level around coastal areas of New Zealand.

'Kontiki' fishing has long been popular off beaches around the New Zealand coast. It is generally undertaken with favourable offshore winds. Kontiki or raft fishing involves setting a line through the surf with a floating bag or raft being drawn off shore by a favourable wind, towing out a rigged long-line of baited hooks or lures. Kite fishing dispenses with the 'raft' and utilises enlarged kites and sails to take a fishing rig out through the surf.

Modern fishing kite designs have the ability to 'tack' and can be flown up to 90 degrees either side of the wind. This means that you can find a fishing kite up to 1500 metres off shore when the wind is blowing along the coastline. The popularity of kite fishing has increased dramatically over the last ten years, and it is estimated that there are now about 30,000 people involved.

The fact that kite fishing can be undertaken in wind conditions not possible a few years ago, and the rapid increase in people involved in the activity, means the likelihood of finding a fishing kite along the coast is significantly higher than it was, and it is likely to increase further.

The Law

Civil Aviation Rules, Part 101 *Gyrogliders and Parasails; and Unmanned Balloons, Kites, Rockets, and Model Aircraft – Operating Rules* includes requirements for the operation of kites (and moored balloons).

There is an over-riding requirement that a person shall not operate a kite (or balloon, model aircraft, gyroglider or parasail) in a manner that creates a hazard to aircraft or to persons or property.

In general, kites or moored balloons (kytoons) may not be flown higher than 400 feet agl. (This is higher than the 200-foot limit in the old Regulations, and pilots need to take note.)

A kite may not be flown in any circumstances on or over an active aircraft movement area or runway.

A 'shielded operation', ie, within 100 metres of a structure and below the top of the structure, is exempt from the following requirements. This allows for kids (of various sizes and ages!) flying their kites in the local park.

A kite may not be flown in controlled airspace and in most special use airspace without appropriate approval, except in the case of low-flying zones, where they are prohibited. They may not be flown within 4 km of an aerodrome boundary without authorisation of ATC in the case of a controlled aerodrome, or in accordance with an agreement with the aerodrome operator for an uncontrolled aerodrome. There are also requirements for distance from cloud and for visibility.

One can appreciate that the rule was written to offer a measure of protection from a kite encounter at or near aerodromes and to cater for kite flying higher that 400 feet agl now and then, which would be advised by NOTAM. However, with the advent of quite sophisticated large high-performance fishing kites, there are a few very real and practical problems. It may be considered unlikely that many users of fishing kites will know of the existence of CAR Part 101, nor understand the boundaries and implications of various airspace – which makes it all the more important for pilots to be aware of the hazard these kites can pose.

Even if a kite user was aware of the rule requirements, the task of estimating kite height, distance from cloud and horizontal visibility is difficult. (Pilots, too, do not find it easy to estimate height and distance.)

One of the newer fishing kites has a combined kite line and mainline length of 1000 metres (or 3280 feet). Depending on the wind strength, line weights, number of hooks, and the parabolic curve of the line out of the water to the kite, the actual kite height could vary over quite an altitude range, certainly possibly above 400 feet agl. Other kite-fishing models indicate line lengths of 50 to 100 metres (or 164 to 328 feet).

If it is a good day for kite fishing, with a suitable wind, then it is likely the fishing

"He immediately started to wind in the kite from an estimated height of 200 feet when one of the aircraft collided with it…"

folk will be off to the beach to set up and launch. It is most unlikely that they will be thinking in terms of our aeronautical rules and requirements. Thoughts about coastal aviators may only come to mind when either the person fishing or the pilot has had a fright. Yes, there have been some!

Kite Encounters

In the last six years there have been over 80 reported occurrences involving kites. In some cases they involve children (or adults) flying ordinary kites near aerodrome takeoff and landing paths, such as at the edge of Lake Wakatipu on the threshold of Runway 05 at Queenstown airport, where there have been a number of reported occurrences. There have also been two instances of children flying kites at 800 to1000 feet in the Palmerston North circuit area.

Most, however, involve fishing kites flown from coastal areas around the country. Some of these beaches are close to aerodromes, with incidents reported at Tauranga, Napier and Gisborne – all controlled aerodromes. It is likely there have been other unreported occurrences at uncontrolled aerodromes. There have also been occurrences at beaches in the Auckland, New Plymouth, Tauranga and Hawkes Bay areas.

It is probably safe to assume that there have been a number of unreported incidents where the circumstances have been such that reporting the incident would be embarrassing for the pilot. Fishing sources say their biggest concerns have been caused by aircraft flying at a very low level.

One reported incident early this year came from a person who was fishing off a beach south of Whangarei when he saw a formation of four biplanes approaching at very low level. He immediately started to wind in the kite from an estimated height of 200 feet when one of the aircraft collided with it and carried on.

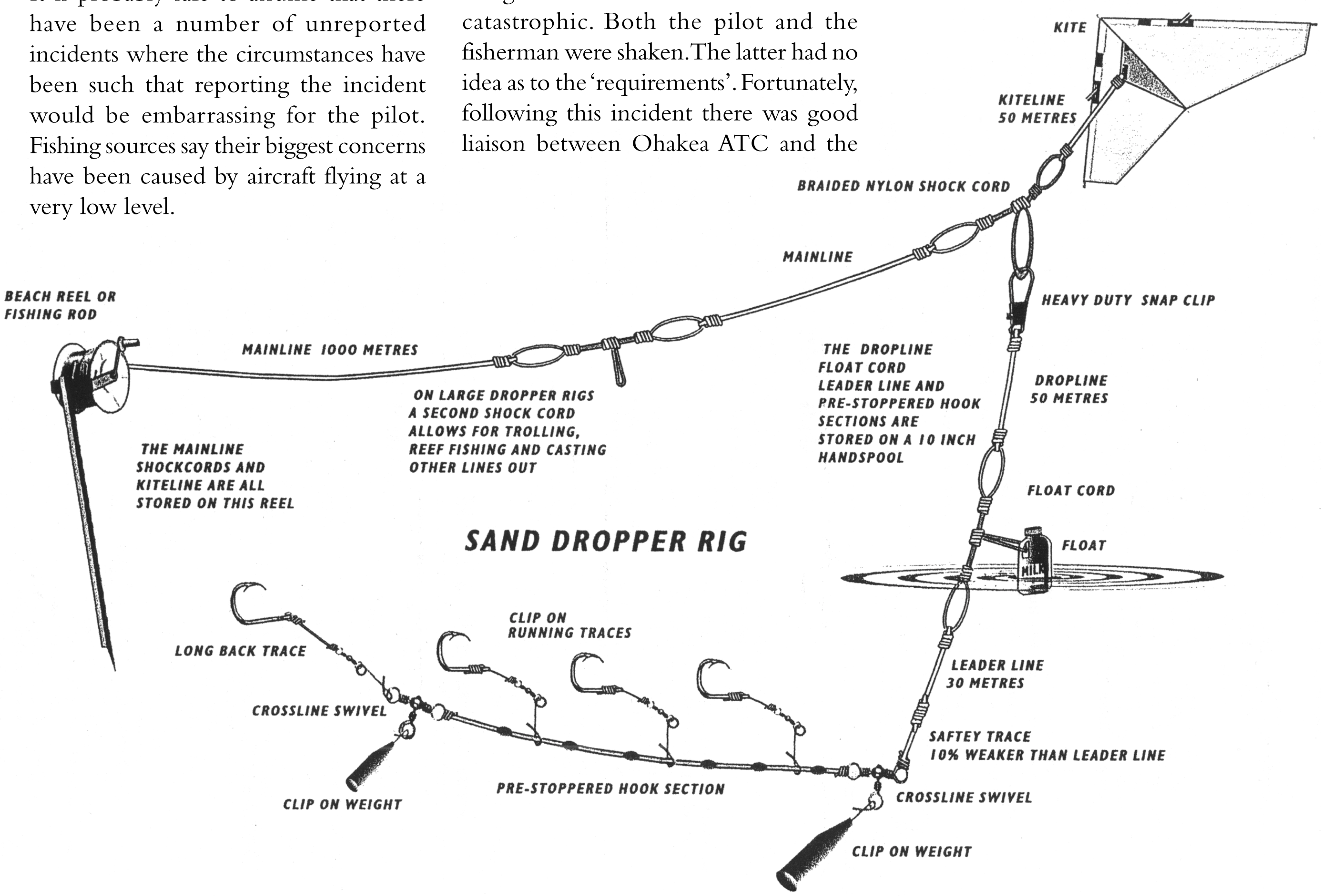
"Modern fishing kite designs have the ability to 'tack' and can be flown up to 90 degrees either side of the wind."

The Manawatu west coast is a popular Kontiki and fishing kite area. Access to these wide black-sand beaches is not difficult. Mid-way along this coastal area, the Raumai Range (M303) extends in a circle approximately five nautical miles inland and the same distance out to sea from the surface to 11,000 feet. It is a major RNZAF weapons training area, with Skyhawk, Macchi and CT4 operations. High-speed target runs are made down to very low levels. In mid 1998 a Macchi had a very near miss with a large fishing kite. The Macchi would probably have broken the line, but the ingestion of all or part of the kite into the gas turbine intake could have been catastrophic. Both the pilot and the fisherman were shaken. The latter had no idea as to the 'requirements'. Fortunately, following this incident there was good liaison between Ohakea ATC and the local fisher-folk with these new large kites, and appropriate notification arrangements have been entered into.

At Gisborne, the airfield elevation is 15 feet amsl, and the approach to Runway 32 is over the Waikanae Beach. Similarly, the departure from Runway 14 is straight out to sea. In the recent past there have been a number of fishing kite incidents at the coastal threshold to this runway. Gisborne ATS have attempted to exercise the authority indicated in CAR Part 101, because this fishing activity is well inside the airspace boundary. Some heated exchanges have taken place, with people suggesting it is their 'right' to fish by these means where and when they want to, without regard to the hazard to approaching and departing aircraft (which include commercial passenger flights).

Auckland International Airport also had an incident this year, with a kite at 200 feet agl on the approach path just 2 NM from touchdown. This is not the sort of distraction a crew need, nor ATS, during this critical flight phase.

Alongside these recent 'near-miss' incidents, there are also informal reports of light aircraft arriving at an airfield trailing lengths of kite line. These have been hooked around undercarriage legs and tailplanes.



Kite-Strike Risks and Hazard Areas

To date there has not been a clearly identified accident from a direct 'kite strike' in New Zealand. But we have had some near misses and frights. The risk is there, however, with kites of increasing size, and with lines of greater strength and length.

With increasing kite size and structural strength from modern materials, a direct 'hit' may damage the aircraft structure, visibility may be masked, controls jammed by debris, or the engine intake(s) blocked, resulting in power loss. A strike on the kite line itself may do little structural damage; the major hazard would be a control surface jam. Since a strike would be at a comparatively low altitude, pilot response would influence the outcome.

Spread out the New Zealand 1:500 000 Aeronautical Charts, and it becomes clear that there are a quite a few aerodromes literally on the coast. Many have runway arrival and departure tracks over the sea or a circuit pattern that can be 'on the coast'. If the beach is suitable, accessible, and the winds favourable, it may be a location where kite fishing could suddenly appear.

Coastal route VFR navigation by light aircraft is popular. It makes navigation 'easy', and terrain is less of a consideration. In the North Island, transit via the west coast is common. In the South Island both the east and west coasts provide good VFR flying routes.

Fishing sources tell us that the coastal areas of the top half of the North Island (from Egmont to North Cape and from North Cape to East Cape) would have ten times the kite fishing activity of other areas. Two of the most intensive areas are the coastal areas south of Manukau Heads and north of Kaipara Heads. (In the latter area, people will sometimes lengthen their lines to allow the kite to be above the cliffs in order to avoid disturbed air.)

In the lower half of the North Island, areas along the Hawkes Bay and Manawatu coastlines are popular. The latter happens to also be the main VFR north-south route.

In the South Island, Birdlings Flat on the east coast south of Christchurch is a popular kite-fishing spot.

Pilot Precautions

In Class G airspace, the practical protection is not to fly below the VFR minimum altitude, namely 500 feet agl. In theory, kites above 400 feet agl should be advised by NOTAM. Whether or not this has happened and pilots have actually read the NOTAM is another matter.

That aside, the altitude minimum is a first protection. Flying higher is better. So seriously consider the risk of flying low-level along the beach.

Fishing kites and their lines can be up to 1500 metres off shore. Flying just inland, over the beach top would place you behind any kites. Alternatively you can go some distance out to sea, but this is less desirable with respect to remaining within gliding distance from land, and for visibility considerations if weather is the reason you are flying at a vulnerable height.

Obviously, local knowledge about coastal kite fishing 'hot spots' is useful. Ask about this at an Aero Club or Flying School in the region. A sports shop may be an even better bet. But first and foremost, remember the foundation of VFR flying – see and be seen. Here the emphasis is on 'seeing'. If your route is in an area where there may be kite fishing, and you are at an altitude where there is a potential hazard, then look for kites. They are getting large, they are multi-coloured, and they may also have a flag on the line. And, as well as looking for the kite, look for the folk fishing. Clusters of vehicles on the beach are a clue to possible fishing activity – so too is the solitary car. If your eyes are really good you may detect the line reel on its pole on the beach.

There is something else to be done also, and that is to educate kite users about our mutual safety concerns and interests. People are not going to stop fishing because we want to fly, and relatively few will know of CAR Part 101 or be affected by it, but none of us want an accident, an incident or substantial damage or loss to our gear. Some of these new big fishing kites can cost over $500, so there should be some interest in avoiding their loss or damage. It goes almost without saying that the costs to a pilot or an aircraft owner of a full-on 'kite strike' could be very much higher.

It is possible that in future an appropriate symbol could be put on charts in the areas where the highest intensity of kite fishing takes place. To assist in gauging the extent of the problem, pilots should report kites that appear to be in a hazardous position to the local ATS unit and the CAA (call 0508 4 SAFETY). Likewise, fishing folk may report low-flying aircraft in the same way.

Acknowledgements

Thanks to Paul Barnes of Paul's Fishing Kites, Auckland for kite information and photos. ■

Beepback Becomes AFRU

For some time now, 'Beepback' units have been successfully used at some unattended aerodromes (eg, Ardmore, Taupo, and Paraparaumu). The CAA and the Airways Corporation have, however, decided not to adopt the phraseology 'Beepback'. Instead, the term Aerodrome Frequency Response Unit (AFRU) will be used to refer to this pilot aid.

An AFRU is a unit that provides confirmation to pilots that they have selected the correct aerodrome frequency, and that their aircraft radio is operating correctly. An AFRU works as follows:

If an aircraft operating within radio range of the AFRU makes a transmission on the aerodrome frequency, the AFRU will detect the transmission and automatically respond on the frequency with either:

- a pre-recorded voice message (normally the aerodrome location and frequency) if no aircraft transmissions have been received in the period (typically 5 minutes) preceding the transmission; or
- a short tone burst if any transmissions have been received in the preceding period.

So, when you come across the term AFRU, you'll know what it is and what it does.

Not Too Dusty?

It is probably not something that we tend to think of as being a hazard in the cockpit, but the build-up of dust and other foreign debris in the aircraft electrical systems can create a potentially dangerous situation. The extract below (adapted from the July 1999 issue of *Air Safety Week*, and reproduced with the permission of Phillips Business Information, Inc.) illustrates this. While this incident involved a large passenger aircraft, it is easy to imagine that the electrical systems of smaller aircraft are just as much at risk.

L-1011 Cockpit Catches Fire

Had the fire erupted halfway through the night flight from Honolulu, instead of just short of San Francisco, a major US carrier might have lost a wide-body jet, and it wouldn't be just the Canadians trying to piece together how an electrical fire destroyed an airliner.

Were it not for the incredible performance of the flight crew, the November 1998 case of Delta Air Lines Flight 225 involving an L-1011, two months after the crash of a Swissair MD-11, could very well have ended with the death of all 61 passengers and crew on board. The loss of the aircraft certainly would have forestalled the congratulatory rhetoric a few weeks later about a "zero passenger fatality" record for the year.

Photograph courtesy of the Transport Accident Investigation Commission

In this case, the crew survived and submitted a report of considerable significance – a sobering alert to Industry. Among the implications of the crew's report is the widespread effect of a fire, even though the second officer identified it and moved smartly and suppressed it. Nevertheless, the multiplicity of system failures – affecting spoilers, causing engine reverse thrust warnings, and repeated illumination of brake warning lights – culminated in the crew's inability to shut down the engines after an emergency landing except by pulling the engine fire handles. Even then the unforeseeable ramifications persisted; the exit doors could not be opened by ground personnel until the aircraft was depressurised.

If the fire had broken out beneath the cabin lining and had been propagated by flammable thermal/acoustic insulation, the outcome may well have been different (although the manufacturer had the prescience to install a polyimide film lining, a particularly fire-resistant material).

Details of the case were spelled out in a report the crew submitted after the event to NASA's Aviation Safety Reporting System (ASRS). The full text of the account shows an extremely close encounter with tragedy, but for the crew's presence of mind and raw aircraft management skills.

"This incident highlights the need for aircraft engineers to inspect wiring at appropriate intervals and to ensure that dust is removed on a regular basis..."

The flight was one from Honolulu (HNL) to San Francisco (SFO). The flight was uneventful until approximately 130 nautical miles west of SFO when an electrical fire in the cockpit occurred behind one of the circuit breaker panels. The arcing was so intense that the second officer was partially blinded. The second officer was having trouble finding the cockpit Halon fire extinguisher. A flight attendant then entered the cockpit, and the second officer asked her for a cabin fire extinguisher. She had one immediately. It was discharged fully into a slit in the circuit breaker panel closest to the fire.

In the meantime, the captain told the first officer to fly the aircraft and declare an emergency. The captain worked through the emergency checklists. He had a sea of inoperative flags on his panel, so was unsure what instruments were working. The fire was at the area of circuit breaker associated with standby DC power. About this time, the crew was aware that they had lost control of cabin pressurisation. This distracted the second officer's attention from fighting the fire. Cabin control was switched to a backup system, and control was re-established. The second officer found the cockpit Halon extinguisher and, since there was still a red glow from the circuit breaker panel, discharged it.

During this time, the captain and first officer tried to don oxygen masks and smoke goggles. They were unable to make the cockpit intercom work. To communicate, the oxygen masks had to be lifted from their faces. With random electrical items giving warnings, it became evident that the aircraft thought it was on the ground and in the air simultaneously. They had engine reverse thrust warnings, and indications were that there would be no spoilers on landing. The captain also thought the aircraft brakes also would be inoperative.

Air traffic controllers directed the aircraft direct to SFO, so the crew had to overfly the airport to establish a downwind for Runway 28R. About this time, the aircraft flight control channels started to fail, leaving the crew with flight control problems. By continuously resetting the flight control channels, they were able to retain enough control to make a successful emergency landing. After landing, the captain had to use manual speed brakes. The engine thrust reversers were inoperative and the engines would not shift out of flight idle. The brakes functioned normally, even though the brake-warning lights had illuminated.

Maintenance personnel found that the root cause of the fire was an improperly installed wiring clamp and about two cm of flammable dust all over the circuit breakers and wiring. Over time, the clamp wore through the insulation and caused a direct short to ground, resulting in the fire.

Vector Comment

Any electrical fire in the cockpit is a very serious situation – especially when airborne – and is a pilot's worst nightmare come true. If the smoke and toxic fumes don't render you unconscious first, then the heat from the fire is likely to quickly become a problem. Even if you are able to remain conscious, retaining control of the aircraft is likely to be difficult because of reduced visibility in the cockpit and lack of functional instrumentation.

This incident highlights the need for aircraft engineers to inspect wiring at appropriate intervals and to ensure that dust is removed on a regular basis – especially from behind the instrument and overhead panels. Preventive inspections are probably the most important measure that we can take to minimise the risks of a cockpit fire occurring. It is also important to have a serviceable fire extinguisher on board the aircraft at all times.

If you are unlucky enough to experience an electrical fire in the cockpit while in the air, then following the basic steps detailed below might save the lives of you and your passengers.

If VMC

- Fly the aircraft first and foremost.
- Turn all electrical systems off immediately. This includes the alternator or generator system.
- Close all vents (including the storm window) and heating systems. Doing so will reduce the through-flow of oxygen that will feed the fire.
- Attempt to smother the fire with the aircraft fire extinguisher. Utilise any front-seat occupant by getting them to direct the extinguisher up behind the instrument panel where the core of the fire is likely to be.
- Once you are confident that the fire is under control, open all vents to flush out smoke and excess carbon dioxide from the fire extinguisher. You may need to open the aircraft doors to clear the cockpit more quickly.
- Land as soon as possible.

If IMC

- Fly the aircraft first and foremost.
- Don smoke goggles (a smoke mask is preferable) and an oxygen mask if available.
- Turn all electrical systems off immediately. Fly the aircraft with reference to the basic instrument panel, maintaining a minimum safe altitude and heading that will keep you clear of terrain.
- Close all vents (including the storm window) and heating systems. If the aircraft is pressurised, turn the bleed air off (reduces through-flow of air that feeds the fire).
- Attempt to smother the fire with the aircraft fire extinguisher. Utilise any front-seat occupant by getting them to direct the extinguisher up behind the instrument panel where the core of the fire is likely to be.
- Once you are confident that the fire is under control, open all vents to flush out smoke and excess carbon dioxide from the fire extinguisher. For unpressurised aircraft, you may need to open the aircraft doors to clear the cockpit more quickly. If the aircraft cabin is pressurised, activate the cabin pressure dump valve to increase the through-flow of air. Smoke evacuation for pressurised light-twin aircraft may be slow due to their small cabin volume and low pressurisation input from the engine bleed-air lines – this makes having a smoke mask all the more important.
- Assess the damage to the aircraft electrical systems and attempt to reinstate **only those systems that are absolutely necessary** to complete the flight safely (ie, com and nav systems). Activate COM 1 first, as it is a priority to declare an emergency and request radar vectors to the nearest suitable aerodrome. If you are successful in obtaining ATC assistance, you probably should not risk trying to reinstate other electrical systems (such as NAV 1) and should certainly keep all other ancillary services switched off. Note that you will need to retain pitot tube heat if in icing conditions. Should you be unable to establish communications with ATC, use only the absolute minimum number of navigational instruments necessary to obtain VMC as soon as possible. One VOR and DME should be sufficient. It is also important that you wait several minutes between activating each system so as to check that it does not cause further electrical short-circuiting.
- Formulate, and act on, a plan to gain VMC and land as soon as possible.

Although the chances of an electrical fire in the cockpit are small, being a safe pilot is about being prepared for the unexpected. Anything that you can do the reduce the risks of an electrical fire occurring in the first place, and knowing what to do if one does, has got to be good aviation practice. ■

ETA Plus How Much?

The Rescue Coordination Centre (RCC) is continuing to receive an unacceptably large number (up to seven a week) of overdue aircraft notification calls from the National Briefing Office – many of the aircraft involved are on a SARWATCH.

It seems that some pilots are simply forgetting to cancel their SARWATCH (ATC does not do this automatically, unlike for a flight plan). Others are not allowing sufficient time beyond their ETA destination to cancel their SARWATCH (there is not the 30-minute additional period after ETA as with a flight plan). Whatever the case, failure to cancel a SARWATCH (or a flight plan) wastes RCC time and money and could mean that search and rescue efforts for persons genuinely in need of assistance are compromised.

The following points are worth considering; they should help reduce the number of unnecessary RCC overdue aircraft notifications:

- Always add a margin of 30 minutes or so to your ETA when determining your SARTIME. This will allow for the unexpected, such as a loss of radio coverage, delays in getting to a telephone, or temporarily forgetting to cancel once on the ground (until something jogs your memory to do so).
- Assess your SARTIME, and amend it in flight (via the appropriate FISCOM frequency) so as to maintain your chosen margin beyond your ETA. Christchurch Information will be happy to record your amended SARTIME as you report it.
- Finally, devise a system to remind yourself to cancel your SARWATCH. This might take the form of a suitably placed sticker on your pilot clipboard or the aircraft instrument console, making a note (in bold text) on your pilot log card, or setting the alarm on your wristwatch to 15 minutes before SARTIME. 'Remember To Terminate Your Flight Plan' stickers are available from the CAA, and a reminder key-ring is also available to aircraft owners/operators. These are just a few ideas to help you remember to terminate.

See *Vector* Nov/Dec 1999 article *Flight Plan vs Sarwatch* for further information on the flight plan and SARWATCH services.

Who Can File a SARWATCH?

The filing of a SARWATCH for alerting purposes, instead of a flight plan (exemption 00/EXE/12 to rule 91.307 allows this) is available only for flights that are to be conducted solely under Part 91 of the CAA rules. Part 135 operations, for example, have more stringent requirements regarding the provision of flight following and alerting services.

More Termination Reminders

Here is a summary of some reminder ideas derived originally from *NASA Aviation Safety Reporting System* survey and published in the August 1991 edition of *NZ Flight Safety* magazine. You might think of other ingenious memory joggers!

- Place reminder stickers in the toilet, hangar, reception area, and kitchen of your aero club/flight training organisation.
- Write "FP" or "SW" on the back of your hand in big letters when activating a flight plan or SARWATCH.
- Clamp a clothes peg on the aircraft ignition key or to your shirt pocket when activating a flight plan or SARWATCH. Take it off again only when you have cancelled. It is unlikely that you will head home without noticing the peg.
- Switch your wristwatch to the other arm after activating a flight plan or SARWATCH. Because a flight plan or SARWATCH deals with time, and you look at your watch many times a day, not seeing it on the normal wrist will be a constant reminder that you are on an active flight plan or SARWATCH.
- If your aircraft has two radios, always leave one tuned to the appropriate FISCOM frequency until you have cancelled your flight plan or SARWATCH. Doing this should jog your memory as you run through the aircraft shutdown checks.

If you don't think any of the above systems will work for you, think of your bank balance after the RCC has charged you for a false search and rescue callout! ■

Fuel Thefts

The CAA has recently received reports indicating that the theft of Avgas continues to be a problem for some aircraft owners and operators – particularly those whose aircraft are parked outside at unattended airfields, where security is very basic or maybe non-existent.

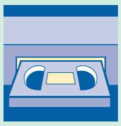
Fuel theft not only means that the owner/operator is out of pocket for the loss of the fuel, but also the possibility of contamination being introduced into the aircraft fuel system – a potentially hazardous situation. The tell-tale signs that indicate tampering with an aircraft fuel system may include: loose or missing fuel caps, leaking fuel drains, and unexplained large or abnormal fuel stains on the ground in the vicinity of the aircraft. The CAA is aware of cases where fuel has been stolen and the fuel caps have been left off, exposing the fuel system to water contamination from rain.

So what can you do to minimise the chance of fuel being taken from your aircraft?

- Parking your aircraft in a secure building is obviously the best means of protection, but for many pilots this is not an option – especially when away from home base.
- Wherever possible, park your aircraft in an area that is well illuminated. Aircraft owners/operators should consider installing motion-activated security lighting as an additional deterrent.
- Keep access points to the airfield secure at all times. Locked gates and other means of restricting access – such as well-maintained fences – help to deter thieves.
- Operators should keep fuel pumps locked, isolate electrical supplies to fuel pumps, and in the case of portable fuel storage facilities have measures in place to reduce the possibility of fuel thefts.

What should you do if you discover or suspect that fuel has been stolen from your aircraft?

- Report the incident to the Police. Fuel theft is a crime, and offenders who are apprehended will usually be prosecuted. Prompt reporting of these incidents to the Police is of real assistance in their ability to catch offenders.
- Fuel thefts can also be reported to CAA as an Occurrence Report (Form CAA 005, available from CAA by contacting the Safety Investigation and Analysis Group) or by ringing 0508–4–SAFETY. Reporters should include a brief outline of circumstances, including date, time, location, aircraft registration and type. Reporting of such incidents to CAA helps to identify trends and patterns of these events, and it can assist in developing preventive measures. In some situations, where an escalation in fuel thefts or other wilful damage to aircraft is identified, the CAA can coordinate an appropriate response.
- Carry out a careful visual inspection around filler caps to check for signs of foreign matter being introduced into the tank.
- Carry out a thorough water-drain check. With some aircraft types with bladder-type tanks, the wings may need to be rocked to dislodge water that is trapped in pockets.
- In some cases it may be possible to make a visual inspection of the interior of fuel tanks using a safe source of illumination. Contaminants may be visible.
- If accessible, check the in-line fuel filter (gascolator) for contamination or dirt. This may require the assistance of a Licensed Aircraft Maintenance Engineer. Where any fuel system contamination is confirmed, tank removal for cleaning and fuel system flushing may be necessary. ■



New Video

We all know that weight and balance is critical to an aircraft's takeoff and landing performance as well as its general in-flight handling characteristics, yet there continue to be a significant number of light aircraft accidents in New Zealand where weight and balance issues are a factor. Poor takeoff and climb performance due to overloading, over-rotation on takeoff and reduced spin recovery due to an aft C of G, and inability to flare correctly on landing due to the C of G being forward of its limit, are just some of the potentially fatal consequences of not getting weight and balance right.

Weight and Balance – Getting it Right is a new CAA video that replaces *Weight and Balance,* the first video programme produced by the CAA back in 1987. This new 30-minute video covers a wide range of weight and balance considerations for single and twin-engine fixed-wing aircraft. Helicopter weight and balance considerations are also dealt with in the latter part of the video.

Whether you are a student pilot, or just want to 'brush-up' on weight and balance, this video is for you. It can be borrowed free of charge from the CAA Library or purchased directly from Dove Video. See *Safety Videos* in this issue for further details.

Letters to the Editor

Mountain Flying

Thank you for the copies of the *Mountain Flying* GAP booklet that you sent. It has proved to be far more informative and in-depth than I originally suspected it would be, considering its target audience.

I have included an extract from MBA's [Airlines of Papua New Guinea] Operations Manual (plus some of my own personal comments) regarding mountain-flying procedures that may be of some use to other *Vector* readers.

Your readers should bear in mind whether they are experienced enough, or indeed have the need, to be in the mountainous environment that this advice has been developed for. MBA operates in this challenging environment, where high levels of training and risk management are vital ingredients to a safe operation. Much of the following has been written with this in mind.

- Never mix IFR with VFR outside the legal parameters of IFR operations. Almost all CFIT [controlled flight into terrain] accidents are a mix of this, plus pushing the weather beyond your limits.
- Always plan ahead. This includes always looking for, and planning, escape routes. When on descent, always plan the best climb-out path while you still have the altitude to see things clearly. Equally, by the time you need a map, or an approach plate, it is too late to be searching in your flight bag for it. **Never** leave yourself without an escape. If you don't, statistically it is only a matter of time before **you** have an accident.
- You need two of three items when crossing ridges: excess altitude, excess speed, and to approach the ridge at a 45-degree angle. If you are unsure as to whether you have enough altitude, circle until you are confident that you do. Generally, if you are seeing more of the terrain behind the ridge appearing, you are out-climbing it. If the terrain is disappearing you **do not** have the altitude to safely cross the ridge. Additionally, never commit yourself to crossing the ridge unless you can see into the next valley and are sure that you can operate safely in that valley.
- Altitude is gold; once sacrificed it can only be regained at the cost of fuel and time.
- Never commit yourself to descending through a break in the cloud without being assured of your ability to climb back through it again – doing so is akin to operating without an escape route. Likewise, don't descend through a cloud break faster than you can climb back through it again – this also leaves you with limited escape options.
- Unless three of the following four factors are available, **do not** commence the flight: Fuel, available airstrips, weather, and daylight. As long as three of them are in your favour, you can generally explore the fourth with some latitude. Remember, once airborne, it is much harder psychologically to turn back than it is to avoid the flight in the first place.
- Have a pre-defined committal point for landing on one-way airstrips. Beyond this point, you will almost always be better off damaging the aircraft in a heavy landing than destroying it in a misjudged and ill-fated go-around attempt.
- Be aware of the effects of altitude, weight, and temperature on an aircraft's performance – make a point of seeing their effects in a safe environment. It is considerably safer to know how an aircraft will perform in varying scenarios prior to needing this knowledge in anger.

Photograph courtesy of Bruce Alabaster of MBA

Typical airstrips found in PNG can be up to 6000 ft AMSL with a 12 percent slope.

- Be aware of the trap of climbing towards sloping airstrips in low cloud base conditions. Aircraft have crashed after their pilots have discovered that they are unable to out-climb terrain on finals.
- Learn to pick wind direction and speed and their effects from signs other than wind direction indicators. Educate yourself to the up and downdraughts and turbulence that can be expected in lee and windward conditions. Tailwinds on ridgeline strips will generally produce uplift over the threshold, while ridges on finals can be expected to produce alternate up and downdraughts.
- Be aware that many valleys, and airfields in the bottoms of valleys, can be badly affected by light and shadow. In some cases, early morning sun in the eyes may blind a pilot or refract off the aircraft windscreen. Early morning and late afternoon lighting may also leave parts of a valley in shadow with poor, and sometimes no, ground definition – so much so that it can even cause an early ECT/late MCT at airfields located in the bottom of valleys.
- Never enter a valley in reduced visibility unless you are sure it is the valley you want. Prior to entering it, establish the bad-weather configuration, ensure access to your maps, and brief your co-pilot on your escape plan.
- Always operate on your preferred side of the valley, taking into account your seat position and the effects of localised winds.
- Always presume you will have an engine failure, and plan your operations on this premise.
- Landmarks and topographical details at 5000 feet on a CAVOK day bear no resemblance to the same points at 500 feet in 4000 metres of visibility. Operate at bad-weather altitudes, and learn the important landmarks, before you need to recognise them in anger.
- **An aborted flight is a sign of prudence, not of cowardice.**

Captain Bruce Alabaster
Flight Safety Officer MBA
August 1999

Thank you for taking the time to share these mountain-flying tips from PNG. There is no substitute for learning from the knowledge and experience of others, especially those with extensive operational experience.

"How To – Fill the GAP" in this issue of *Vector* gives details of how to obtain a copy of our *Mountain Flying* GAP. ■

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

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:

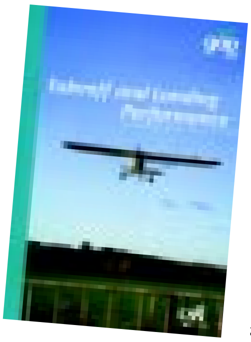
The Safety Education and Publishing Unit
Civil Aviation Authority
P O Box 31-441, Lower Hutt
Phone 0–4–560 9400

*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

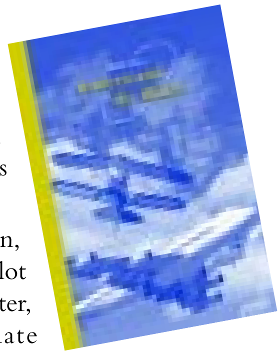
Takeoff and Landing Performance GAP



Takeoff and landing are high-risk phases of flight and currently account for over 50 percent of all aircraft accidents in New Zealand. Most of these accidents involve similar elements: failure to get airborne in the distance available, collision with obstacles owing to inadequate climb performance, failure to recognise a go-around situation, and overrun on landing – all of which are avoidable.

Takeoff and Landing Performance discusses the many factors that affect takeoff and landing performance and outlines how to allow for them through performance calculations. This new GAP steps you through how to use Performance Charts and the Group Rating System (worked examples are included) in order to determine takeoff and landing distances. Sample performance problems are included.

How to Understand the Rules



The moment you become involved in aviation, the Civil Aviation Rules affect you.

Everyone in aviation, from the private pilot to the aircraft importer, needs an intimate understanding of the rules that apply to them.

This eight-page booklet is designed to explain how the rules are made, how they affect you, and how you can contribute to the rule-making process. Inside, you'll find a 'whiz wheel', which will give you an idea of the primary rules you need, depending on your area of involvement in aviation. ■

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

If you need medicine to feel OK,
You're too sick to fly!

Field Safety Advisers

John Fogden
(North Island, north of line, and including, New Plymouth-Taupo-East Cape)
Ph: 0–9–425 0072 Fax: 0–9–425 7945
Mobile: 025–852 096
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Ross St George
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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-BTX, Piper PA-18, 20 Dec 98 at 1842, Karekare. 2 POB, injuries 1 fatal, 1 serious, aircraft destroyed. Nature of flight, private other. Pilot CAA licence CPL (Aeroplane), age 37 yrs, flying hours 500 total, 200 on type, 6 in last 90 days.

Immediately after takeoff from Karekare Beach, the aeroplane made a right turn out to sea, followed by a left turn back towards the beach. In the left turn, the aeroplane stalled and spun from a very low altitude, impacting in a near-vertical attitude at the surfline. The pilot was killed outright and the passenger sustained serious injuries.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 98/3405

ZK-GNH, Grob G102 Club Astir IIIB, 27 Jan 99 at 1300, Drury Ad. 1 POB, injuries 1 minor, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours 145 total, 7 on type, 1 in last 90 days.

During the downwind leg of the circuit, the pilot observed a glider about to be towed across the active runway approximately 500 metres beyond the threshold. The pilot was not sure whether the glider he was flying had an effective wheel brake so attempted to land short to allow for the possibility of a longer landing run.

He extended the low-level circuit but encountered sinking air and lost height and airspeed. The control column was pushed forward to regain the lost airspeed, but a tall tree could not be avoided. The glider rotated through 180° and crashed into a horse corral short, and off to one side, of the runway centreline.

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

CAA Occurrence Ref 99/76

ZK-EQZ, Piper PA-28-161, 24 Feb 99 at 1300, Patea. 1 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 48 yrs, flying hours 349 total, 45 on type, 74 in last 90 days.

The aircraft was taxiing on the narrow airstrip. When the pilot turned the aircraft to line up for takeoff it slid on the wet grass causing its wing tip to hit a fence post.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 99/464

ZK-JGW, Kolb Twinstar Mark-II, 28 Feb 99 at 1455, Te Puke. 2 POB, injuries 2 fatal, aircraft destroyed. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours 40 total, 40 on type, 15 in last 90 days.

The pilot was on a local flight from his father's farm at Paengaroa and was seen circling over a relative's house south of Te Puke. The aircraft then made a low, slow, steep turn over an adjacent property. From the turn, the aircraft entered a vertical dive from which it did not recover.

The pilot's instructor had not been made aware of his intentions to fly that day and was therefore unable to supervise the flight as required by the procedures of the Recreational Aircraft Association of New Zealand. The pilot was not certified to act as pilot-in-command of an aircraft carrying passengers. The pilot flew below the minimum height permitted by the Civil Aviation Rules.

The most likely cause of the accident was poor handling of the aircraft by the pilot while trying to manoeuvre at low level.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 99/466

ZK-FNO, Micro Aviation B22 Bantam, 14 Mar 99 at 1200, Stratford. 2 POB, injuries 2 fatal, aircraft destroyed. Nature of flight, private other. Pilot CAA licence nil, age 73 yrs, flying hours 355 total, 215 on type, 16 in last 90 days.

The microlight was on a local flight to the west of Stratford Aerodrome. Immediately after it crossed over a major powerline at low level, the upper surface of the right wing tore apart, and the aircraft dived into the ground several hundred metres further on.

There was no indication of structural failure of the wing. Although the investigation was inconclusive, it is probable that the pilot pulled up abruptly on sighting the powerline, and then checked forward equally vigorously. The sudden transition from positive to negative G probably caused the fabric on the upper surface of the right wing to tear. It is likely that the airflow then progressively worsened the situation to the point where the wing was not capable of producing useful lift any more.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 99/590

ZK-HBH, Aerospatiale AS 350B, 2 Apr 99 at 1301, nr Tuatapere. 5 POB, injuries 5 fatal, aircraft destroyed. Nature of flight, transport passenger A to B. Pilot CAA licence CPL (Helicopter), age 47 yrs, flying hours 14817 total, 5000 on type, 148 in last 90 days.

On Good Friday, 2 April 1999, Aerospatiale AS350B helicopter ZK-HBH was on a charter flight from Clifden, carrying a hunting party into Fiordland when some loss of control occurred. The helicopter collided with trees and the ground in the Rowallan Forest, killing all five occupants.

The cause of the loss of control was not conclusively established, but the pilot's ability to control the helicopter may have been medically impaired by the sudden onset of a cardiac event.

Safety issues identified include the need for a cargo restraint system for helicopter operations and the need for a passenger list system for helicopter operations.

Main sources of information: Abstract from TAIC Accident Report 99-003.

CAA Occurrence Ref 99/768

ZK-EKJ, Cessna U206G, 18 Apr 99 at 1538, nr Milford. 5 POB, injuries 5 fatal, aircraft destroyed. Nature of flight, transport passenger A to A. Pilot CAA licence CPL (Aeroplane), age 44 yrs, flying hours 5325 total, 4500 on type, 250 in last 90 days.

On Sunday 18 April 1999 at around 1538 hours, ZK-EKJ, a Cessna 206 floatplane on a round-trip scenic flight from Te Anau to overhead Milford Sound, struck the top of a vertical craggy mountain ridge. The pilot and four passengers died during the impact. The pilot probably attempted to cross the ridge crest at low level and might have misjudged the height of the ridge top because of visual illusions or distraction. Some localised turbulence or downdraughts and the fast speed of the aircraft may have contributed to the accident. Had the pilot applied a safe ridge-crossing technique, including maintaining a sufficient height margin above the ridge, the accident could have been avoided.

The pilot was reported to have carried out unnecessary low flying and crossing of ridge crests with minimal clearance on scenic flights, on a number of occasions over several years before the accident.

The operator did not adequately supervise the pilot, independently investigate an allegation of the pilot low flying, or establish a system to control or monitor the pilot's performance and compliance with safety requirements.

The pilot's reported acts of unnecessary low flying were not made known to the Civil Aviation Authority. The operator's organisational shortcomings that probably contributed to the accident were not identified by or made known to the safety authority.

Safety recommendations were made to the operator's chief executive and the Director of Civil Aviation to address safety issues identified during the investigation.

Main sources of information: Abstract from TAIC Accident Report 99-004.

CAA Occurrence Ref 99/910

ZK-GIL, PZL-Bielsko SZD-36A Cobra 15, 8 May 99 at 1330, Lake Station. 1 POB, injuries 1 serious, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age 58 yrs, flying hours 1100 total, 60 on type, 30 in last 90 days.

Following a winch launch, the pilot turned to the southwest and tracked to a nearby ridge where he anticipated finding light lift. As he turned across the face of the ridge he encountered light sink instead. In an attempt to fly out of the situation the glider collided with treetops.

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

CAA Occurrence Ref 99/1294

ZK-EUH, NZ Aerospace FU24-954, 8 May 99 at 1530, Stratford. 1 POB, injuries nil, damage substantial. Nature of flight, agricultural. Pilot CAA licence CPL (Aeroplane), age 56 yrs, flying hours 17000 total, 7950 on type, 358 in last 90 days.

The aircraft was landing at a topdressing strip when, during the landing roll, the pilot noticed a pile of road metal near the threshold. He was unable to avoid the pile and ran through it. Unfortunately he struck a second pile of metal, which caused damage to righthand wing, flap, and undercarriage.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 99/1313

ZK-ENE, North American Harvard 3*, 23 May 99 at 1530, Wanaka Ad. 1 POB, injuries nil, damage substantial. Nature of flight, training solo. Pilot CAA licence PPL (Aeroplane), age 72 yrs, flying hours 1880 total, 32 on type, 10 in last 90 days.

The pilot was on his third landing during circuit practice and, because of the very strong sun, had taken off on Runway 29 and then made a wide circuit to join left base for Runway 11, which was a change of routine. He made his normal checks but missed selecting the landing gear down and did not notice the red warning light. The pilot felt the tail wheel contact and then the nose drop. The plane skidded on the grass to finish up to the side of the main runway.

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

CAA Occurrence Ref 99/1576

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

Relay circuit board fails

The pilot experienced a total electrical failure while on approach to land. Emergency checklist actions carried out by the pilot failed to solve the problem.

Further investigation revealed that the cause was the failure of the Bus Shed Relay. The Main Relay circuit board had cracked, causing the Main Electrical Shut-off Relay to activate.

ATA 2400 CAA Occurrence Ref 98/3060

Bell 206B

Pitch change link cracks

The tailrotor pitch link was found to be cracked during a routine inspection. The crack was due to a corrosion fatigue failure. The helicopter's primary use had been in the agricultural role.

ATA 6400 CAA Occurrence Ref 98/3253

Cessna R172K

Engine runs roughly

The pilot experienced rough engine running so leaned the mixture. The problem was cleared but then reoccurred. The aircraft was landed safely.

An engineering inspection revealed detonation damage to the No 1 cylinder. The engine was removed and the fuel system sent to an overhaul agency for further detailed investigation. A minor blockage in the fuel nozzle was found. The blockage sample was sent to Mobil for testing, but it was found not to be EDA related.

ATA 7310 CAA Occurrence Ref 00/124

Micro Aviation B22 Bantam

Engine fails

The aircraft suffered an engine failure and landed successfully in a paddock.

Further investigation revealed piston damage, the cause of which could not be determined.

ATA 8500 CAA Occurrence Ref 98/3453

NZ Aerospace FU24-954

Valve rocker incorrectly fitted, P/N 17 F 21187

The No 6 cylinder in the aircraft's engine stopped running.

Further investigation found that the inlet valve was not opening due to the push rod collapsing. It had worn through due to inadvertent transposition of the inlet and exhaust rockers. The cylinder was changed.

The submitter of this defect report indicated that the rocker manufacture process had recently changed and that the inlet and exhaust rockers can now, once again, be inadvertently fitted in either position. The submitter further suggested thorough checking and identification to ensure that valve rockers are correctly installed. TSO 200 hrs.

ATA 8530 CAA Occurrence Ref 99/1010

Partenavia P 68B

Elevator trim control lost

While in level flight, with the autopilot engaged, the aircraft pitched down and began to lose height. The pilot had to apply considerable backpressure on the control column to prevent further height loss. It was found that the electric trim, and the manual trim wheel, had no effect on changing the aircraft nose attitude. The pilot experimented with different speed and flap combinations before making a half-flap approach and landing.

An engineering investigation revealed that the elevator trim cable had become entangled in the electric trim capstan.

ATA 2730 CAA Occurrence Ref 98/2940

Piper PA-28-140

Exhaust pipe breaks

While climbing after take off the engine exhaust noise increased and the cabin filled with brown smoke. The aircraft returned immediately to Paraparaumu and landed safely. The exhaust pipe had broken and exhaust gases impinged on the firewall.

ATA 8510 CAA Occurrence Ref 98/3739

Piper PA-28-161

Cylinder assembly cracks, P/N LW12416

The aircraft suffered a power loss while on approach to the grass runway. The pilot made a PAN call requesting to land on the sealed runway. This was achieved safely. The cause of the power loss was found to be a cracked cylinder.

ATA 8530 CAA Occurrence Ref 98/3229

Piper PA-28-181

Radio master switch fails, P/N W31X2AIG-50

During the climb, the pilot noticed a burning smell and sparks were seen around the radio master switch. Flames, which extinguished quickly, also appeared around the switch. The aircraft was three minutes flying time from Oamaru aerodrome, so the pilot elected to return to the aerodrome. The aircraft landed safely.

Further investigation revealed that the master switch had failed internally and shorted out. No other damage was found. TTIS 7300 hrs.

ATA 3900 CAA Occurrence Ref 98/3362

Piper PA-34-220T

Tyre separates from rim

The righthand tyre separated from the rim during takeoff. The runway was closed until the wheel was replaced.

ATA 3240 CAA Occurrence Ref 98/2926

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 August 1996 edition of *Aisa-Pacific Air Safety* that is published by the Bureau of Air Safety Investigation (BASI), Australia.

Cessna 172E – Aircraft loses power while at low level

The pilot was carrying out a fence inspection at 500 feet agl when the engine power reduced to idle. He changed the fuel tank selector to the fullest tank but there was no response from the engine. The pilot then closed and opened the throttle lever a number of times. This resulted in an increase to 1000 rpm, but power again returned to idle when he stopped moving the throttle. As the aircraft was losing altitude, the pilot discontinued his trouble-shooting checks and attempted a forced landing in heavily timbered terrain. The aircraft struck a number of trees during the landing.

The only fault found during an inspection of the wreckage was a fuel tank vent line containing a wasp nest. Testing of the line indicated that the nest could move, causing either a partial or full blockage. The vent outlet was covered with a piece of gauze to prevent this type of occurrence. The fuel tanks were fitted with vented fuel caps.

The reason for the loss of power was not determined.

Cessna 210J – Multi-pin plug fouls control column during takeoff

Because of the condition of the strip, the technique the pilot used for takeoff was to set 20 degrees of flap and apply almost full-back elevator control to lift the aircraft off the ground at low airspeed and then to accelerate in ground effect before climbing away. On this occasion, after liftoff at 55 knots, the control column became jammed near the fully-back position. The aileron control was partially jammed.

At about 300 feet, with the aircraft in a high-nose attitude and the airspeed decreasing through 40 knots, the pilot reduced engine power and the nose attitude decreased. He was able to climb the aircraft to about 500 feet and maintain pitch control through use of engine power and flap. The rudder was used for roll control.

The pilot conducted a straight-in approach to Inverell and landed safely.

Post-flight inspection revealed that a multi-pin plug had become detached from an ADF indicator unit in the instrument panel. The plug had lodged in the side channel for the control column, thus causing the restriction.

United Kingdom

Occurrences

The following occurrences come from the Summer 1999 edition of *Flight Safety Bulletin,* which is published by the General Aviation Safety Council, United Kingdom.

Cessna T337D – Pilots mismanage fuel system

This aircraft was to be ferried from a maintenance organisation at Bournemouth to Biggin Hill for storage. The C of A had not been completed, so an 'A Condition' certificate was issued to permit the ferry flight. This prohibited the carriage of passengers.

Two pilots agreed to undertake the flight. One had a current FAA ATPL, but no UK licence. He had flown the Cessna 337 but was not current. The other pilot held a UK PPL with a twin rating but had not flown the Cessna 337. Both pilots stated that the other was the commander. Both stated that they were unaware of the restrictions of 'A Conditions'.

Two passengers were on board for the flight. The fuel state was discussed before departure and both pilots agreed that the gauges were reading FULL. The aircraft has one main and one auxiliary tank in each wing and the fuel gauges should indicate whichever tank is selected. The FAA pilot occupied the left seat and was the handling pilot on departure.

The PPL, who was not an instructor, was in the right seat. Some 35 miles from Biggin Hill, overhead Farnham, the front engine ran roughly and stopped. Despite being close to Farnborough the decision was made to continue to Biggin Hill. Both fuel gauges were still reading FULL. Five minutes later the rear engine stopped.

The handling pilot lowered the gear and flaps and positioned for a forced landing close to the M25. The aircraft struck a tree, separating a large portion of the left wing. Both pilots suffered significant injuries. Both passengers escaped serious injury.

The main tank of the right wing was full but the auxiliary tank was empty. The fuel selectors were OFF. There was no evidence of any pre-impact systems failure.

Piper PA-38-112 – ATC landing clearance flusters student pilot

The student pilot was returning to Liverpool from a Qualifying Cross Country flight. The airfield was busy with a large volume of traffic. The pilot made the standard radio calls for zone entry, including the phrase "Student Pilot", and was eventually cleared to an unpublished reporting point.

On arrival there, he reported but did not get a reply from ATC so began an orbit to await clearance. He was then cleared to the east bank of the Mersey to await a further clearance to join a three-mile final for runway 27.

He was then instructed to "turn final number one". He was cleared to land and requested to "land long and expedite runway clearance". The pilot said he would attempt to comply but was a student and had not previously flown such an approach.

The crosswind was close to the pilot's limit so he flew 10 knots faster than normal to guard against anticipated turbulence. He became stressed, flared too soon, landed heavily and bounced three times before departing the runway. He regained the runway and taxied clear before shutting down. The aircraft was substantially damaged.

Investigation of the ATC aspects of this accident were inconclusive because the RTF tapes were not available due to 'procedural errors.'