January / February 2006

VECTOR

POINTING TO SAFER AVIATION

New-look *Vector*

Spinning

Warbirds Over Wanaka

PEDs Revisited

CIVIL AVIATION AUTHORITY OF NEW ZEALAND

VECTOR

Published by: the Communications and Safety Education Unit of the Civil Aviation Authority of New Zealand, P O Box 31–441, Lower Hutt, New Zealand. Tel: +64–4–560 9400, Fax: +64–4–569 2024, Email: info@caa.govt.nz. Published six times a year, in the last week of every odd month.

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Design: Gusto Design & Print Ltd.

Publication Content

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CAA web site, www.caa.govt.nz – Civil Aviation Rules, Advisory Circulars, Airworthiness Directives, CAA application forms, CAA reporting forms. (Note that publications and forms on the web site are free of charge.)

Aeronautical Information Management (AIM), 0800 500 045 – *AIP New Zealand* Volumes 1 to 4 and all aeronautical charts.

AIP Online, www.aip.net.nz – *AIP New Zealand* is available free on the Internet.

Aerobatics ace, Jurgis Kairys, performing at Warbirds Over Wanaka in 2004. See ***Spinning***, page 3, and ***Warbirds Over Wanaka***, page 5. Photo courtesy of Rob Neil.

ISSN 1173-9614

Spinning

Spinning is still a prevalent cause of fatalities in New Zealand aviation. This article gives a recent history of spin accidents, steps that are being taken to improve spin awareness and training, and a reminder of the dangers of flying aircraft (any aircraft, but particularly those operating aerobatically) outside weight-and-balance limits.

Thirteen people have perished in seven spin-related accidents in New Zealand between 2000 and 2003.

As can be seen in the table, they are not confined to any particular aircraft type, activity, or pilot experience.

Date	Location	Type	Reg	Killed	Pilot Hours
15 Dec 00	Wanaka	Pitts S2A	PTO	Two	12,346
25 Dec 02	Thames	Bantam	SPK	Two	200
28 Dec 02	Tauranga	Zenith	JLP	Two	465
31 Jan 03	Raumati South	Tomahawk	USA	One	57
17 Jun 03	Loburn	Rans Coyote	CMC	Two	77
18 Oct 03	Taumarunui	Tiger Moth	DHA	Two	1,487
21 Oct 03	Ararimu	Steen Skybolt	JET	Two	2,637

Spin Fatalities – 2000 to 2003 – CAA Reports

Yet regardless of the training philosophy, aircraft still spin – and they still kill. The ability to perform a spin recovery is very often an academic argument. Simply put – the majority of spins occur at altitudes that are too low for recovery and generally have only one outcome.

Spin Awareness

A group of concerned pilots, with backing from the Tiger Moth Club of New Zealand has approached the CAA for assistance in promoting spin awareness training. The CAA will assist in this endeavour by helping with the production of a publication relating to spinning. This should be published later this year. The Tiger Moth Club will also be conducting spin awareness training using experienced Tiger Moth instructors.

Weight and Balance

Something that may have been a factor in some of the spin accidents was the operation of aircraft outside the weight or centre of gravity (C of G) limits. This article will not go into the detail of the Principles of Flight relating to spinning. You can get that information from many commonly used aviation texts, and it will be covered in detail in the new publication on spinning. This article will briefly cover the effect that operating at high weights, and outside balance limits, might have on aircraft spin characteristics and recovery.

The spin characteristics of an aircraft result from a balance between three sets of forces: aerodynamic, inertial, and gyroscopic. The aerodynamic forces are the result of continued airflow over the aircraft, its wings and control surfaces. Inertial forces are the result of aircraft mass, and the distribution of that mass. Gyroscopic forces are developed due to the high rates of roll, pitch, and yaw that are evident in spinning.

A stable spin is a fine balance of all those forces, and a slight change in one of them may significantly affect the aircraft spin characteristics, and more importantly spin recovery.

Operating at high weights, in particular outside the approved aerobatic weight for an aircraft, can be sufficient to change that force balance, perhaps to the detriment of safe recovery.

The RNZAF lost a Strikemaster jet trainer in a spinning accident when the aircraft entered a spin with 1600 pounds of fuel on board – 200 above the maximum of 1400 pounds allowed for spinning. The aircraft failed to recover from the spin and crashed, with the pilot safely ejecting. Subsequent tests showed that the aircraft was probably unrecoverable with that extra 200 pounds of fuel – less than 3 percent of the aircraft's all up weight.

Note that a number of aerobatic aircraft in common use have quite restrictive limits for aerobatic operation. The last crash in the table above, that of the Steen Skybolt was a case in point, with the aircraft operating well outside the aerobatic weight limit. To operate dual aerobatically would require two very light pilots and not much fuel in that type of aircraft. The weight limit may be imposed due to G limits or other factors, but may also have a marked effect on spin characteristics.

Continued over...

Photo courtesy of Rob Neil

Aerobatics Outside Limits – A Cautionary Tale

National Transportation Safety Board (NTSB): Biplane May Have Been Overweight, Out of C of G At Time of Accident.

Witnesses say pilots were performing aerobatics in a Christen Eagle II that went down last year in Iowa. The aircraft may have been overweight and at the limit of its C of G envelope for aerobatic flight, according to the NTSB factual report issued on the accident this week.

The two men on board the small biplane died when the aircraft went down southwest of Iowa City on 27 March. Witnesses at the scene told authorities the pilot had been performing aerobatic manoeuvres, including flips and barrel rolls, prior to the accident.

The NTSB stated the aircraft's designer specifies a published rearward C of G limit for flight within the acrobatic category of 99.60 inches, at a maximum gross weight of 1520 pounds; and 100.40 at a weight of 1450 pounds.

Investigators studied three scenarios with differing amounts of fuel on board, according to the report, and found the aircraft may have been as much as 97 pounds overweight when the accident occurred, depending on fuel load. In both scenarios, the C of G may have been anywhere from 0.2 to 0.3 inches outside the aft limit for aerobatic flight.

With 1/4 tank of fuel on board, the aircraft would have been barely within its gross weight limit (by only nine pounds) – but the C of G would have been 0.3 inches outside the envelope for the Christen Eagle II.

The findings are significant, as witnesses reported the aircraft entered a flat spin prior to ground impact. The reported gross weight and C of G conditions would have made it very difficult to exit such a manoeuvre, according to the NTSB.

The Christen Eagle Airplane Flight Manual is also very emphatic on the subject.

"Any particular Christen Eagle II aircraft will recover from any spin type using standard recovery techniques ONLY IF THE AIRCRAFT IS PROPERLY BALANCED," it states. "The C of G of the aircraft must be within design limits to ensure safe spin recovery. Any aircraft can be dangerously loaded (C of G beyond design limits) making spin recovery extremely difficult or impossible. Weight and balance considerations must be taken seriously, and pilots must be absolutely certain that the flight C of G of their aircraft is within design limits."

NTSB investigators stressed that the report does not specify a cause of the accident, adding the Probable Cause report may not be issued until later in the year.

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Photo courtesy of Rob Neil

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Just as important as weight is the position of the C of G. An aft C of G shortens the moment arm of the tail surfaces and thus decreases the anti-spin potential of the rudder and elevator. Aft C of G also makes it easier to achieve higher angles of attack and deeper stalls – thereby generating stronger pro-spin forces and moments. This will promote flatter spin attitudes, with the spin more stable and recovery more difficult.

Provided that the C of G is within the flight envelope range, the spin characteristics of an aircraft should be predictable. Loading the aircraft beyond the aft limit of the weight-and-balance envelope may make even an incipient spin unrecoverable. A number of common four-seat training aircraft are difficult to spin when they are flown with just the two front seats occupied. With this load distribution, the elevators have insufficient power to place the aircraft at a large enough angle of attack for a spin. Now take two additional friends for a ride in the back seats, and this same aircraft cannot be flown under the terms of its Utility Category, and must now comply with the Normal Category – which prohibits spinning. Yet this is the very time that the C of G has moved back under the weight of those two passengers in the rear, and your docile four-seater will have its most aggressive spin characteristics.

Aeroplanes certified under current Federal Aviation Regulations (FAR) Part 23 Normal and Utility Categories must be able to recover from a one-turn spin. For a Utility Category aeroplane to be approved for (intentional) spinning, it must also meet the Acrobatic Category requirements, where recovery at any point in a six-turn spin must be demonstrated.

Summary

- Spins are still happening and still killing pilots.
- Do not operate any aircraft outside weight-and-balance limits – this is particularly dangerous in aircraft being operated aerobatically. Note that these limits can be very restrictive on a number of commonly used training aircraft.
- Note that a number of common four-seat trainers are certified in the FAR Utility Category with two POB, and **may** be able to spin and recover safely. Put an extra two people in the same aircraft and it will now be in the FAR Normal Category, with significantly different spin characteristics. ■

Warbirds Over Wanaka

Photo courtesy of Ian Berridge

It's that time again. Warbirds Over Wanaka 2006 will be one of the biggest aviation events of the year and a significant number of aircraft will be converging on the Wanaka area for the Easter airshow. The Wanaka organisers report that there will be even more warbirds on display than in previous years, plus some surprises that are sure to make this 10th Warbirds Over Wanaka one of the best yet. The following article discusses some of the considerations you need to think about to fly to and from Wanaka for the airshow.

Following the tragic Lindis Pass crash after the 2000 event, CAA, Airways Corporation and the Warbirds organisers put much effort into ensuring that the 2002 event did not suffer in the same way. The March/April 2002 issue of *Vector* had an extremely comprehensive article about cross-country flying in general, and flying to Wanaka in particular. If you haven't been to Wanaka before, or have limited recent cross-country experience, it would be a good idea to read that article to refresh your knowledge – it is available on the CAA's web site, www.caa.govt.nz, under "Safety information – Publications".

This article will not revisit all of the issues raised back then, but will instead concentrate on some of the key lessons. Note that some pilots may choose not to fly to Wanaka aerodrome, but instead park at one of the other local aerodromes: Queenstown, Cromwell, Alexandra and Omarama being common alternatives. In this article, the generic term 'Wanaka' may be used to indicate flight to any of these aerodromes as well as Wanaka itself.

Weather

The biggest factor likely to affect any cross-country flight is the weather, particularly in the mountainous terrain around Wanaka. On a fine day it can be an exhilarating, scenic and fun trip through the hills. On a bad day you may wish you had never left home. Low cloud, poor visibility, rain, snow, updraughts, downdraughts, and turbulence are not much fun anywhere, but even worse in the mountains, and much, much worse in unfamiliar terrain. We can't control the weather, so your planning, flying, and contingency thinking must take into account the very real possibility that you will not be able to fly your chosen route on any given day. Make sure you obtain up-to-date weather forecasts for any cross-country flight.

Time Pressure

To avoid the insidious danger of time pressure, it is a good idea to build-in a weather contingency. Make sure that your boss and the owners of the aircraft you are flying are happy that you might not be back on Monday or Tuesday, but could be delayed by a few days if the weather turns bad. They will be happier to see you back safely a bit late, than to see you splattered on a hillside trying to get home at a fixed time. Have some back-up accommodation planned as well.

Weather is not the only source of time pressure. On departure from Wanaka there is likely to be a long queue of aircraft, particularly on the Sunday. Don't put yourself in the situation where a delay getting airborne will compromise a safe arrival at your destination. ECT at Wanaka is at 1830 NZST on 16 April, and slightly earlier in most other South Island destinations.

A number of aero clubs en route reported significant congestion on the ground in 2004, particularly around fuel pumps. Don't rely on being able to land and gas up without delay en route – you may find yourself number 10 at the pump, with an unplanned extra hour on the ground.

Another problem that may test your patience will be the likely congestion on the Christchurch Information radio frequencies. Airways will balance the load by using up to three operators during peak traffic flows, but that still means that each may be dealing with upwards of 50 or 60 aircraft. Keep your radio calls concise and clear. Note that it may take some time to get a quiet patch to get in your call, so don't leave essential calls (such as SARTIME amendment or flight plan termination) too late.

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Pre-flight Preparation and Publications

There are a number of documents you will need to be able to plan a safe flight to and from Wanaka. These include:

- An up-to-date *AIP New Zealand Vol 4.*
- Visual Navigation Charts (VNC) covering your proposed route.
- *AIP Supplements* 37/06, 38/06 and 39/06.

You will need landing plates for all the aerodromes you may land at en route. Pilots coming from the north may well fly down on one coast, and then choose (or be forced by weather) to fly back on the other. Make sure you have charts to cover all possible routes home.

AIP Supplements

The importance of having read and understood the *AIP Supplements* about Wanaka cannot be overstressed. Note especially that Wanaka will be a **controlled aerodrome** (Wanaka Tower 123.0, ATIS 127.6), with an associated temporary control zone (CTR/D).

Every year, ATC reports instances of pilots arriving at Wanaka who have either not read the *AIP Supplements* or for some reason seem incapable of following the instructions they contain. This causes significant and unnecessary problems for ATC and other pilots. To be blunt, such pilots are a menace to themselves and others. **Read and make sure you fully understand the procedures in use.** Ideally you should be able to follow them from memory, but have them available for quick reference in the cockpit. Use your passengers to help out. Brief them to point out all the aircraft they spot (several hundred aircraft converge on Wanaka within a short space of time), as this may be the busiest traffic environment you will ever encounter in the air. Keep your head on a swivel, keep radio calls brief and to the point, and follow all ATC instructions.

The paragraph above is a direct quote from a 2002 *Vector* article regarding Wanaka. Unfortunately, the message did not get through to all pilots that year as ATC once again reported that a significant number of pilots arrived who obviously did not know what was expected. In contrast, the 2004 event was marked by generally very good airmanship and procedures – so much so that in a subsequent *Vector* article the Director of Civil Aviation took the time to congratulate pilots for their efforts. Let's try and repeat that result in 2006.

The *AIP Supplements* will be available on-line at www.caa.govt.nz (see "*What's New*"), www.aip.net.nz, or as a link from the IFIS web site www.ifis.airways.co.nz. **Read them.** Note that other information relevant to the Wanaka event will also be posted on the IFIS web site, so we recommend you check it out before flying down.

***AIP Supplement* 37/06** is basically a warning to all pilots that the airspace around Wanaka will be busy with display practices and early arrivals in the week leading up to Easter.

***AIP Supplement* 38/06** gives details of the flow control procedures for aircraft intending to land at Queenstown, or flying through Queenstown airspace, between 13 and 17 April. If you are not intending to land at Queenstown it may be a good idea to plan your flight to avoid flying through the Queenstown airspace. The key point to note is that all VFR aircraft intending to operate in Queenstown's airspace **are required to telephone** Queenstown Tower at least one hour before ETA to be allocated an arrival slot. You must do this by phone. Notification by radio or flight plan does not count as sufficient notification. Given that you may not be allocated the arrival slot you want – 'first in, first served' – it would be a good idea to plan to land at an appropriate aerodrome (Omarama, Alexandra, or Cromwell, for example) and make a phone call from there. You should then arrange your departure from that aerodrome to arrive at Queenstown at the allocated time.

Queenstown ATC has also requested that any pilots flying to Queenstown should be familiar with the VFR arrival procedures. It is also suggested that any pilots unfamiliar with

Photo courtesy of Ian Berridge

the Queenstown area should read the GAP booklet *In, Out and Around Queenstown*.

***AIP Supplement* 39/06** covers procedures for operating in and out of Wanaka aerodrome. There is a lot of information in this *Supplement*. Take the time to sit down and work your way through the procedures. Have a copy of the VNC to hand, with your planned route drawn on it. The key points are:

- **You must** plan your arrival for the periods that the airspace is open. Given likely traffic delays, it would be a good idea to arrive at the start of the open slots, not towards the end, or you may miss the slot and be turned away.
- **You must** have an additional 30 minutes of holding fuel **above** normal reserves.
- **You must** terminate your flight plan. It is recommended to terminate your plan on the ground by telephoning the National Briefing Office (0800 626 756). Wanaka Tower will not accept plan terminations. Terrain effects can make contact with Queenstown and Christchurch Information difficult at lower altitudes, so take this into account when amending your SARTIME. Check your cellphone for messages on arrival. If you have missed your SARTIME the National Briefing Office may have left a message.
- **You must** plan on flying one of the published arrival procedures.

Note that there are different arrival procedures for higher performance and multi-engine aircraft. To avoid undue traffic conflict it is imperative that you accurately fly the published procedure at the right altitude.

Note that for the Runway 11 arrivals, all aircraft will funnel through the top of downwind. Beware of the converging flight paths of the Dunstan and Tarras arrivals at that point. For the Runway 29 arrivals, high-performance aircraft will be joining straight in for the runway, while other aircraft will be joining on a right base, having flown a full circuit.

Note that outside the hours of watch of the Wanaka Tower, the aerodrome reverts to normal unattended procedures **and frequency (119.1 MHz).**

Indications are that this may be one of the biggest airshows yet at Wanaka. The deal is 'first in, first served', so later arrivals may well be instructed to land at an alternative aerodrome. Note that other aerodromes, particularly Queenstown and Cromwell may also get congested. You should take that possibility into account when planning your travel and accommodation requirements. All pilots intending to visit Wanaka are reminded that camping in, around, or under their aircraft at the Wanaka airfield light aircraft park is prohibited.

Summary

A flying trip to the Wanaka airshow can be one of the highlights of your flying career. The air display, the spectacular location, and the atmosphere that surrounds the Wanaka airshow all combine to make it a memorable event. A little bit of thought and preparation on your part can only enhance the experience, not to mention making it far safer and easier for you, your passengers and other pilots. See you there. ■

Have you seen these titles in our GAP series, which contain information relevant to operating in the Wanaka area? If not, we suggest that you read them before heading off to Wanaka. Copies can be obtained from your local flight-training organisation, CAA Field Safety Adviser, or by emailing info@caa.govt.nz.

Flight Plan Overdues

There is still concern over the number of flight plans going overdue. Here are the statistics for the last six months.

2005	Jul	Aug	Sep	Oct	Nov	Dec
Number filed	1703	2379	1897	2384	2557	1878
Number overdue	129	232	160	190	276	158
Percentage overdue	7.6%	9.8%	8.4%	8.0%	10.8%	8.4%

Please make an effort to remember to **amend your SARTIME** as required and to **terminate your flight plan** at the end of the flight.

Don't forget that you can get free reminder posters and stickers from the CAA Field Safety Advisers, or by emailing info@caa.govt.nz.

Fuel Cards

An easily overlooked item during the pre-flight planning for a cross-country flight is the fuel card. It is important to check what fuel is available at the destination aerodrome (ie, Shell, Mobil or BP), the type of fuel (avgas or Jet A-1) and that it matches the fuel card. Remember to also check the expiry date on the fuel card and that it belongs to the aircraft you are flying. This will avoid the frustration of arriving at the aerodrome requiring fuel but finding that the card has expired, or there is a different fuel brand from your card.

If you arrive at the aerodrome with the wrong fuel card, or it has expired, you may be able to purchase fuel (it will almost certainly be more expensive) but in some instances this may not be possible.

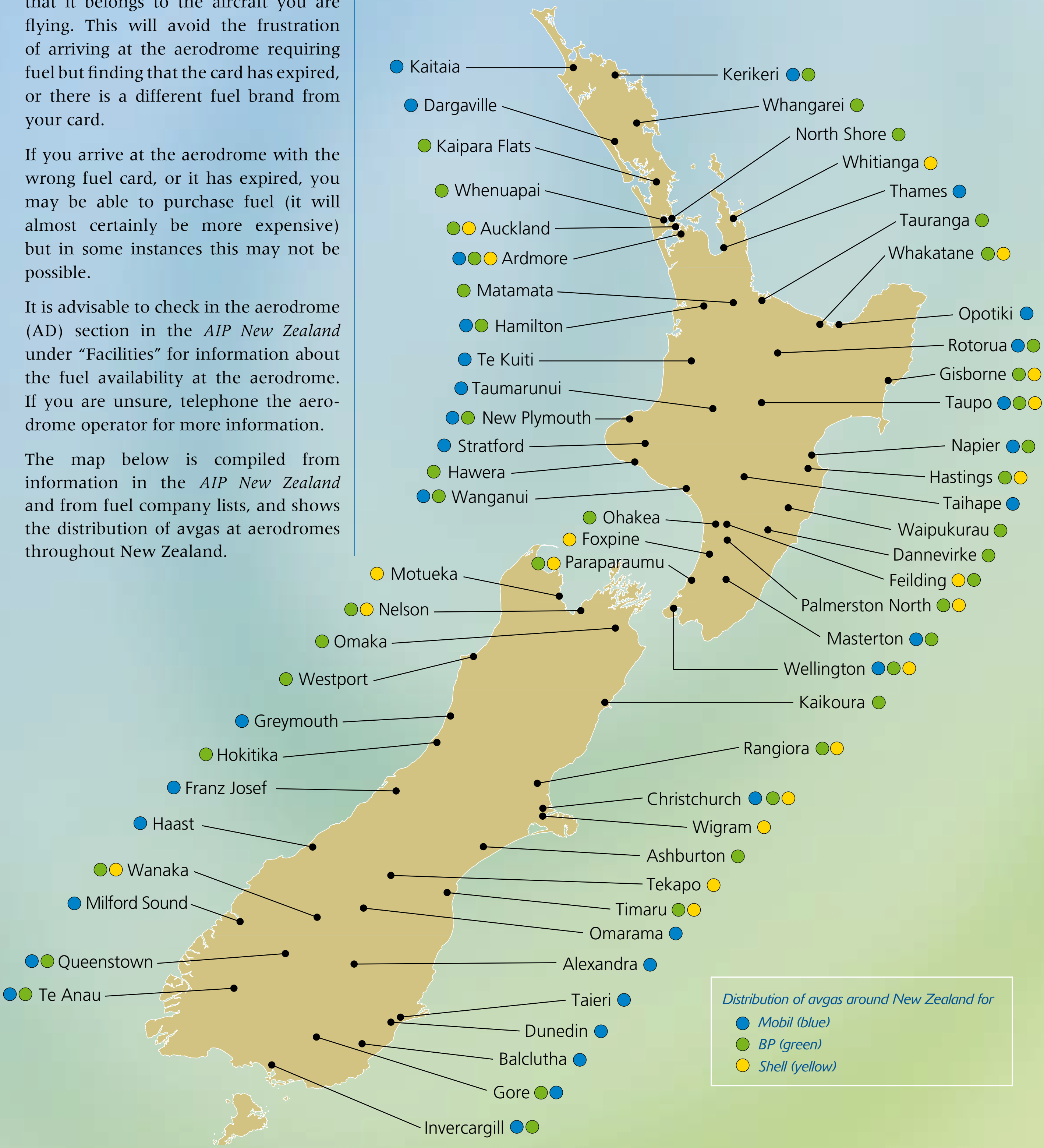
It is advisable to check in the aerodrome (AD) section in the *AIP New Zealand* under "Facilities" for information about the fuel availability at the aerodrome. If you are unsure, telephone the aerodrome operator for more information.

The map below is compiled from information in the *AIP New Zealand* and from fuel company lists, and shows the distribution of avgas at aerodromes throughout New Zealand.

Note that some of the aerodromes may not have swipe card access but fuel is delivered by fuel tanker – refer to the *AIP New Zealand* for more information.

Remember after refuelling to return the fuel card back to the appropriate place in the aircraft. The prudent pilot swipes the card and returns it straight away to minimise the chance of leaving it on top of the fuel pump or in their pocket.

If you want to print yourself a convenient sized version of this map to carry with you, we have reproduced it in A5 format on the CAA web site, www.caa.govt.nz, see "Safety information – Publications". ■



Rotor in the Red

On Friday 23 April 2004, UH-1B helicopter ZK-HSF was on a ferry flight to Gore to facilitate maintenance work. En route near Mokoreta a main rotor blade separated, the helicopter broke up and fell to the ground. The pilot, the sole occupant, was killed and the helicopter was destroyed.

The above is part of the abstract of TAIC report 04-003. It states that the accident resulted from fatigue failure of a tension-torsion (TT) strap, a critical rotor hub component.

The TT strap bears the centrifugal loads of its associated main rotor blade, transferring them to the hub assembly, while still permitting movement of the blade about its feathering axis. On this particular helicopter, the TT strap assemblies comprised a one-inch (25.4 mm) stack of 50 stainless steel laminates each 0.020 inches (0.50 mm) thick. The laminates were 16 inches (406 mm) long, measured between the retaining pin holes at each end. The centre 30 laminates were 1.6 inches (40.7 mm) wide, with 10 laminates, half that width on either side.

These TT straps are different from those found on most other UH-1 series helicopters, which have straps of a wire-wound and bonded construction.

Metallurgical examination of the failed TT strap found that the majority of the laminates showed low-cycle, high-load fatigue cracking initiating at the anchor pin holes and spreading across the strap. A few of the narrow laminates had failed in overload about mid span, stretching up to 40 mm before failure. All laminates showed buckling of varying severity due to overload at the anchor pin holes – those with less buckling also had about 80 percent of fatigue striations across the fracture surface, indicating that their failure had occurred before the final overload event.

Damage at the TT strap retention pin hole.

The other strap had not failed but had two laminates that had, and several with visible cracks. The fracture surfaces showed fatigue patterns similar to the failed strap. All laminates had overload-related buckling at the anchor pin holes. Fretting on the tensile load bearing surfaces of the anchor pins and the position of the fatigue crack initiations on the laminates indicated that the fatigue initiation was from major tensile loads.

A similar strap, although time-expired, was examined and found to have none of the damage displayed by the two straps from the accident aircraft.

The damaged straps showed clear evidence of tensile forces that exceeded those developed at normal rotor speeds. The only loads supported by the TT straps in normal operation are tensile loads, and the only mechanism by which those loads can become excessive is a rotor overspeed. From the metallurgical evidence, it was deduced that the rotor had been overspeed at some time in the preceding 100 hours of flight.

In normal operation, the normal maximum rotor rpm for the UH-1B is 324 (100 percent), although in autorotation, operation up to 339 rpm (105 percent) is permitted. Any overspeed up to 356 rpm (110 percent) requires reporting, and specific inspection criteria must be met before further flight. Any overspeed beyond 356 rpm requires, among other things, the main rotor hub to be removed and returned to an overhaul facility for evaluation.

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What do you do when your machine suffers an overspeed? Sometimes you may be too busy to check the tachometer at the critical moment, but even a glimpse can be useful. You can see the position of the needle in relation to the red line, and often get an impression as to whether the rpm have peaked, are still increasing, or are on the way back down to normal. It can in some cases be possible to later quantify the overspeed by checking the graduations on the gauge and counting back to the red line after the machine has been shut down, knowing where you saw the needle during its excursion.

Note the peak rpm achieved (you will have to assume the worst case if you saw the needle on the way back down) and also the estimated duration of the overspeed – both figures may be required for engineering purposes on some aircraft. Check the figures against the flight manual limits, and if these have been exceeded (requiring engineering action), **report it at once**. If the engine and rotor rpm needles were joined at the time of the overspeed, you also have an engine exceedance to contend with. Both are potentially very expensive, leading to the temptation to understate or even to not report the overspeed at all.

MD 369HS tachometer indicating an overspeed that will require engineering action.

The effects of an overspeed are not directly proportional to the rpm – they increase with the **square of the rpm**. A 110 percent overspeed applies 121 percent of the tensile loads at normal rpm; it only takes an overspeed to 122 percent to increase the loads to 150 percent of normal. This is definitely getting into failure territory, and there is only one course of action open to the pilot – **land as soon as possible**. Not negotiable!

Note that the cumulative effects of several lower magnitude overspeeds may ultimately lead to the same conclusion, hence the need for every event to be documented and investigated. Refer to the maintenance manual for your helicopter type for specific requirements.

The accident discussed in this article represents the worst case – ultimate failure of the main rotor. The scary part is that it could have resulted from one single unreported overspeed event some time earlier. How would you feel, after having a rotor overspeed, not reporting it and later seeing the result scattered all over some paddock? ■

Don't even think about it

We repeat the advice in last issue's article on rotor strikes: err on the side of caution and have the appropriate checks done – even if it means flying engineers into the site, or in extreme cases, having the machine lifted out. We also refer you back to the article *Ag Work and the R22* in the March/April 2005 issue, in which the consequences of exceeding limitations are discussed.

New-look *Vector*

Best wishes to our readers for the New Year.

In 2001 we celebrated the 150th issue of ***Vector***, pointing out that although the look and structure of our aviation safety magazine had changed a few times over the years, the basic philosophy remained the same.

Now we have another one of those small milestones in the format of the magazine. It has often been difficult to decide whether an article is placed in ***Vector*** or the former ***CAA News*** – after all, everything we do is for safety. Now we make it easier for you by combining the magazine so that ***Vector*** will bring you all our information about aviation safety, whether it's advice on flight planning or news about a rule change.

The basic philosophy remains the same – to bring you good advice in a manner that is easily understood.

Peter Singleton and the ***Vector*** Team

178 Seconds to Live

The following article by Verdon Kleimenhagen, Ron Keones, James Szajkovics (Federal Aviation Administration (FAA)) and Ken Patz (Minnesota Dept of Transportation Office of Aeronautics) was featured in the January/February 1993 issue of FAA Aviation News*, and is reproduced with permission. Although the article is now 13 years old, and the original '178 Seconds' is even older, the principles discussed have not changed. In 2005, there were three fatal New Zealand accidents, resulting in six deaths, in which bad weather was a dominant factor. While not pre-empting the outcome of the investigations still in progress, this article serves as a timely reminder that there are some fairly compelling reasons for not continuing VFR flight into IMC.*

How long can a pilot expect to live experiencing **spatial disorientation**? Researcher at the University of Illinois found the answer to the question. Twenty student 'guinea pigs' in ground trainers flew into simulated instrument weather, and all went into graveyard spirals or rollercoaster-like oscillations. The outcomes differed in only one respect – the time required until control was lost. The interval ranged from 20 seconds to 480 seconds. The average time was 178 seconds – just two seconds short of three minutes. Here is the fatal scenario…

The sky is overcast and the visibility poor. That reported five-mile (8000 m) visibility looks more like two (3000 m), and you cannot judge the height of the overcast. Your altimeter says you are at 1500 feet, but your chart tells you there is terrain as high as 1200 feet in this sector. There might be a tower nearby because you are not sure how far off course you are. But you have flown in weather worse than this, so you press on.

You find yourself unconsciously easing back just a bit on the controls to clear those none-too-imaginary towers. With no warning, you are in the soup. You peer so hard into the milky white mist that your eyes hurt. You fight the feeling in your stomach. You swallow only to find your mouth dry. Now you realise you should have waited for better weather. The appointment was important but not that important. Somewhere a voice is saying, "You've had it. It's all over."

You Now have 178 Seconds to Live!

Your aircraft feels on an even keel, but your compass turns slowly. You push a little rudder and add a little pressure on the controls to their original position. This feels better, but your compass is now turning a little faster and your airspeed is increasing slightly.

You scan your instrument panel for help, but what you see is unfamiliar. You are sure this is just a bad spot. You will break out in a few minutes (but you do not have a few minutes left).

You Now have 100 Seconds to Live!

You glance at the altimeter and are shocked to see it unwinding. You are already down to 1200 feet. Instinctively you pull back on the controls, but the altimeter still unwinds. The engine RPM is into the red and the airspeed nearly so.

You Now have 45 Seconds to Live!

Now you are sweating and shaking. There must be something wrong with the controls – pulling back only moves the airspeed further into the red. You can hear the wind tearing at the aircraft.

You Now have 10 Seconds to Live!

Suddenly you see the ground. The trees rush up at you. You can see the horizon if you turn your head far enough, but it is at an unusual angle – you are almost inverted. You open your mouth to scream but…

You Now have No Seconds Left!!

You have just become a victim of Spatial Disorientation.

Continued over...

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Understanding Spatial Disorientation

In the past, pilots have taken the subject of spatial disorientation far too lightly. Recent statistics from the National Transportation Safety Board (NTSB) indicate that spatial disorientation is the **number one cause of fatal accidents.** Most pilots think 'Pilot Error' and 'Weather' were the most common causes. Therefore efforts have been concentrated on adding better weather information systems. (**Note**: in New Zealand we have IFIS and MetFlight GA.) We promote in-cockpit resource management and decision making – all of these new information systems and training methodologies are great and have reduced the accident rates over the last 10 to 20 years. We do not emphasise the limitations of the human anatomy.

The outcomes differed in only one respect – the time required until control was lost.

Pilots need to experience spatial disorientation in a controlled setting. Why? Because we have to dispel some common myths and illustrate why flying aircraft is different from other two-dimensional modes of transportation.

1. Myth: "Just believe your instruments."

Truth: Many pilots have no idea that some types of spatial disorientation are so incapacitating. Though the pilot knows something is wrong, the sensory conflict is so great that the thinking process breaks down and the pilot is unable to recover the aircraft. This may be compounded by the inability to obtain visual information due to blurring of vision (nystagmus).

2. Myth: "I am an instrument-rated pilot. All of this spatial disorientation information doesn't really apply to me because I have already demonstrated my ability to fly instruments."

Truth: FAA accident reports tend to contradict this statement. Many instrument pilots experience spatial disorientation every year, often with fatal consequences.

3. Myth: "Continued flight into adverse weather, or flying VFR into IMC conditions are the real causes of many of the aviation accidents."

Truth: What really caused the accident was spatial disorientation. Maybe this sounds a little like who came first, the 'chicken or the egg.' The pilot wouldn't have experienced spatial disorientation if it wasn't for the weather. Again, however, statistics will seem to indicate that just because we improve our weather information systems we still don't prevent this kind of accident. What pilots often don't understand is that weather, especially poor visibility, leads to spatial disorientation. Because pilots have never experienced spatial disorientation in a controlled situation, they do not know how incapacitating it can be, or how to avoid it.

Case in Point: A private non-instrument-rated pilot, flying in an aircraft that was not IFR equipped, departed an airport on his way home from Oshkosh. After having been briefed thoroughly about the marginal weather along his route of flight, he departed in limited visibility and crashed, killing himself and his passenger about an hour and a half later. It is hard to believe that if the pilot had known the risks associated with spatial disorientation, he would have made the decision to make this flight.

The Inner Ear

Most problems related to disorientation can be traced to the inner ear, a sensory organ about the size of a pencil eraser. It may well be the most well-protected organ in the human body, and for good reason. It is the key to our ability to balance when on the ground, or to remain oriented in space when we fly.

The inner ear is similar to a three-axis gyro. It detects movement in roll, pitch, and yaw. When the sensory outputs of the inner ear are integrated with appropriate visual references and spatial cues from our bodies, there is little chance to experience disorientation.

The inner ear consists of an auditory and a non-auditory portion. The latter, primarily associated with equilibrium, contains the three semicircular canals. The semicircular canals are filled with fluid and are located at approximately right angles to each other.

One end of each canal is enlarged, and in this area is a mound of sensory hair cells. Movement or rotation of the body tends to move the fluid of the semicircular canal, thereby causing displacement of the hair cells. The hairs, or cilia, which project into the fluid, are extremely fine and light, and bend with the fluid's movement. The cilia transmit messages to your brain, telling it which way they are displaced, and your brain figures out the direction of your rotation. Since each canal lies in a different plane, the semicircular canals can report on rotation in three dimensions.

…you pull back on the controls, but the altimeter still unwinds.

The problem occurs when the outside visual input is obscured, and the 'seat of the pants' input is ambiguous. Then you are down to just the output from the inner ear. That is when the trouble can start because fluid in the inner ear reacts only to rate of change, not a sustained change.

For example, when you initiate a turn, your inner ear will detect the roll into a turn. This system works fine for short turns, but if you hold the turn constant, your inner ear will compensate and rather quickly, although inaccurately, sense that it has returned to level flight. Therefore if a constant-rate turn continues for more than 15 seconds, the motion of the fluid in the canals catches up with the canal walls (stabilises in the canals), the hairs are no longer bent, and your brain receives false impression that the turning has stopped. Thus, after a few seconds, it is impossible for your semicircular canals to detect that you are in a turn, especially if it is a gentle turn.

As a result, when you finally level the wings, that new change will cause the inner ear to produce signals that make you believe you are banking to the right. This is the crux of the problem you have when flying without instruments in low visibility weather.

Even the best pilots will quickly become disorientated if they attempt to fly without instruments when there are no outside visual references. That is because vision provides the predominant and coordinating sense we rely upon for stability.

... spatial disorientation is as old as aviation itself...

Perhaps the most treacherous thing under such conditions is that the signals the inner ear produces – incorrect though they may be – feel right! These sensory illusions occur because flight is an unnatural environment; our senses are not capable of providing reliable signals that we can interpret and relate to our position in three dimensions without visual reference.

As to 'risky weather decisions', all pilots should understand that, unless they are thoroughly trained and **current** in instrument flying techniques, they are basically incapable of safely operating in reduced visibility. The accident statistics attest to this. Unless understanding is brought to the consciousness of every pilot, no substantial reduction in fatal weather accidents is likely to be achieved in the foreseeable future.

In addition, a change of bank, pitch, or yaw may be too slow to be perceived by a pilot. In other words, acceleration may be below the threshold of perception. In the course of normal cockpit duties a pilot may be surprised to look up and find the aircraft in a bank when it was not previously in a bank.

Although the problem of spatial disorientation is as old as aviation itself, its significance in flight safety is clearly underplayed. For example, in flight training and throughout general aviation a great deal of attention is given to weather and the movement of weather fronts. But little or no mention is made of the connection between weather and spatial disorientation. In the FAA *Pilot's Handbook of Aeronautical Knowledge* (FAA-H-8083-5) the student pilot can obtain a wealth of information on weather. We have made tremendous progress with improving aircraft design, power plants, radio aids and navigational techniques. Safety in flight however, is still subject to conditions of limited visibility. An NTSB study of fatal weather involved general aviation accidents shows spatial disorientation as a frequent cause. Many of the fatal, weather-involved, general aviation accidents are caused by the pilot's mistaken idea of his or her ability to cope with flight in reduced visibility.

The FAA *Aviation Instructor's Handbook* (FAA-H-8083-9) discusses the desirability of 'integrated flight instruction' from the first time each manoeuvre is introduced. When this training technique is used, instruction in the control of an aircraft by outside visual references is integrated with instruction in the use of flight instrument indications for the same manoeuvre. This handbook states that such instruction provides the student with the ability to control an airplane in flight for limited periods if outside references are lost. This ability could save the pilot's life or those of the passengers in an actual emergency. The real hazard of loss of visual reference, ie, spatial disorientation, is not specifically identified, and such identification is important if both pilots and flight instructors are to more successfully deal with this flight hazard. (**Note**: the New Zealand *Flight Instructor's Guide* discusses the subject in the chapter "Instrument Flying".) ■

Further Reading

Aviation Medicine and other Human Factors: Dr Ross L Ewing
Basic Flight Physiology: Richard O Reinhart
Fit for Flight: Richard O Reinhart
Flightdeck Performance, the Human Factor: David O'Hare & Stanley Roscoe
Human Factors for General Aviation: Stanley R Trollip & Richard S Jensen

Honour for Civil Aviation Service

In the New Year Honours list for 2006, Peter McNeill was made a Member of the New Zealand Order of Merit for services to civil aviation. Peter has had a long and distinguished career in the field of civil aviation. He joined the Transport Department in 1956, transferring to the Air Department in 1963. In February 2005, Peter retired as manager of the Civil Aviation Authority's Enforcement Unit. In this role he was responsible for the development and implementation of aviation enforcement policy and practice. He has been involved with investigation and enforcement since the early 1970s and is regarded as having had a pivotal role in developing the CAA's enforcement capabilities, thereby increasing aviation safety for the travelling public.

Portable Electronic Devices (PEDs) Revisited

In the November/December 2005 issue of *Vector/CAA News* we highlighted that under Civil Aviation Rule (CAR) 91.7 *Portable Electronic Devices*, cellphones and any other devices designed to transmit electromagnetic energy, may not be operated at any time during a flight under IFR. This rule was designed to protect aircraft systems from interference by electromagnetic transmitting devices, and it does not allow the use of cellphones in 'flight' or 'plane safe' mode.

Cellphones with 'flight' or 'plane safe' mode have become very common. This mode has been designed to disable the transmitting ability of the cellphone, while still allowing the use of other functions like digital diaries and organisers.

The Director has granted a general exemption from CAR 91.7(a), "only with respect to the operation of a portable electronic device while the cellphone or electromagnetic transmit function of the device is deactivated from being able to transmit electromagnetic energy, provided that the requirements of rule 91.7(b) are applied." CAR 91.7(b) prohibits the operation of any portable electronic device on any IFR flight during an instrument approach, or departure procedure, or during any other critical phase of flight. This means that cellphones in 'flight' or 'plane safe' mode could only be used in the cruise phase of flight. They must be switched off entirely during takeoff and landing.

Significant research has been carried out by the CAA's Aircraft Certification Unit before granting the exemption. This included studying overseas rules and experiences. Regulatory authorities in the United Kingdom and Australia permit operators to allow the use of cellphones in 'flight' or 'plane safe' mode during flight.

Operators in New Zealand must still determine under CAR 91.7(c)(6) that cellphones with a 'flight' or 'plane safe' mode will not interfere with any aircraft system. This determination is very important and may require sophisticated testing. An appropriate passenger briefing is also essential to ensure that passengers understand what PEDs are permitted to be used during the different stages of flight.

The CAA will consider revising CAR 91.7 to bring it in line with current international standards and the latest cellphone technology. An update to the rule would eliminate the need for the current exemption.

Tim Allen, General Manager Airlines, says, "This exemption will bring New Zealand's rules in line with international standards. It is very important that aircraft operators make a concerted effort to ensure that the devices they permit in flight do not interfere with aircraft systems". ■

young eagles RNZAC

Young Eagles News

Young Eagles Scholarships

Six Young Eagles scholarships will be awarded this year. Five will be Ross Macpherson Young Eagles Scholarships, and one will be the Around New Zealand Air Race Scholarship. Scholarship winners are entitled to $1500 worth of flying through their local aero club. Entries closed on 31 December 2005, and judging is currently taking place.

Pickard Memorial Trophy

The six winners of Young Eagles Scholarships are eligible to compete for the Pickard Memorial Trophy at the 2006 RNZAC National Championships in Whitianga. The competition will be held on Friday 17 February. The Young Eagles will start the day with an in-depth aircraft inspection, followed by an aviation knowledge questionnaire. Next, they will participate in a lecture on navigation and then complete a work paper using the skills they have just learned. In the afternoon, the competitors will answer a general knowledge questionnaire. The winner of the trophy will receive a cash prize. To end the day on a high note, all the scholarship winners will be taken for a flight along the Coromandel Peninsula.

Aero clubs who have sponsored scholarship winners are encouraged to help their young people get to and from the Nationals. The RNZAC helps each scholarship winner who attends the Nationals with $100 towards their accommodation costs.

Sponsors of Young Eagles are the CAA, Aviation Services Ltd, Airways New Zealand, Aviation Cooperating Underwriters Pacific, Pacific Wings, Sparc, and Air BP.

Mt Tarawera MBZ Procedures

Photo courtesy of Volcanic Air Safaris

Mount Tarawera looking south.

If you are thinking about flying in the Mount Tarawera Mandatory Broadcast Zone (MBZ) but you are unfamiliar with flying in the area, this article covers some information to help assist in your flight planning.

The Mount Tarawera MBZ can be very busy with tourist flights. To minimise the risk of a mid-air collision, pilots who intend operating in the MBZ need to take the time to find out what the local operating procedures are **before** going there. It is recommended that you spend time studying the relevant information in the *AIP New Zealand* and the visual navigation charts (VNC). It is also a good idea to talk to a pilot with experience of flying in the area to supplement this information. Local operators are willing to offer advice.

The Rotorua Airspace Users Group reports that there have been some problems occurring in the MBZ. Specific problems include:

- Aircraft flying into the MBZ unannounced.
- Pilots not making position reports, especially when operating to the north and east of Mt Tarawera.
- Generally poor RTF technique.
- Not circuiting the mountain in a clockwise direction.
- Not maintaining VFR meteorological minima with respect to CAR Part 91.

It is important to make frequent, concise, and accurate radio calls on 120.9 MHz when operating in the MBZ. There can be a wide range of aircraft scenic operations sharing the same airspace – especially in the vicinity of Mount Tarawera. Local operators recommend for traffic separation that aircraft on scenic flights, circuit Mount Tarawera in a **clockwise** direction – see the accompanying map (page 16) for route details.

Be aware when operating in the vicinity of Mount Tarawera, that black-backed gulls may be soaring over the upper slopes of the mountain (particularly during summer). Large populations often soar in vertical columns up to 1000 feet above the mountain.

Caution is required when operating over Mount Tarawera (elevation 3644 feet), as controlled airspace starts at 4500 feet. Flying wide allows more terrain clearance. During windy conditions considerable updraughts and downdraughts occur in the area, and it may be prudent to obtain a clearance from Christchurch Control (119.5 MHz) to fly in controlled airspace above the MBZ.

Continued over...

Lake Okataina (foreground) looking southeast across Lake Tarawera towards Mount Tarawera. The line marks approximately the boundary between the Rotorua CTR/D and the Mount Tarawera MBZ.

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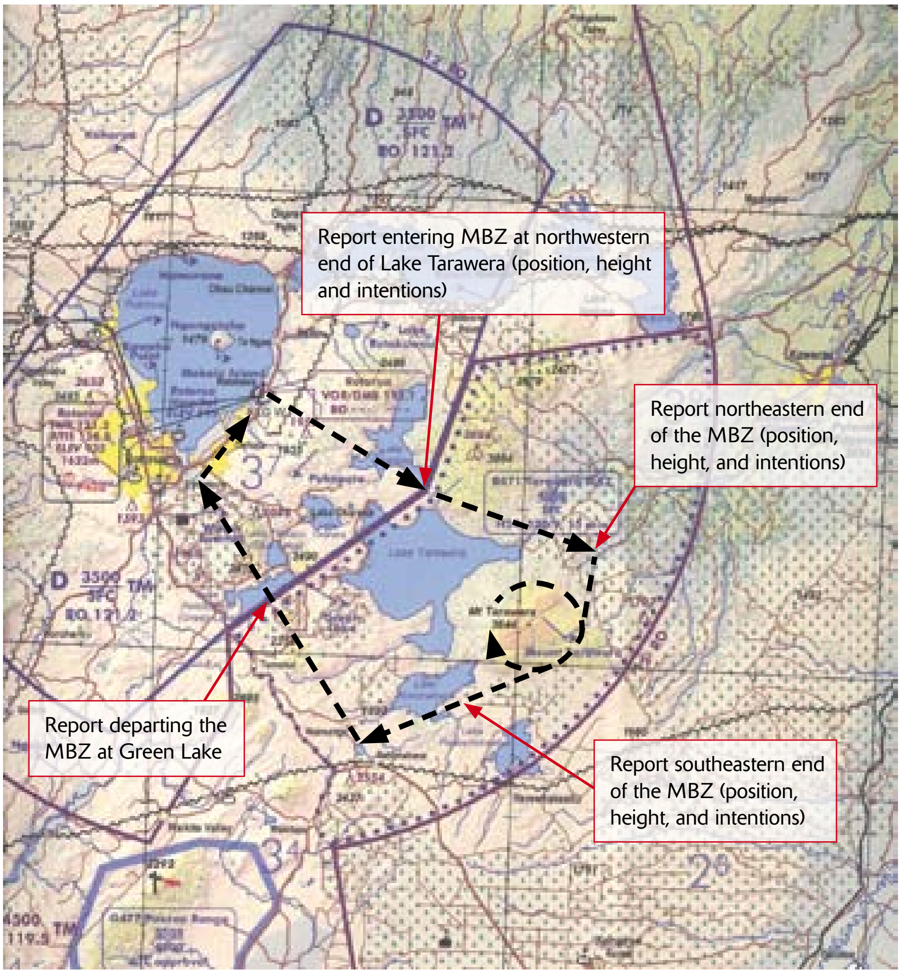
Things to note when operating in the area:

- Position and intention reports on 120.9 MHz are mandatory on entry and every 15 minutes when operating within the Tarawera MBZ. The frequency of reports should be increased when traffic densities are high. Where there are limited geographical features (for example, to the north and east of Mount Tarawera), position reports should state a bearing and distance from the nearest prominent feature. If in doubt as to the whereabouts of other traffic or a procedure, confirm the details with a call on 120.9 MHz.
- Landing and anti-collision lights must be on.
- Maintain a vigilant lookout for birds.
- Avoid flying in the area in reduced visibility and when there is a cloud base obscuring the mountain tops.
- Be aware of the Rotorua control zone (CTR/D) immediately adjacent to the Mt Tarawera MBZ. Remember to change frequencies, particularly when leaving the CTR/D and entering the MBZ.

Similar vigilance and position reporting procedures should apply when planning a flight into any MBZ or SPA (Special Procedures Area) where busy tourist flight-seeing operations take place. ■



An example of the typical flight paths and position reports made by local flight-seeing operators. It is suggested that itinerant pilots wishing to go flight-seeing in the area should follow these procedures to minimise the risk of a mid-air collision.

ATTTO Supports Gateway

The Aviation, Tourism & Travel Training Organisation (ATTTO) is encouraging businesses to become involved in the Gateway programme. Gateway is an initiative funded by the Tertiary Education Commission that offers structured workplace learning opportunities to high-school students in Years 11 to 13. The students complete a work placement, usually for one day per week during the school year. Placements in blocks, however, or during weekends and holidays, are also possible by negotiation with the workplace. The students have their learning assessed against unit or achievement standards on the National Qualifications Framework.

Workplace learning is a formalised arrangement set in an actual workplace. A written agreement and learning plan between the school, the employer, and the student, sets out the knowledge and skills to be gained during the placement, with support from a workplace mentor. Workplaces do not pay the students, but they do provide training on the job. This allows students thinking about entering the tourism, travel, museum, or aviation industry the chance to start a career pathway while they are still at school. Workplace learning is different from work experience, which is designed to give students a taste of different occupations.

The high-school's Gateway coordinator ensures a good fit between student and workplace and looks after any administration.

There are many benefits for companies involved in the Gateway programme, such as: exposure to possible new employees, extra help for peak periods or one-off projects, the opportunity to gain experience in workplace training, and finding out how modern apprenticeships could help their business. Gateway is also a way of helping young people and giving something back to the community.

The ATTTO sees a huge benefit in exposing students to the aviation, tourism and travel industries at an early age. To make the process easier for workplaces and schools, ATTTO have put together a Gateway package of five unit standards that are suitable for aviation, tourism and travel workplaces. They also offer a liaison service for workplaces and schools.

More information is available on the ATTTO web site, www.attto.org.nz, or by calling 0–4–499 6570.

IFR Alternates

When flight planning for an IFR flight, it is important to consider whether an alternate aerodrome is required.

The selection of an IFR alternate depends on a variety of factors. These include: weather; aircraft performance (fuel, payload, single-engine performance); and navigational equipment (on board the aircraft and at the aerodrome). It can, in some circumstances, be tricky to select a suitable alternate aerodrome, especially if the weather conditions are fluctuating.

Alternates are generally classified into three types: weather alternates, technical alternates, and departure alternates.

Weather Alternates

A weather alternate must be nominated if the weather at the aerodrome of intended landing is below the required meteorological standards prescribed in the Civil Aviation rule 91.405 *IFR alternate aerodrome requirement*.

An alternate is required **unless**, at the time of submitting the flight plan, the meteorological forecasts indicate, for at least one hour before and one hour after the estimated time of arrival (ETA), at the aerodrome of intended landing:

- The ceiling (lowest cloud layer of five octas or more, ie, BKN or OVC) will be at least 1000 feet above the prescribed minima ie, Minimum Descent Altitude (MDA) or Decision Altitude (DA) for the instrument procedure likely to be used; and
- The visibility will be at least 5 km, or 2 km more than the prescribed minima, whichever is the greater.

Careful study of the current and fore-cast weather is therefore necessary. If the forecast includes TEMPO conditions that are below the required minima, and which could occur during the two-hour window specified, then an alternate will be required.

If an alternate aerodrome is required, the meteorological conditions at that aero-drome must meet prescribed minima. This means that the meteorological forecasts at the time of submitting the flight plan indicate that, at the ETA at the alternate aerodrome, the ceiling and the visibility will be at or above the alternate minima prescribed in the *AIP New Zealand* Table ENR 1.5 – 7.

In some cases you may need to nominate an alternate aerodrome that does not have prescribed alternate minima. In these circumstances, the forecast for that aerodrome at the time of lodging the flight plan must indicate that, at ETA (at the alternate), the ceiling and visibility will be equal to or greater than the following meteorological minima:

- For a precision approach procedure, a ceiling of 600 feet, or 200 feet above the Decision Altitude (DA) or Decision Height (DH), whichever is the higher, and a visibility of 3000 metres, or 1000 metres more than the prescribed minima, whichever is the greater.

Continued over...

Table ENR 1.5-7
IFR Alternate Aerodrome Minima

SAMPLE ONLY

Note: Height in feet above aerodrome

Approach	ILS	Non Precision			
		Aircraft Category			
	All Categories	A	B	C	D
Auckland LLZ VOR (With DME) VOR (No DME)	600 – 3000 --- ---	800 – 4000 1100 – 7			
Christchurch	600 – 3000	800 – 4000		800 – 4500	
Dunedin	600 – 3000	1200 – 4000	1200 – 5	1200 – 6	NA
Gisborne	---	1000 – 5	1100 – 6	1100 – 7	NA
Hamilton	---	900 – 5		900 – 6	900 – 7
Hokitika Day only	---	900 – 5		900 – 6	NA
Invercargill With DME No DME	--- ---	800 – 5 1100 – 5		1100 – 7	
Kaitaia Day only	---	900 – 6		1200 – 6	NA
Napier	---	1000 – 5		1000 – 6	NA
Nelson VOR/DME NDB	---	900 – 4000 1000 – 10	900 – 4500 1000 – 10	1100 – 6 NA	NA NA
New Plymouth	---	1100 – 5		1100 – 7	NA
Oamaru Day only	---	800 – 4000	800 – 5	1000 – 6	NA
Palmerston North	---	800 – 4000	800 – 5	1100 – 7	1400 – 7
Paraparaumu	---	2400 – 7			NA
Queenstown Day only	---	5000 – 7		5000 – 10	NA
Rotorua Day Night	--- ---	1300 – 7 1300 – 8		1600 – 7 NA	NA NA
Taupo	---	900 – 5		1100 – 7	NA
Tauranga	---	800 – 4000	1200 – 5	1700 – 7	NA
Timaru	---	800 – 4000	800 – 5	1000 – 6	NA
Wanganui	---	1400 – 5		1400 – 7	NA
Wellington	800 – 4000	1200 – 7		1700 – 7	
Westport Day only	---	800 – 4000		800 – 6	NA
Whakatane Day only	---	1000 – 5		1100 – 6	NA
Whangarei	---	900 – 5	1000 – 5	NA	
Woodbourne VOR/DME VOR TWIN NDB+/DME TWIN NDB	---	800 – 4000 800 – 4000 1000 – 10 800 – 4000	800 – 4000 800 – 5 1000 – 10 800 – 4500	800 – 5 1500 – 6 1000 – 10 1500 – 7	NA NA NA NA

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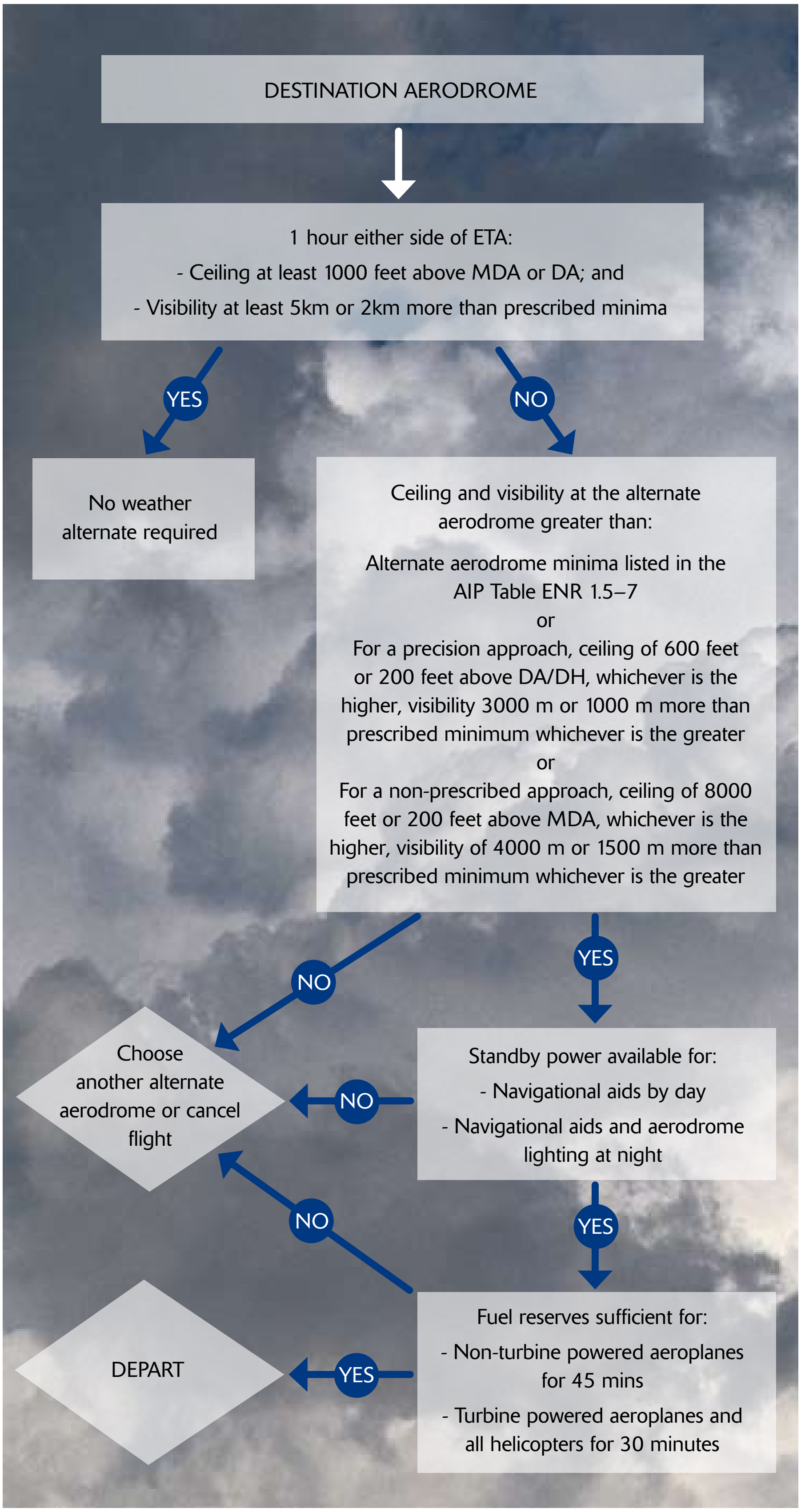
- For a non-precision approach procedure, a ceiling of 800 feet, or 200 feet above MDA, whichever is the higher, and a visibility of 4000 metres, or 1500 metres more than the prescribed minima, whichever is the greater.

- If no instrument approach procedure is prescribed, the ceiling and visibility minima prescribed under Part 91 Subpart D for VFR will be at or above the applicable minimum altitude for IFR flight. Refer to rule 91.405 (b)(3).



Flow chart summarising the factors involved when considering whether an alternate aerodrome is required.

Remember that the alternate aerodrome chosen must have a secondary electric power supply for the ground-based electronic navigation aids necessary for the instrument approach to be used, and aerodrome lighting for night operations. To check whether standby power is available, refer to the aerodrome chart in the *AIP New Zealand*.

It is also important to check the enroute weather when selecting a suitable alternate. For example, there may be a situation where the weather at the alternate is suitable for the approach, but the enroute weather to the alternate is unsuitable, eg, icing or severe turbulence.

It is good airmanship to nominate an alternate aerodrome on an IFR flight whenever the weather conditions are at all doubtful.

If your flight has to divert to the alternate, that aerodrome becomes your new destination, and the normal instrument approach minima apply.

Technical Alternates

A technical alternate is recommended when aerodrome or aircraft equipment has known shortcomings. Consider the following situations:

- For private operations (Part 91), if your aircraft has only one operable ADF receiver, and your destination aerodrome has only an NDB approach, then you should nominate a technical alternate where you could use an alternative approach that you are equipped for, eg, a VOR. Note that for air transport operations, the aircraft is required to be additionally equipped with the number of instruments and equipment to ensure that the failure of any independent system required for navigation will not result in the inability to navigate safely as required for the route being flown.
- When a destination aerodrome navigation approach aid suffers failure of one source of power supply, and actual or forecast meteorological conditions indicate that an instrument approach requiring that aid is necessary, then a technical alternate should be nominated.

When an alternate is named for technical reasons, all the requirements for an alternate aerodrome apply. Fuel will need to be carried to fly to the alternate to arrive there with the mandatory reserves.

Departure Alternates

IFR aircraft on air transport operations may be required to nominate a departure alternate.

If the weather at the departure aerodrome is at or above takeoff minima but below the landing meteorological minima, then an appropriate alternate aerodrome is required. For two-engine aircraft this aerodrome must be within one hour flying time at single-engine cruise speed from the aerodrome of departure (rules 135.161, 125.161 and 121.161 *IFR departure limitations*).

The forecast weather at the named alternate aerodrome must, at the ETA, be at least the meteorological minima specified for that aerodrome when used as an alternate aerodrome.

Fuel Reserves

Fuel loads vary depending on whether an alternate aerodrome is, or is not required (rule 91.403 *Fuel requirements for flights under IFR*).

When an alternate is required, sufficient fuel must be carried to fly to the aerodrome of intended landing, then to the alternate aerodrome, and then:

- for non-turbine-powered aeroplanes, to hold for 45 minutes at a height 1500 feet above the aerodrome.
- for turbine-powered aeroplanes and all helicopters, to hold for 30 minutes at a height of 1500 feet above the aerodrome.

Other Requirements

If GPS is used as the primary means for navigating, and a weather alternate is required, the alternate must have a promulgated instrument approach procedure based on other than a GPS approach (eg, VOR, ILS or NDB – rule 19.207 *Primary means GPS operations*).

Air transport flights under Parts 135 and 125 cannot depart if the weather (current and forecast) at the ETA for the destination aerodrome indicates that conditions are below the minimum standards required for the instrument procedure likely to be used. (Part 121 operations have some alternative options.)

For private operations, you can depart provided you nominate an alternate aerodrome where the meteorological conditions (current and forecast) meet the prescribed minima.

For air transport operations, where current meteorological information indicates that the visibility at the aerodrome is less than the visibility prescribed for the instrument approach procedure being used, the approach must not be continued beyond the final approach fix (FAF) or the final approach point (FAP) for an ILS. (When no final approach fix is provided, do not continue beyond the end of the procedure turn, established inbound.)

Summary

When planning an IFR flight it is important to study the current and forecast weather conditions carefully to see if an alternate aerodrome is required – refer to the flow chart and rule 91.405. If you have any doubt about the forecast, it is safer to nominate an alternate. Depending on the navigational equipment in the aircraft, it may be prudent to nominate a technical alternate as a back-up. If you do choose an alternate, check in the *AIP New Zealand* to see if standby power is available. Remember that nominating an alternate will require having extra fuel for the flight. ■

Peter Blackler Retires

After 45 years in the aviation industry, CAA's Technical Manager Rules, Peter Blackler, is to retire at the end of February 2006. His career, which started in telecommunications engineering, has been mainly involved in the engineering and maintenance of air navigation and Air Traffic Control systems, and Rules Development.

For the last 15 years or so, Peter has been involved in the rules area – initially rules for the airways systems, and later managing the whole rules development process.

"The last 15 years or so have been very enjoyable in the rules area, which has given me exposure across the whole of civil aviation and given me a much broader knowledge of the system," says Peter.

"To be part of the team implementing the changes in the rules concepts following the Swedavia report has been very satisfying. That, and being part of the senior management team at CAA, has been satisfying and given me the feeling of contributing to the overall civil aviation system in New Zealand."

Peter says that industry participants are more responsible today, "They've seen that management systems are all part of good business and that those systems actually assist them if they are carried out properly."

For his retirement, Peter has renovations and extensions to complete after moving house, to provide room for his favourite pastimes: vintage engines, Puch motor scooters, valve radios, chiming clocks, and the grandchildren, to name a few.

Landing with Carburettor Heat?

A reader has raised the question of the use of carburettor heat during approach and landing.

"A great deal has been written about the application of carb heat. I was taught to apply it flying a C172, when pulling power downwind, and removing heat at 300 feet agl ready for a go-round. After reading a lot of accident reports, and talking to a lot of people, I rejected this absolute for a more 'holistic' approach to landing. Too many variables come into play when on finals to guarantee power will be available should a go-round be required. … My practice is to keep carb heat until the plane is just about on the runway – indeed it is the last consideration before landing. Should a go-round be necessary, the plane will still be capable of climbing with full heat and a drop of a couple of hundred engine revolutions.

So what do other pilots think?"

A good question.

It is useful to have standardised procedures for flight training, especially in organisations where more than one aircraft type is operated. It is important, however, to understand why a specific procedure is adopted.

The aircraft Flight Manual is always a good place to start to establish good safe procedures. The operating manual for the engine is also a good source. Manufacturers' information, combined with operating procedures developed from years of flight training in a wide variety of operating environments, form the basis of recommended practices that are taught.

We have gathered the following information from aircraft and engine manufacturers' operating manuals.

Before reviewing this information, a quick recap on when carburettor icing can occur. Carburettor icing is not restricted to cold weather and will occur on warm days if the relative humidity is high, especially at low power settings. Engines at reduced power settings are more prone to icing because engine induction temperatures are lower and the partially closed throttle butterfly can be restricted more easily by ice build-up.

Aircraft Manuals

Cessna Flight Manuals for C152 and C172 advise the use of carburettor heat prior to any significant reduction or closing of the throttle. The carb heat should be on for approach and landing and placed to the cold position after landing. In the case of a go-around, move the throttle to full power and carb heat to cold.

Piper Flight Manuals for the Cherokee series (140, 151, 181, etc) advise for descent**,** carb heat "ON if required". For approach and landing "carburettor heat should not be applied unless there is an indication of carburettor icing, since the use of carburettor heat causes a reduction in power which may be critical in case of a go-around. Full throttle operation with carburettor heat on can cause detonation."

The flight manual of a newer-generation trainer, the **Robin R 2160** advises the use of carb heat as required on approach and to move to cold on final. The advice of moving carb heat to cold is repeated in the overshoot checklist.

Engine Manuals

The engine manufacturer's operating manuals offer further information in relation to carburettor icing.

The **Lycoming O-320** manual advises that during flight on damp, cloudy, foggy or hazy days, regardless of outside air temperature, to look out for loss of power. They advise that on landing approach, the carburettor heat is normally cold, but if icing conditions are known or suspected, use full heat.

If full power is required, for example in a go-around, move carb heat to cold after full power application. They advise referring to the aircraft flight manual for specific instruction.

It adds "As a safety measure, there is no objection to the use of carburettor heat during landing approach provided that on a go-around, or touch-and-go landing, the carburettor heat is returned promptly to the cold position."

The **Continental O-200** operator's manual contains this advice for descending and landing.

Carburettor heat is available only at engine outputs well above idle. Apply carburettor heat before closing the throttle and place carburettor heat OFF before opening the throttle so full power will be available if necessary.

Advisory Documents

A **Lycoming Key Reprint** on induction icing contains the following:

Whenever carburettor heat is used in the landing configuration, and a go-around or touch-and-go takes place, there are some important steps for the pilot to remember. The throttle must be advanced and the carburettor heat lever placed in the cold position. The order in which these steps are accomplished is not too important, but both must be done. Leaving the carburettor heat on during a go-around will result in a loss of power that could be critical at low altitude and low airspeed.

Do not use carburettor heat for takeoff or climb with a Lycoming engine as it is not necessary, and it may bring on detonation and possible engine damage.

Key Points

From all this information some key points emerge.

- Some aircraft/engine combinations are more susceptible to carb icing than others. In some engines, the carburettor is more isolated from the engine heat and different manufacturers use different hot air sources for carb heat.
- The use of carb heat during the landing approach (or any low-power descent) is a wise precaution. A good rule-of-thumb is to apply carb heat with any power reduction below 2000 rpm unless the aircraft has a carburettor air temperature (CAT) gauge allowing for the temperature in the carburettor to be monitored.

- Carb heat should be applied **before** the power is reduced (particularly if reduced to idle) to ensure sufficient heat is available before the exhaust starts to cool.
- Carb heat should be cold for a full-throttle climb as occurs in a go-around situation. This is necessary to obtain full power and there is the danger of detonation if carb heat remains in the hot position.
- Whenever carb heat is applied full heat should be used, unless the aircraft is fitted with a CAT gauge.

The Question of When?

Making a judgment or developing a procedure of when to put the carb heat to cold should include assessment of the following factors.

Training procedures on this have changed over the years, and they may vary in different parts of the country based on experience in that environment. There is generally higher humidity as one proceeds north (but the muggy days through December in the South Island may have raised awareness of carb icing in southern areas).

If the procedure of keeping carb heat on until after landing is the norm, the pilot has a well-trained response to move it to cold for an overshoot as this is the normal practised procedure. Ideally, the carb heat is moved to cold before the application of full power but sometimes time and runway available may decree getting the power on first. There is the slight danger of full power not being immediately available for an overshoot if the carb heat is still on. Rapid application of throttle should be avoided as this could cause an engine 'hiccup'.

If the procedure adopted is to put carb heat to cold on final, there does need to be an understanding of when on final approach this should happen. Some pilots tie this action in with selecting full flap – but the timing of this can vary, and in a strong wind full flap may not be selected at all (so carb heat could be overlooked). Another trap is when the pilot turns on to final and selects carb heat off to 'get that out of the way' and there is then a danger of carb icing occurring during the long final. Sometimes the action of putting carb heat to cold just insidiously creeps in earlier and earlier on final.

It is important that full heat remains applied to a point where there is no danger of carb icing occurring during the remainder of the approach. A good practice is to make "carb heat cold" part of a short finals check along with checking the windsock, establishing the runway is clear and confirming that the approach path is suitable for a safe landing.

Pilots who learn "carb heat cold" on final do not have such a well-ingrained response in an overshoot situation. The "carb heat cold" check should also be part of a go-around checklist – that way if it gets overlooked on approach, it will still be actioned.

Conclusion

It is useful to have standard procedures and cockpit checklists for various phases of flight. Understanding the reasoning behind a procedure – the 'why' factor – can help one to remember and implement it correctly. ■

Omnibus 2 Rule Project

An 'Omnibus' Rule Project was started some years ago to address minor amendments that were required to a variety of Rule Parts. Some of the issues were dealt with in rule amendments last year; some that required further work were put into an 'Omnibus 2' project; and some issues were included in current specific rule projects.

The Omnibus 2 draft Notice of Proposed Rule Making (NPRM) is currently with the Ministry of Transport and should be approved for general release shortly.

Of particular interest in this NPRM will be the CAA's proposal in response to a rule petition suggesting that the hazardous area in rule 121.91(d) does not comply with the Australian, New Zealand Standard (AS/NZS). This disparity was recognised by the CAA, and a General Exemption allowing Part 121 operators to apply the AS/NZS was issued by the Director.

The AS/NZS is reflected in the requirements of the Hazardous Substance and New Organisms (HSNO) Regulations 2001. These regulations apply to the handling and dispensing of all Class 3 fuels, among other things, and of course apply to all aviation operators.

The proposal in this NPRM is not only to amend rule 121.91 to reflect the AS/NZS in the HSNO Regulations, but also to amend the applicable rules in Parts 125 and 135, and insert a new rule in Part 91 that will require operators to apply the hazardous zone areas in the HSNO Regulations during fuelling operations.

Other topics covered in this NPRM include: amended Definitions, RVR requirements, Ditching Certification, instrument and meteorological requirements for IFR operations, Glider Tow Hooks, Helicopter External Load operations, maintenance personnel terminology, and some editorial amendments.

Profile 2005

The CAA *Profile* for 2005 was published late December with the theme "Safety Outcome Targets – Towards 2010". The *Profile* reports on the Safety Targets for 2005, and explains the new targets for 2010. Aircraft Certification is also highlighted, as 2005 has been an exceptional year for new aircraft types – the first Boeing 777 features on the cover.

You can get copies of the *Profile 2005* from your local Field Safety Adviser (see contact details in *Vector*), or by emailing info@caa.govt.nz

The Authority Visits AUCKLAND

Each year the Authority members, together with CAA senior managers, visit a number of aviation organisations around the country. In March 2005 the Authority visited companies in Christchurch, and in October 2005 they visited companies in Auckland. Included in the visit were the Aviation Security Service, Auckland International Airport, Airways New Zealand, Air New Zealand Engineering Services (ANZES), and Jetconnect.

The purpose of the visits is to facilitate dialogue between aviation community participants and members of the Authority. This helps to increase awareness and appreciation of the issues that both face.

The visit to Auckland International Airport presented an ideal opportunity to see changes being put in place to meet international requirements. The International Civil Aviation Organisation (ICAO) required all international hold-stowed baggage to be security screened from 1 January 2006, and screening was operational in Auckland mid December.

Senior Sergeant Andrew Smith (left) explains screening equipment to (from left): Robyn Reid, Mark Everitt, Susan Hughes, Darryll Park, Hazel Armstrong, and John Jones.

Airport staff and Aviation Security staff explained how screening would take place in the airport's new baggage hall, where there is a labyrinth of conveyor systems, screening machines, and laser barcode readers to keep all the baggage on track. The use of automation, with the ability for security staff to intervene at any point, means that the time required for passengers to check in does not need to be increased.

Peter Pilley (centre) is presented with a trophy by Graham Puryer (left) and Mark Everitt (right).

The visitors also saw work being carried out to separate incoming from departing international passengers.

The Aviation Security Service's new Auckland base for the Explosive Detector Dog (EDD) Unit was officially opened by the Chairman of the Authority, Ron Tannock. Northern Region Operations Manager, Peter Pilley, was recognised for his 10-year contribution to the EDD team, and was presented with a trophy by EDD Unit head Graham Puryer, and the General Manager Mark Everitt, on behalf of the dog handlers from throughout New Zealand.

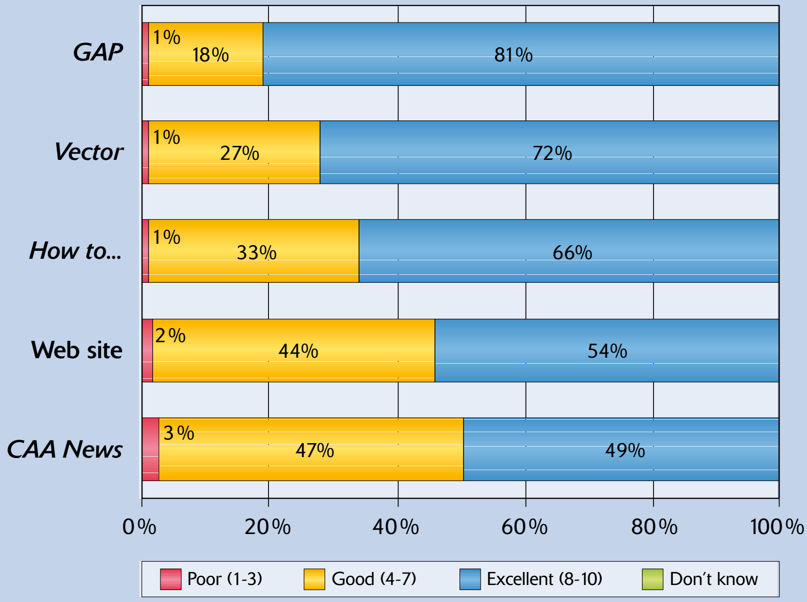
Air New Zealand's restructuring of their subsidiary Air New Zealand Engineering Services (ANZES) was news at the time of the visit, and the company took the opportunity to brief Authority members and CAA senior managers on the proposals.

Jetconnect is a wholly-owned subsidiary company of Qantas Airways, operating domestic services in New Zealand and some trans-Tasman international routes. Jetconnect explained their growth since beginning in New Zealand, and they discussed future plans. ■

Survey of Safety Education Products

In August 2005 the CAA engaged Colmar Brunton to conduct an internet-based survey to investigate the value, content, retention, and influence on behaviour of the safety education products produced by the CAA. The survey was completed by 456 CAA clients, and here are some of the results.

Clients were asked to rate the overall value of each safety education product. The chart below shows a comparison of these ratings.



When asked if *Vector/CAA News* was the best method for distributing the information that the magazine contains, 97 percent of people answered yes, and only 3 percent answered no. A similarly high response was given when asked if *GAP* and *How to…* booklets were the best method of distributing the more detailed information they contain, with 96 percent answering yes.

When the CAA web site was examined, more than half of the clients who had used it gave the web site an "excellent" rating (54 percent) for providing useful information, 46 percent gave it a "good" rating, and 0 percent gave it a "poor" rating. The ease with which people could find information, however, did not rate as well, with 11 percent choosing "poor", 59 percent choosing "good" and 30 percent rating it "excellent". A project has been started to redesign the CAA web site making it more user-friendly.

Clients were asked which CAA publications had resulted in changes to the way in which they or their organisation operated in the last 12 months. Half of the 456 surveyed said that *Vector* had resulted in changes to the way they operate, while 38 percent said that none of the CAA's products had changed their behaviour. Of those who had seen or read *GAP* booklets in the last 12 months, 40 percent said they had changed the way they operated as a result.

The CAA would like to thank all those pilots, engineers, air traffic controllers, aircraft owners, and others who took the time to complete the survey. It has given us valuable information for improving the safety education products we produce. It is a means of finding out which products are thought to be relevant and useful to the aviation community, and which are the most effective at influencing behaviour. This information will help the *Vector* team with our aim of "pointing to safer aviation".

The full survey report can be seen on the CAA web site, www.caa.govt.nz, under "About us – Public Documents".

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Accident Notification

24-hour 7-day toll-free telephone

0508 ACCIDENT
(0508 222 433)

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

Aviation Safety Concerns

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

0508 4 SAFETY
(0508 472 338)

For all aviation-related safety concerns

OCCURRENCE BRIEFS

LESSONS FOR SAFER AVIATION

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

ACCIDENTS

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

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

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

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

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

CAA Occurrence Ref 03/2106

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

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

Main sources of information: Accident details submitted by operator.

CAA Occurrence Ref 03/3803

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

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

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 03/3801

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

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

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

CAA Occurrence Ref 04/1641

ZK-ZAA, Zlin Aviation Savage, 10 Jun 04 at 13:55, Te Kowhai. 2 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence unknown, age 72 yrs, flying hours 1289 total, 31 on type, 29 in last 90 days.

The pilot was performing a touch-and-go. After landing, the pilot applied full power, the tail lifted, but the aircraft drifted to the right and struck a hedge causing substantial damage.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 04/1931

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

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

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 04/2011

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

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

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 04/2690

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

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

Main sources of information: Accident details submitted by operator.

CAA Occurrence Ref 04/2717

ZK-BEM, Ryan ST-M S2, 29 Aug 04 at 15:12, Clevedon. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 43 yrs, flying hours 350 total, 200 on type, 5 in last 90 days.

The aircraft engine failed en route, and the pilot carried out a forced landing into a field. The engine suffered a catastrophic failure due to the magneto drive gear failing, and this in turn affected oil pump operation.

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

CAA Occurrence Ref 04/2759

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

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

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 04/2877

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

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

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 04/3505

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

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

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

CAA Occurrence Ref 04/3930

ZK-SNX, Sonex Ltd Sonex, 29 Dec 04 at 18:00, Taieri Ad. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours 459 total, 107 on type, 25 in last 90 days.

The microlight was taxiing on the runway when the left wheel detached itself from the undercarriage, resulting in damage to the propeller and wing tip. Investigation revealed that the lefthand main landing gear axle weld had failed; it had been working for some time.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 04/4101

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

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

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

CAA Occurrence Ref 05/138

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

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

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

CAA Occurrence Ref 05/263

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

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

Key to abbreviations:

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

Aerospatiale AS 350B
Ariel 1b module three

During a routine boroscope inspection of the gas producer turbine wheel in module three, the reporter found severe sulphidation evident, scaling of the blades, and sections of the leading edges eroded away. Eroded sections exceeded Maintenance Manual in-service limits. The erosion was due to operation in a salt-laden environment and the low frequency of compressor washing. TSI 5305 cycles, TSO 1409 hours.

ATA 7200 CAA Occurrence Ref 05/1861

Bolkow Bo 208 C Junior
Cylinder

The aircraft was 2 NM south of Paraparaumu, when the engine lost significant power and developed rough-running. The pilot landed the aircraft with no further incident. An engineering investigation revealed that the rocker shaft posts had broken off on the number two cylinder.

ATA 8530 CAA Occurrence Ref 05/727

Britten-Norman BN2A-26
Artificial horizon

While in IMC conditions on the ILS approach, the artificial horizon toppled 180 degrees. It then returned and was estimated to be out for around 40 to 50 seconds. It was found defective and replaced.

ATA 3421 CAA Occurrence Ref 05/687

Britten-Norman BN2A-26
Autopilot cable

After reaching top of climb, the pilot could not level the aircraft using the control column or manual trim system. The pilot had to physically overpower the controls to regain control. A precautionary landing was made. On inspection, it was found that an autopilot cable had frayed and jammed in a pulley. An engineering procedure was introduced where the cable would be replaced every 1000 hours.

ATA 2732 CAA Occurrence Ref 05/1955

Cessna 182R
Carburettor

While flying near Waiheke Island the aircraft engine started to run rough. The pilot made a precautionary landing on Waiheke aerodrome. An engineering inspection of the aircraft found that the engine was running over-rich.

ATA 7320 CAA Occurrence Ref 05/2296

Cessna 182R
Rudder cable

The rudder cable was found to not be running in the pulley at the fuselage just aft of the fuel selector. The engineer suspects that this was not correctly fitted at the time of manufacture, as the pulley was not worn at all, unlike the associated left pulley. The cable was not frayed but had cut through the structure. TSI 49 hours, TTIS 940 hours.

ATA 2720 CAA Occurrence Ref 05/667

Cessna U206G
Cylinder hold down nut

During the preflight inspection, the crankcase through-bolt nut was noted to be missing. Inspection found that there was a cracked nut sitting on the engine cooling baffles.

ATA 7200 CAA Occurrence Ref 05/1934

Hughes 369D
Oil pressure and torque lines

When an Aerofilter was being fitted, the torque and oil pressure lines were moved. This resulted in one line (nylon) snapping in two. Further testing of the line found that at this position movement of about 30 to 40 degrees caused the line to snap. Both lines were replaced with lines of new material, as it was presumed the lines were original.

ATA 7200 CAA Occurrence Ref 04/3343

Kawasaki BK117 A-4
Tail rotor gearbox

Metal was found on the tail rotor gearbox chip plug. The gearbox was replaced.

ATA 6520 CAA Occurrence Ref 05/2441

NZ Aerospace CT/4B Airtrainer
Continental engine power section

After rolling inverted for a reverse Cuban, a sudden increase in engine rpm was heard; it was found to be 300 rpm above the red line. The throttle was closed, but initially the rpm didn't decrease. The aircraft levelled off and the oil pressure light illuminated; oil pressure reading was zero; oil temperature remained constant at 70 degrees throughout most of the incident. The aircraft turned back towards the airfield and power was increased to 15 inches.

Slight rough running was heard and felt, so a MAYDAY was declared. Power was increased further to 20 inches, and the rough running worsened. The throttle was closed and the propeller stopped. A successful forced landing was carried out in a paddock.

A bulk strip was carried out. The evidence indicated the counterweight roller retaining plate had fractured initially, with fragments causing piston and cylinder damage. Some steel fragments passed through the oil pump pick-up screen and entered the pump. The loss of oil pressure at this point would have starved the propeller of oil, resulting in an engine overspeed. The loss of oil pressure caused the main and camshaft bearing failures. The cause of the initial roller plate fragmentation was due to excessive wear on the roller and bush, causing the roller to hammer sideways sufficiently to fracture it. Excessive roller wear is consistent with continued throttle movement and rapid engine rpm changes.

TSO 1072 hours, TTIS 6367 hours.

ATA 8520 CAA Occurrence Ref 02/2615

Pacific Aerospace Cresco 08-600

Longeron and frame

The pilot heard a loud bang during the pull-out after a lime sowing run. An engineering investigation revealed frame P/N 08-10037-7 at the instrument bulkhead, was cracked right through on the left hand side from the longeron cut out. The longeron P/N 243019-3L was cracked and totally fractured, initiating from the welded strut P/N 08-10271-4 attachment bolt positions. The welded strut was inspected and found cracked at the bolt attachment positions. The longeron and strut were replaced and a repair carried out on the airframe. AD DCA/CRESCO/8A did refer to this type of failure, but the manufacturer's Maintenance Manual now has a life limitation on the engine mount struts.

ATA 5310 CAA Occurrence Ref 05/376

Pacific Aerospace Cresco 08-600

Front mount

During a 100-hour inspection, the vertical fin aluminium front mount (P/N 243017-2) was found broken. The aircraft had accumulated 3500 hours TIS. Airworthiness Directive DCA/CRESCO/7 now requires installation of a steel fitting. TTIS 3691 hours.

ATA 5500 CAA Occurrence Ref 04/1305

Piper PA-23-250

Fuel control unit

During the climb at approximately 2000 feet, the righthand engine lost all power. The aircraft was landed at the departure aerodrome. An engineering inspection found a defective fuel control unit.

ATA 7320 CAA Occurrence Ref 05/2105

Piper PA-32-260

Oil filter

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

ATA 7920 CAA Occurrence Ref 05/635

Piper PA-34-200T

Number five cylinder push rod

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

ATA 7200 CAA Occurrence Ref 05/537

Piper PA-38-112

Main landing gear axle

The aircraft was landing at West Melton when the lefthand main wheel detached itself from the aircraft. It was discovered that the four bolts attaching the axle to the undercarriage leg had sheared on landing. The engineers suggested replacing the bolts on an annual basis.

ATA 3241 CAA Occurrence Ref 05/1430

PZL Warszawa-Okecie PZL-104 Wilga 35

Ignition leads

The Wilga's engine began to misfire, then got progressively worse, with a loss of power. The pilot made a precautionary landing on the beach. An engineering investigation revealed the ignition leads were faulty. New leads were fitted, and the aircraft was ground run and returned to service. It was considered to be the long-term storage of the engine that had caused a deterioration of the ignition lead insulation.

ATA 8500 CAA Occurrence Ref 05/10

Robin R2120 U

Internal baffling

The operator reported that the muffler internal baffle tube end plug (P/N 56-40-37-010) was found stuck inside the tail pipe. An engineering investigation revealed the perforated baffle tube end plug had broken from inside the muffler and lodged in the tail pipe.

ATA 7820 CAA Occurrence Ref 05/1329

Robinson R22 Beta

Blades

Corrosion was found on both tailrotor blades around the bearings. Corrosion was also detected in bonding on one blade. The tailrotor hub was also found to have corrosion around the bolt holes. The components were replaced.

ATA 6410 CAA Occurrence Ref 05/984

Robinson R44 II

Exhaust collector

The exhaust collector had a hole burned at the junction with number one cylinder. This is the second separate incident that the submitter is aware of, where the collector has become holed while the aircraft is under warranty. TTIS 502 hours.

ATA 7810 CAA Occurrence Ref 05/1582

Tecnam P92S Echo

Main cap bolt

The operator reported that while taxiing for takeoff the main undercarriage collapsed. Investigation revealed a retaining bolt head had failed due to fatigue. It was also determined that significant wear had occurred in the landing gear clamping assembly.

ATA 3210 CAA Occurrence Ref 05/1055

Attitudes, Airmanship, and Accidents

Hazardous attitudes – what role do they play?
Situational factors in aircraft accidents

Circle these dates on your calendar for the next series of CAA AvKiwi Safety Seminars. *Attitudes, Airmanship, and Accidents* is an interactive seminar that focuses on the roles that pilot attitudes and situational factors play in aircraft accidents.

The seminars will be presented by Jim Rankin, RNZAF Instructor, or Carlton Campbell, CAA Training Standards Development Officer.

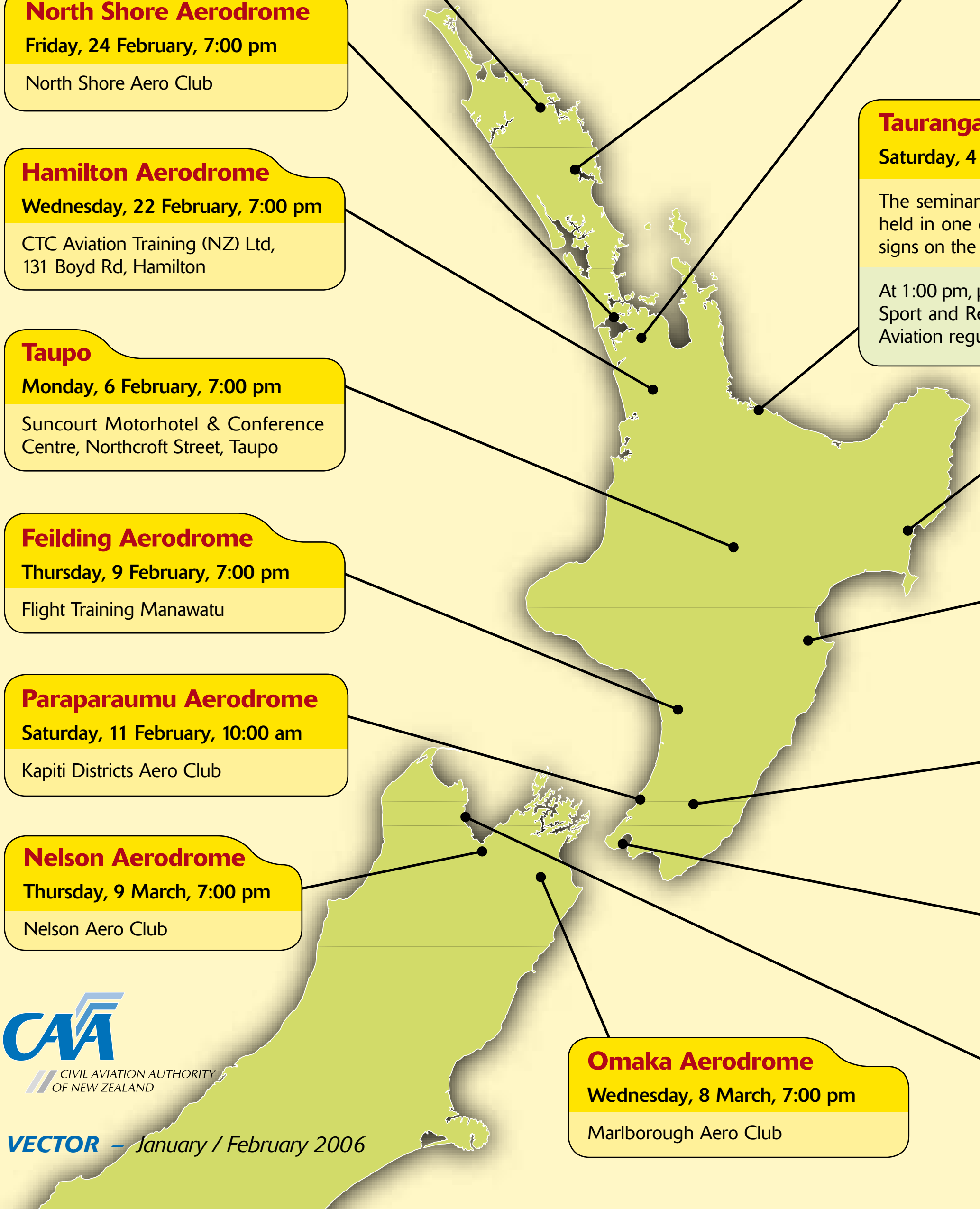
Spot Prizes

There will be a spot prize given away at each seminar – a full set of the current VNCs **or** an *AIP New Zealand Vol 4*, with a 12-month amendment subscription (compliments of Airways New Zealand). Check out the CAA web site for further information, www.caa.govt.nz, see "Safety information – Seminars".

Seminar Schedule

(duration approximately 2 hours

More South Island venues will be announced in the next issue of *Vector*.)



Kerikeri Aerodrome
Sunday, 26 February, 1:00 pm
Bay of Islands Aero Club

Whangarei Aerodrome
Saturday, 25 February, 2:00 pm
Northland Districts Aero Club

North Shore Aerodrome
Friday, 24 February, 7:00 pm
North Shore Aero Club

Ardmore Aerodrome
Thursday, 23 February, 7:00 pm
ATC Cadet Hall, (opposite Ardmore Flying School)

Hamilton Aerodrome
Wednesday, 22 February, 7:00 pm
CTC Aviation Training (NZ) Ltd, 131 Boyd Rd, Hamilton

Tauranga Aerodrome
Saturday, 4 February, 1:30 pm
The seminar is during the SportAvex fly-in, and will be held in one of the hangars on the airfield. There will be signs on the day indicating which hangar.
At 1:00 pm, prior to the AvKiwi, Rex Kenny, CAA Manager Sport and Recreation will be giving an update on Sport Aviation regulation, with time for questions and answers.

Taupo
Monday, 6 February, 7:00 pm
Suncourt Motorhotel & Conference Centre, Northcroft Street, Taupo

Gisborne Aerodrome
Tuesday, 7 February, 7:00 pm
Gisborne Aero Club

Feilding Aerodrome
Thursday, 9 February, 7:00 pm
Flight Training Manawatu

Hastings Aerodrome
Wednesday, 8 February, 7:00 pm
Hawkes Bay & East Coast Aero Club

Paraparaumu Aerodrome
Saturday, 11 February, 10:00 am
Kapiti Districts Aero Club

Masterton Aerodrome
Thursday, 16 March, 7:00 pm
ATC Building

Nelson Aerodrome
Thursday, 9 March, 7:00 pm
Nelson Aero Club

Wellington Aerodrome
Wednesday, 15 March, 7:00 pm
Wellington Aero Club

Omaka Aerodrome
Wednesday, 8 March, 7:00 pm
Marlborough Aero Club

Motueka Aerodrome
Friday, 10 March, 10:00 am
Nelson Aviation College

CIVIL AVIATION AUTHORITY OF NEW ZEALAND