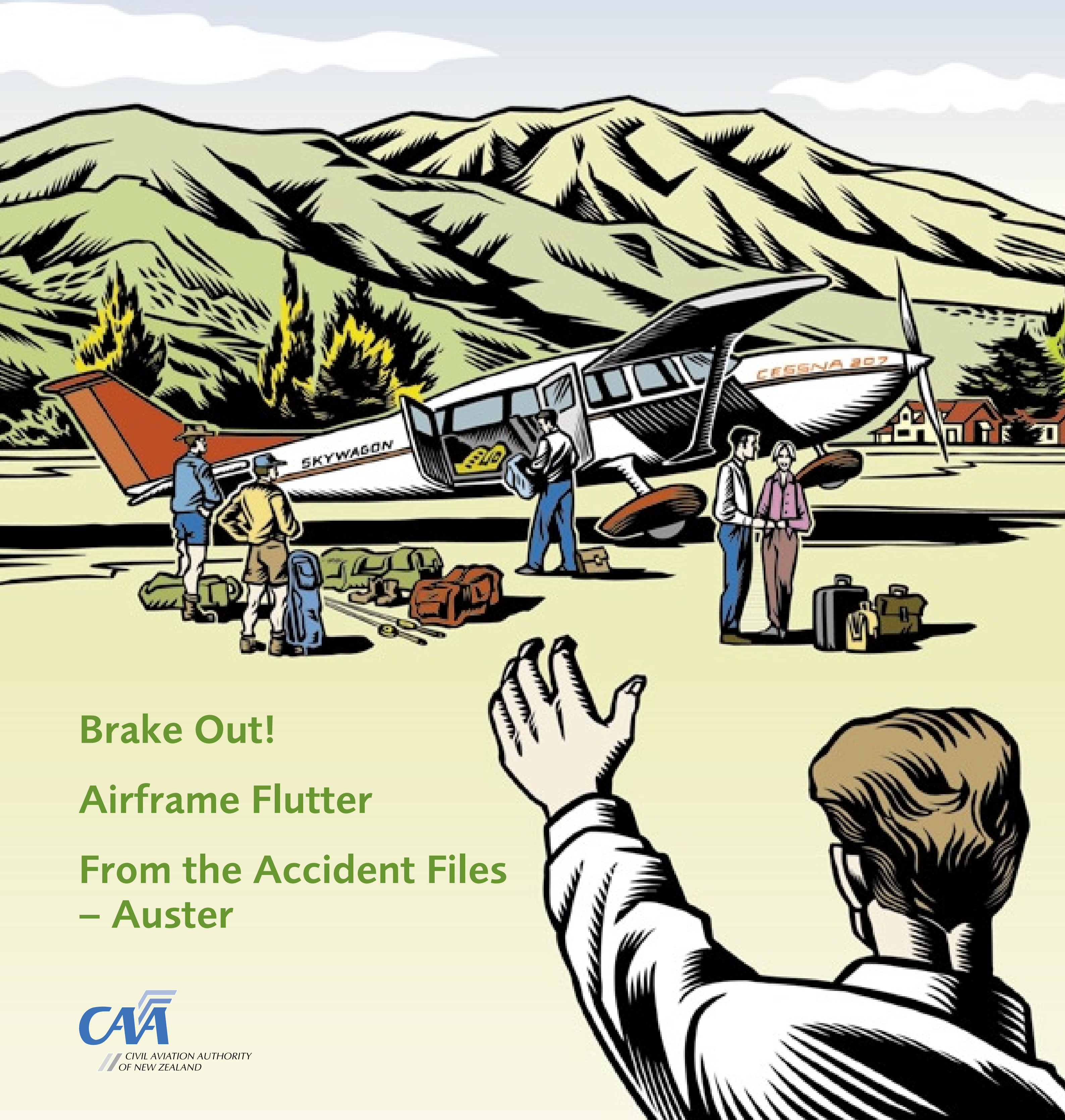
November / December 2003

VECTOR

Pointing to Safer Aviation

Overloaded!



Brake Out!

Airframe Flutter

From the Accident Files – Auster

CAA
CIVIL AVIATION AUTHORITY
OF NEW ZEALAND

VECTOR

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Cover Illustration: Jeremy Bennet

Overloaded!

– An inexperienced pilot risks everything to keep his job –

*An article adapted and reproduced from **Flight Safety Australia**, May-June 2002.*

Introduction

In December 1977, my flying experience totalled just over 1,600 hours. I'd logged nearly 900 hours as an instructor and I'd just gained my first all-weather multi-engine charter job.

I was on top of the world, I had a great job and, like many young pilots, I thought I knew everything. I was proved wrong early on New Year's Day 1978.

The company liked to 'keep its costs down' when endorsing new pilots, and I received minimal training on the company's two main aircraft types, the Piper Chieftain and Aerostar.

> *"For some reason, the economics seemed very important to me and I didn't want to lose my job over a few newspapers."*

The Chieftain was the largest aircraft at our base, and new pilots didn't get to fly it very often. I flew one sector in the Chieftain in my first month with the company – a daylight single-pilot ferry flight with no passengers.

My second chance to fly the Chieftain came several weeks later. Due to a predictable shortage of senior pilots on New Year's Eve, I was asked to fill in on that night's paper run. That involved flying to Paraburdoo, picking up several piles of newspapers from a MacRobertson Miller Airlines (MMA) Fokker F28, delivering the papers to Newman, and then flying home.

Weighing the Options

The flight to Paraburdoo was uneventful. My problems started when I discovered the papers I was supposed to pick up weighed 1,050 kg, 150 kg more than I was expecting.

My fuel load and weight calculations were based on 900 kg of payload. Anything more than that was going to put me over maximum takeoff weight. The way I saw it I had three choices:

- Do two sectors between Paraburdoo and Newman. (This would mean calling out a refueller early on New Year's morning.)
- Leave 150 kg of papers behind.
- Overload the aircraft. (Calling the boss or any other company pilot at this time on New Year's morning was not really an option.)

I considered the first option for a time but doubted whether the company would be paid for the extra hour-and-a-half of flying and the refueller callout charges. I also wondered if I would be able to raise the refueller in the early hours of New Year's morning.

For some reason, the economics seemed very important to me and I didn't want to lose my job over a few newspapers. The Chieftain had great performance and could surely handle a bit extra. I decided to throw on the extra papers.

Use of Flap

When I did my endorsement, I was told that flap can be used for takeoff, though it is not normally done. One such takeoff was demonstrated and I remember being impressed by the aircraft's performance. It should have occurred to me that the endorsement was done with zero payload and just two people on board, so impressive performance could be expected in those takeoff configurations.

I have not flown a Chieftain for many years now, but if I were asked I would say you should **never** use flap for takeoff. The marginal increase in lift is countered by a massive increase in drag. The only possible exception might be short-field operations when the aircraft is lightly loaded.

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Takeoff and Climb

Taxiing out I realised I was in a different aircraft to the lightweight Chieftain I had become used to.

Paraburdoo airport is more than 1,000 feet amsl, surrounded by hills, and located about six nautical miles out of town. The temperature at this time of year would have been above 30°C, even at this early hour of the morning. There was a gentle breeze, and the weather was clear and fine. The Minimum Sector Altitude (MSA) for the Paraburdoo–Newman track was 5,100 feet amsl.

I had flown out of Paraburdoo many times in the previous month, but only a couple of times at night, and only once to the east on the Paraburdoo–Newman track – and that was in clear daylight conditions.

I decided to depart on Runway 24 and stay within the airport circling area until I'd climbed to the MSA. Runway 24 requires righthand circuits and is oriented toward the township of Paraburdoo, but the lights of the town cannot be seen until after takeoff, as there is a small range of hills between the airport and the township.

I set the flaps at the maximum allowed takeoff setting and completed a comprehensive pre-takeoff checklist. There was no rush as it was 02:30 in the morning, and all I had was freight on board. All seemed fine, so I set maximum thrust for takeoff and released the brakes.

The acceleration was considerably less than expected, and I briefly considered aborting the takeoff. Surely, I rationalised, if F28s can takeoff on the same runway it must be long enough for me.

I rotated near the end of the runway at about 100 knots, which was a slower IAS than normal, and quickly realised something was very wrong. The vertical speed indicator (VSI) showed a sluggish 100 ft/min rate of climb, and there was not much improvement after gear retraction.

It was a pitch-black night, and I still couldn't see the lights of the township. The airspeed was not yet to blue line, and I was starting to worry. I knew there was some rising terrain ahead, so I commenced a gentle right turn – the rate of climb decreased (obviously), but I felt it was necessary – as I should have been able to see the lights of the township by now.

For a moment I thought I'd suffered an engine failure. I forced myself to take both feet off the rudder pedals – everything seemed okay.

I had no idea what was wrong. There were no visual cues, so I was totally reliant on instruments. I kept the turn going and eventually sighted the runway lights – I was very low.

I raised the flaps by a couple of degrees, and the rate of climb increased immediately. As I slowly raised them the rest of the way the aircraft accelerated and began to settle into an acceptable rate of climb.

More Surprises

I was soon climbing past the MSA on track for Newman. With surely the worst part of the flight over, I engaged the autopilot and reached behind me to get a paper and relax for the next 30 minutes or so until descent. As I turned I noticed, to my horror, that the exhaust pipe on the right-hand engine was glowing bright red. I instantly shifted my gaze to the engine instruments. Incredibly there were no abnormal indications.

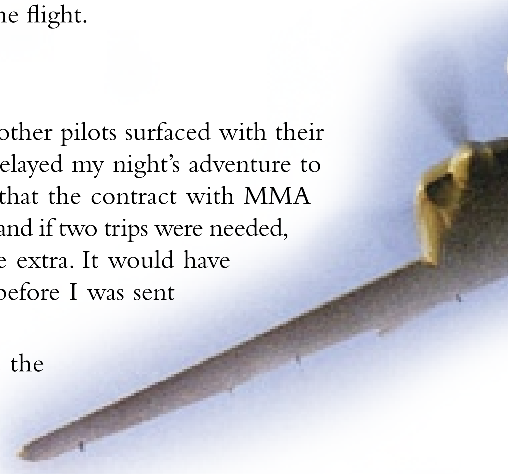
I did not want to shut the engine down. I had no idea what an overweight Chieftain would do on one engine in ISA+15 conditions and there was certainly nowhere to land before Newman. The thought of shutting down the right engine was immediately dismissed when I saw that the exhaust on the left engine was also glowing red.

I richened the mixture of both engines and opened the cowl flaps, despite the fact that the cylinder head temperatures were normal.

For the remainder of the flight my eyes hardly left the engine instruments. To my great relief the engines continued operating normally for the rest of the flight.

Conclusion

Later that day, when the other pilots surfaced with their New Year's hangovers, I relayed my night's adventure to them. I soon discovered that the contract with MMA was for 900 kg of payload and if two trips were needed, they would have paid the extra. It would have been nice to know that before I was sent on my first paper run.



I was also informed that the exhaust pipes always glow red on Chieftains. It's perfectly normal, though not apparent in daylight. Neither this, nor the fact that flaps should not be used on heavy take offs, were covered in my training.

Notwithstanding that, it was my decision to push myself, and the aircraft, beyond safe limits. I had very little experience in the aircraft, and it was fortunate that I survived to learn from the mistake.

I actually believe that if I had been 150 kg lighter (that is, at maximum takeoff weight), I would have had a similar story to tell. A fully loaded aircraft is different to a lightly loaded one and most definitely should be included in conversion training.

New Year's Day, 1978, is the only day in my 28-year aviation career that I have actually feared for my life. I have averaged over 500 flying hours a year since I learnt to fly in 1974 and have flown aircraft ranging from single-seat Pawnees to 400-plus seat Boeing 747s. I still learn something new about my trade each time I go flying.

Analysis – Training, Supervision and Communication

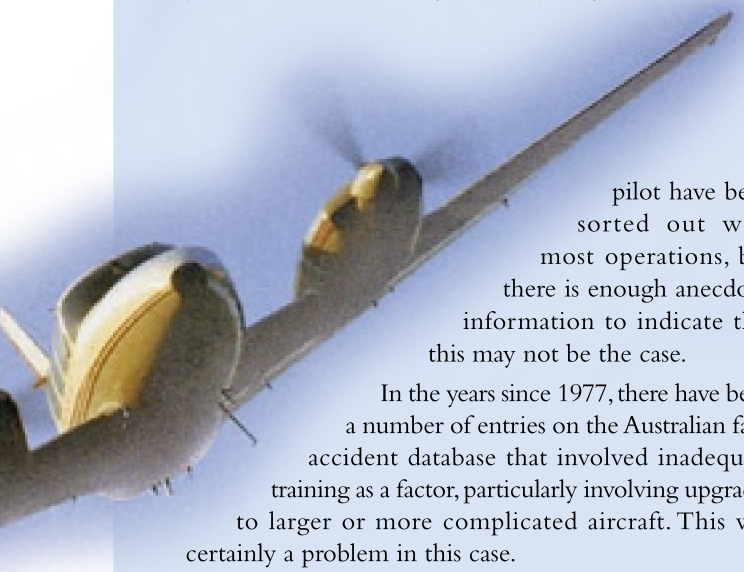
by Bruce Byron

Bruce Byron is an airline transport pilot and chairman of the Australian Aviation Safety Forum. He has recently been appointed CEO of the Australian Civil Aviation Safety Authority – CASA.

This article presents a number of lessons, but not only for the pilot. There are clearly some issues of performance, planning and handling that this pilot, with the benefit of experience, has been able to analyse and provide us with appropriate solutions.

However, the article also raises issues that relate to the operation, including the training pilot, chief pilot and the owner of the business.

A quarter of century later, we would hope that the organisational or systems issues that acted against this young pilot have been sorted out with most operations, but there is enough anecdotal information to indicate that this may not be the case.



In the years since 1977, there have been a number of entries on the Australian fatal accident database that involved inadequate training as a factor, particularly involving upgrades to larger or more complicated aircraft. This was certainly a problem in this case.

The pilot informs us that he received "minimal training" and that the training didn't provide him with all the information needed to operate safely.

The provision of adequate training was clearly the responsibility of the operator (including the chief pilot and training pilot), although with 1,600 hours of experience, the pilot should have had a good idea of what to expect in a new type endorsement.

Operators today should detail, in their Operations Manual, how they intend to conduct training.

New Zealand Type Rating Requirements

In New Zealand, the CAA type rating minimum experience requirements for an initial issue on a multi-engine aeroplane not exceeding 5700 kg, are five flight hours and one hour for each subsequent aircraft type. The flight time must be dual instruction, and where the aircraft is to be used on air transport operations, a course of approved training should be completed. See also AC 61-1.10.

Remove the Uncertainty

The manufacturer's manual will provide sound advice regarding takeoff configuration in various weight and altitude/temperature conditions. In this case it would most certainly have pointed our pilot in the direction of a no-flap takeoff.

As years of experience have shown this pilot, flap used during takeoff assists in getting airborne, but once in the air the benefits of lift are not as great as the costs in drag.

In simple terms, for most conventional aircraft, the lift/drag ratio of a wing suffers with flap selected and as such is not as efficient as a clean wing.

In practical terms, provided the aircraft is flown at the recommended climb speed, rate of climb will be better with no flap than with flap selected.

That information would have been of great comfort to this pilot prior to takeoff and would have avoided the uncertainty of that initial climb.

The manufacturer's manual should also provide some information regarding climb performance after takeoff in the weight/altitude/temperature circumstances, **but it will not tell you** about overload performance.

The information should be available, and it removes those tense moments in flight with the pilot thinking "I wonder if it will make it?" Combined with manufacturer's data, the thinking pilot can then get an idea of how best to achieve minimum safe altitude.

Anything to remove the uncertainty!

Supervision and Communication

The article also raises other issues that fall cleanly in the operator's court, notably supervision and communication. Chief pilots are there to provide supervision to other people in the operation. That's okay in theory, but what if the chief pilot makes it clear to young pilots that he or she does not want to be called at two in the morning?

Given that no young pilot wants to incur the wrath of a chief pilot and risk losing their job, it's an unfair but realistic question. The 'clinical' answer is that the operator should provide the pilot with all the information – including, in this case, the fact that 900 kg was the contract load.

But what if the operator is not that talkative and believes the young ones should 'sort it out for themselves'? The best advice is to acknowledge that a lack of communication and provision of standard procedures is a problem, then try and build some safeguards. Think of the possible variables to the operation, and ask a lot of 'what ifs' when the chief pilot is around. Such a tactic isn't guaranteed to capture all possibilities, but it can certainly help.

But what if you have done all that and you are still stuck out on the ramp at two in the morning, with an operational issue that you can't resolve because you haven't been given the information. Easy! **Pick up the phone and ring the chief pilot**. His or her lack of sleep isn't as important as your safety, the safety of the aircraft, or your long-term career. It might even change the way the operation is run. ■

Out of Gas!

The Incident

The pilot had refuelled the Walter-powered Fletcher in preparation for a busy day's tandem parachute jump flying.

Later in the day, after completing a substantial number of tandem-jump flights, the aircraft experienced an engine power loss while climbing through 5500 feet amsl. The pilot instructed the parachutists to jump out, which they accomplished safely. The engine stopped approximately one minute later, whereupon the pilot declared an emergency and proceeded to carry out a forced landing onto a nearby aerodrome. This was accomplished successfully.

The engine had failed due to fuel exhaustion.

The high-flow fuel pump system used to refuel the incident aircraft. This system is capable of delivering fuel at a significantly higher rate than the standard fuel pumps found at most aerodromes.

Analysis

Investigation revealed that the aircraft became airborne without sufficient fuel because the pilot inadvertently under-fuelled it. Refuelling had been accomplished via the aircraft's outboard tanks, using a high-flow fuel pump situated at the privately owned airstrip.

This particular model of Fletcher (PAC FU24-950 with a Walter M601D turbine engine) has two interconnected fuel tanks in each wing, each filler neck being located on the outer-most tank. During refuelling, fuel can take some time to transfer from the outboard to the inboard tanks because of the diameter of the interconnecting tubes. A sight glass is located above each inboard tank to allow the pilot to confirm that the tanks are full and have in fact equalised.

At normal fuel pump flow rates, there is usually sufficient time for the tanks to equalise at the same rate as the fuel is being pumped in. With a high-flow fuel pump (such as was used to refuel this aircraft), the tanks can not equalise at the same rate as the fuel is being pumped in. The outboard tanks will consequently fill before the inboards. This can lead the person refuelling to believe that the inboard tanks are also full.

The pilot of the incident aircraft had not been made aware of this problem during his recent type rating training. He therefore assumed that the tanks were full (he sighted the outboard tanks as being full so did not see the need to dip them) and calculated the aircraft's safe endurance accordingly.

Since the operation did not require the pilot to get out of the aircraft between each flight, he was not in the habit of dipping the tanks or checking the sight-glass between each refuelling stop. Because the aircraft fuel gauges were unreliable, endurance was calculated using the cockpit fuel totaliser. This value was of course erroneous. The fuel totaliser showed that there was sufficient fuel onboard for several more flights at the time of the engine failure.

Lesson Learnt

This was a serious incident that could have easily resulted in a bad accident. There are a number of safety lessons that can be learnt from it. Refer to the Fuel Management GAP for additional advice on refuelling:

- Pilots and operators of aircraft with interconnected fuel tanks need to be aware that fuel transfer problems can develop when refuelling with high-flow fuel pumps. We suggest that the fuel be delivered using a medium-flow type fuel pump, or that each tank be given time to settle before being topped up, ie, fuel one side then come back to top it up after having fuelled the other side.
- Avoid refuelling the aircraft when parked on a slope.
- Always dip the tanks (or check other fuel quantity indicators like the glass sighter) to confirm you have the fuel on board that you think you have. This can be done sometime later, after the fuel has settled, along with a fuel drain.
- Make sure your aircraft's fuel gauges are serviceable, and refer to them.
- For prolonged operations (like parachute jumping or ag-flying where the engine is kept running) where the fuel endurance remaining is determined by deducting a known trip or burn rate, consider occasionally shutting down and dipping the tanks. There is no substitute for knowing exactly how much fuel is in the tanks, as this incident and many other similar accidents have illustrated.
- As a general rule, avoid operations with less than one quarter tanks. For many aircraft types, prolonged climbing, descending, or unbalanced flight, with less than this quantity of fuel, can result in fuel exhaustion and engine failure. Always ensure that you plan to land with at least 30 minutes reserve (taking into account the unusable fuel) on board on every flight. ■

Surveys of our readership have shown that one of the most popular features in *Vector* is a Share-Your-Experience type of article written by a pilot (or anyone else involved in aviation). Other safety-focused magazines and journals often run this type of article as well, some under the heading "I Learnt About Flying From That". There are a number of possible reasons why readers the world over find such articles to be valuable:

- They relate to a real-life event, and are not just some waffly theory.
- It is often easy for pilots to picture themselves in the same situation.
- There is a degree of sometimes ghoulish voyeurism in all of us that makes reading about the problems others have faced interesting (why else would people watch soap operas or so-called 'Reality TV'?)
- They usually carry a safety message that we can all readily understand and remember.

Vector would like to include more of this type of article, so we have decided to re-brand the "Share Your Experience" series to the universal catch phrase "I Learnt About Flying From That". We hope that this will encourage more readers to submit their experiences for publication. It is appreciated, however, that many people who have had an interesting experience either don't have the time to write an article, or don't feel that they have the literary skills to do so.

The solution? If you have had an experience that you think would make the basis for a good article, but haven't got the time or inclination to do so, then contact *Vector* (see below). One of the editors will then contact you, arrange an interview, and write the story for you. The draft article will then be returned to you for comment or modification before it is published.

Some points to note:

The article can be anonymous and de-identified if that is what you prefer – the only persons who need to know your identity are the *Vector* editors who write and process your story. They will not pass it to any other CAA employee.

You will have the final say on what is published, and if you don't like the article it won't be published at all.

Vector will only write and publish an article if there is a valid flight safety message that can be made from your experience.

Note also that *Vector* staff will be proactive and may approach people about articles.

If you do have a story you would like to relate, then send it to: Bill Sommer, Managing Editor, Communications and Safety Education Unit, CAA, P O Box 31 441, Lower Hutt or email sommerb@caa.govt.nz.

We look forward to reading about your experiences! ■

Flight Plan Overdues Update

We continue our feedback on the campaign to reduce the number of flight plans going overdue.

VFR Overdues Statistics

Total plans filed and percentage overdue

2003	May	Jun	Jul	Aug	Sep	Oct
Number filed	1665	1468	1872	1661	1513	2555
Number overdue	156	119	163	133	148	216
Percentage overdue	9.4%	8.1%	8.7%	8%	9.8%	8.5%

September saw an upward trend nearly to the 10 percent mark, which was the sort of result prevalent in the early months of this year. October was slightly better, but not encouraging.

This is a concern. We are moving in to the busy summer flying period. We need to keep focused on improving these statistics.

Please make a conscious sustained effort to **update your SARTIME** as required and to **terminate your flight plan** at the end of the flight.

Make full use of the reminder posters and stickers advertised in the last issue. They are available from your local CAA Field Safety Adviser or flight training organisation. The stickers are available in two sizes and feature the message "Amend SARTIME or Terminate Flight Plan". The larger one is intended for locations that pilots are likely to frequent after a flight, eg, toilet, kitchen, reception area or hangar. The smaller one for individual use can be placed on items like your AIP, flight-log clipboard, aircraft dashboard or door. Both stickers are of the non-permanent variety so will not damage the surface underneath.

Instructors – why not make this topic a feature for your next safety meeting or newsletter safety column?

Let's get back on the reduction track and aim for under 8% in the next two months. Safe (and considerate) flying! ■

Mt Tarawera MBZ Procedures

Looking southwest towards Mt Tarawera.

The Rotorua Airspace Users Group reports that local operators are having problems with itinerant pilots not adhering to standard procedures when operating within the Mt Tarawera 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.
- A lack of awareness of the hazard posed by Black Backed Gulls soaring the upper slopes of the mountain over summer. Large populations often soar in vertical columns up to 1000 feet above the mountain.

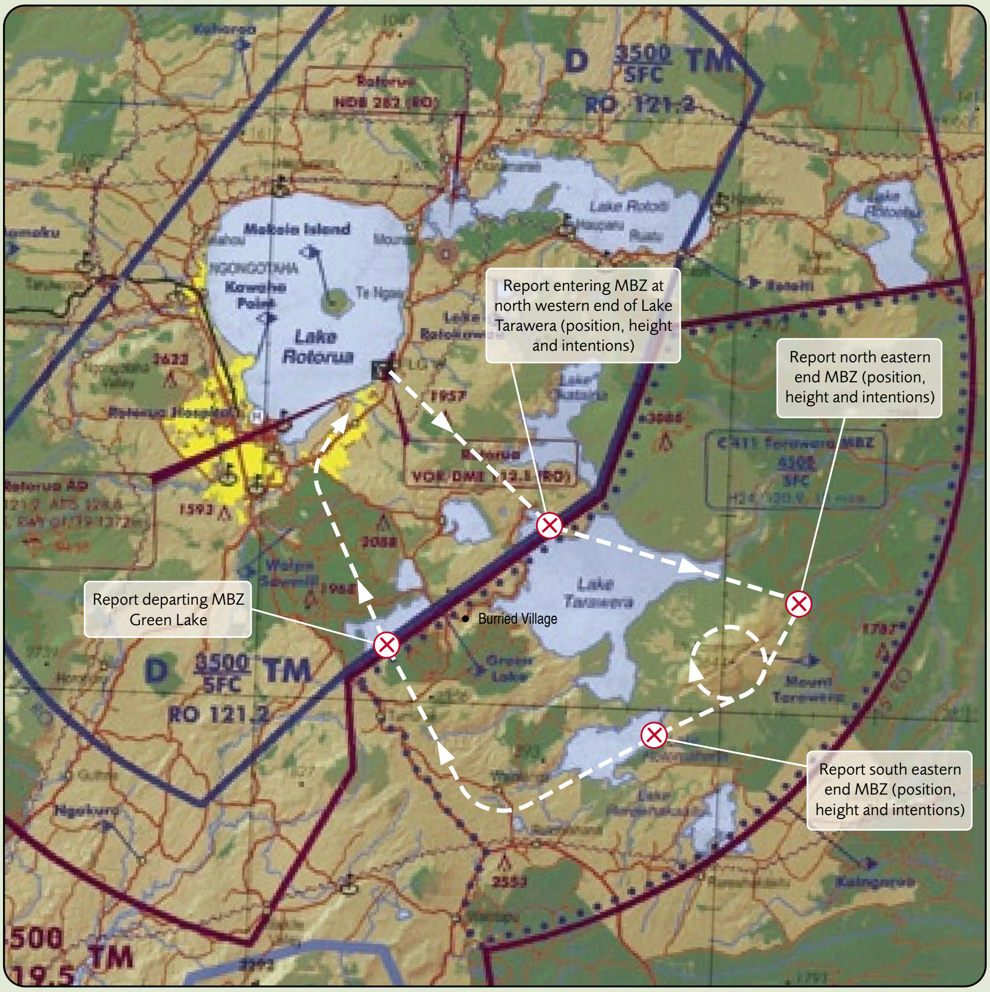
These problems appear to be exacerbated by the limited amount of information promulgated in the AIP. Also, there are few prominent geographical features to the north and east of Mount Tarawera to assist pilots with accurate position reporting.

Things to note when operating in the area:

- Position and intention reports on 120.9 MHz are mandatory on entry, exit, and every 15 minutes when operating within the Tarawera MBZ. The frequency of reports should be increased when traffic densities are high. Landing and anti-collision lights must be on. Note: Where there are limited geographical features, position reports should state a bearing and distance from the nearest prominent feature (preferably one that is named on the VNC). If in doubt as to the whereabouts of other traffic or a procedure, confirm the details with a call on 120.9 MHz.
- Local tourist operators fly in a clockwise direction around the mountain. See the accompanying map for route details.
- Maintain a vigilant lookout for birds.
- Avoid flying in the area when there is a cloud base or reduced visibility obscuring the mountain tops.

To minimise the risk of a mid-air collision, pilots who intend operating in the Mt Tarawera area need to take the time to find out what the local operating procedures are **before** going there. The information in this article will help, but we suggest talking to a pilot with experience of flying in the area to supplement this information.

The same advice 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.

This is the first in a new series of articles that will consider recent aircraft accidents in New Zealand. The aim is to amplify the safety messages that can be derived from the accident. The official accident report or brief can be found on the CAA web site at **www.caa.govt.nz** under "Accidents & incidents"

Auster Crash

ZK–APO crashed in the Lindis Valley at the southern end of the MacKenzie Basin on 30 June 2002, killing both pilots. The aircraft was on a flight from Hokitika to Twizel, then on to Alexandra, the home base of the aircraft, when the accident occurred. Earlier in the day the pilots had flown from Takaka to Motueka, after attending a fly-in at Takaka. At Motueka they refueled the aircraft and made a cellphone call to a friend at Fox Glacier, who advised that the weather there was good. They then flew to Hokitika, where they refueled the aircraft from fuel containers they carried in the aircraft.

The aircraft was observed to take off from Hokitika and later overfly Bruce Bay on the West Coast. A farmer in the Twizel area heard an aircraft, presumed to be APO, flying overhead above an overcast cloud layer. The cloud precluded a landing at Twizel. The pilots were apparently trying to reach Alexandra when the aircraft ran out of fuel and crashed.

Refer to the full accident report (Occurrence No 02/2023) on the CAA web site for additional information.

As the first photograph shows, the aircraft impacted fairly high up a mountain slope. This tends to indicate that the aircraft was still in cloud when impact occurred. If the pilots were in clear air they could have landed in the valley below, in a possibly survivable arrival.

The thought of being caught above cloud in mountainous terrain while running out of fuel must be fairly high up the nightmare scale for most pilots. How did two experienced pilots find themselves in that situation, and what can you do to make sure the same thing doesn't happen to you?

Pre-flight Planning

Weather and NOTAMs

It does not appear that the pilots obtained any sort of weather or NOTAM briefing before or during the flight, apart from the phone call to Fox Glacier. A fax-on-demand weather briefing was available at Motueka, which would have told them that weather conditions in the lower South Island were deteriorating and not conducive to VFR flight across the mountains. While the weather on the West Coast was suitable for VFR, once they crossed the main divide the basins and valleys were full of forecast low cloud.

This illustrates why it is so important to obtain up-to-date forecasts for the whole of your planned route – no matter how often you have flown it. Using services such as IFIS, weather information is available **free**. By all means phone trusted persons at destination or en-route stops to check weather conditions ahead, but this should be **as well as,** and **not instead of,** proper forecasts.

VFR Flight Plans

The pilots did not file a flight plan, nor did they advise anyone of their specific intentions. Because of this, their disappearance was not reported for two days. It took a further four days to find the aircraft. This particular accident was not survivable, so search time was not relevant.

Continued over …

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If the pilots had survived, however, then the two days before the search started could have made the difference between life and death.

File a flight plan no matter how well you know the route. It costs about the same as five minutes flying in a typical light aircraft, but it could save your life. If you don't file a plan, then at least make sure that you have let someone know of your specific intentions, and what time they should alert authorities if you don't turn up as planned. These days, many flight-training organisations have their own flight-following systems in place, which should be utilised in addition to the Airways system.

Fuel Planning

At the typical cruise speed of an Auster (about 83 knots) the safe endurance is between 1 hour 15 minutes and 1 hour 30 minutes, with the mandatory 30-minute reserve. This equates to a still-air range of between 103 and 124 NM. The distance from Hokitika to Twizel via Bruce Bay is 137 NM, thus even before they took off they could have expected to eat into the requisite reserve. The pilots had already flown a 130-NM leg from Motueka to Hokitika, so this was not the first time they had planned so tightly.

There was no need to eat into the fuel reserves. The pilots were topping up the aircraft fuel tank from containers of MOGAS they carried with them. Between Motueka and Hokitika they could have landed at Murchison, Westport or Greymouth to top up. Between Hokitika and Twizel the options were more limited, but they could have included Franz Joseph, or a slightly longer flight via Haast.

Note: Carriage of fuel in such containers is not a practice that we would recommend. Even empty containers can provide a potential problem with volatile fumes. It is acknowledged, however, that a number of aircraft use MOGAS, and given the lack of airfield fuel pumps that provide MOGAS, pilots of such aircraft often resort to carrying containers that they can fill at the local service station.

As well as planning to fly to the limits of the fuel available, it appears that the pilots had probably not considered a Point of No Return. By the time they crossed the main divide, they were already committed to continuing on. This subject has been fully covered in a previous article in the July/August 2003 edition of *Vector*.

Use of GPS

The pilots were apparently navigating by sole reference to GPS. Up-to-date maps were available in the aircraft, but they do not appear to have been used. The pilots may not have attempted to fly to Twizel over the ranges and eventually over cloud, if they did not have the GPS available.

GPS is a wonderful tool, and it makes your flying more accurate and efficient, but remember **never** go **anywhere** with GPS that you **wouldn't** go without it.

Summary

This flight started off as a trip home in good weather after a nice weekend away. The tragic ending could have been avoided with a bit more planning and preparation. The aircraft was being flown to the limit of its fuel endurance, over inhospitable terrain, and then cloud, without obtaining any form of weather information about the destination – a sure recipe for disaster. ■

Brake Out!

Readers are encouraged to share their aviation experiences in order to alert others to the potential pitfalls. Please send you experiences to:

Bill Sommer, Managing Editor, Communications and Safety Education Unit, CAA, P O Box 31 441, Lower Hutt or email sommerb@caa.govt.nz.

Note: We will only publish an article if it contains a valid flight safety message. The article can be anonymous and de-identified if you prefer – you will have the final say on what is published. We can help you write the article if required.

The (Non) Event

This little story is in the category, "I learned something more about my aircraft from this!" Fortunately my partner and I are pretty good about systematically using the standard Piper Cherokee Warrior checklist with our aircraft, and this includes the brake check after start and when starting taxiing. On the occasion that prompted this story, the right-side brake was just not there. A couple of quick toe-brake stokes had no effect. There was 'no one at home'.

Action

Well, that put an end to that flight. It was shutdown time, and the investigation began.

The hydraulic fluid reservoir was full to the required level. Inspection of the slave cylinder on both disc brakes revealed no loss of fluid, and no staining. Upside-down-and-under-the-dash inspections did not reveal any leaks on the toe-brake actuating cylinders, nor the handbrake cylinder. Although, there was a hint of hydraulic fluid, though not recent, on one toe-brake cylinder… there are four. Hmmmm…a bit of a mystery.

Retesting the brakes in the hangar found still no pressure on the righthand toe-brakes. Over about half an hour, pressure on the handbrake had dissipated. It was time for a serious talk with our engineer.

Engineer Expertise

Engineering intervention started with the one toe-brake cylinder that showed a hint of leaking. Now these are not easy to access on a Warrior. It was a case of thinking 'here we go, this is going take a good many hours to remove each cylinder, check, re-kit, replace, and bleed. Oh well, 'if you own a plane…accept the maintenance with a smile and a suitably funded bank account.'

It was hard to say definitively that the first toe-brake cylinder had worn O-rings or seals. By engineering judgement all looked serviceable. However, seals and rings were replaced and the unit refitted.

All is Revealed

A good decision was made then, to test before the removal of the next toe-brake cylinder. The bleed valve opened and the righthand toe-brake pumped, but there was minimal flow and no pressure (resistance). Next step was to remove the bleed valve from the disc brake unit and clean the components. Surprise, surprise…we started to get some flow, but not of anything resembling quality aviation hydraulic fluid. It was a brown to green to golden coloured fluid. It was not a 'healthy' red typical of aviation hydraulic fluid.

The diagnosis was that it was 'old' hydraulic fluid that had absorbed moisture and contaminants that had accumulated in the toe-brake cylinders, thus losing its incompressibility. The engineer's view was that it had affected the operation of the original ineffective cylinder, and probably aspects of the whole system.

Remedial Work

The next obvious step was to completely drain and flush through the whole system and replace the hydraulic fluids completely. Once done and bled, the toe and handbrake system was back in operation fully, with a firm 'feel' probably not experienced in quite some time!

What do Manufacturers Say?

Does the manufacturer's service manual require the regular replacement of the hydraulic fluids? The answer seems to be 'No'. I can find no complete hydraulic fluid replacement as a scheduled maintenance item. A search of a Cessna 172 manual (another common GA aircraft) was likewise silent on this subject. But a search of two Toyota car manuals and a Mitsubishi car manual found hydraulic fluid replacement intervals specified. True, these car manuals are more recent than the 1970-vintage aircraft manuals.

What does the FAA Say?

The FAA Advisory Circular AC 43.13-1B/2a on "Aircraft Inspection, Repair and Alterations" remarks that hydraulic system maintenance should be performed in accordance with the aircraft manufacturer's instructions and servicing at the intervals specified. It advises on fluid identification checking methods and contamination control. There is advice on troubleshooting for various conditions, but actual fluid quality is not explicitly mentioned. Maybe it is assumed that the shop-floor practice of 'normal colour' checking will catch a deterioration of actual fluid quality.

What do Engineers Think?

Discussing this with CAA engineering staff, they suggested that GA workshop experience is for hydraulic fluid to be replaced whenever the colour is no longer 'normal'.

By and large this seems satisfactory, because the hydraulic fluids may get completely replaced in the normal course of brake disc and pad replacement, at a major rebuild, or when there is major brake overhaul following a system problem becoming evident.

But, if there has been no obvious problem evident, then we should not overlook the chance that this deteriorating fluid may be in the system a very long time. It can accumulate and – as Murphy has it – cause the brakes to fail at the worst time. Landing on a short vector? Murphy would just love that! Manoeuvring on the ground amongst other aircraft? Try telling the other owners it was Murphy's fault!

My Recommendation

Now it may be naïve in engineering terms, but as aircraft owners we think there is a place for the regular inspection and periodic complete replacement of GA aircraft hydraulic brake fluids. We've had our engineer make a detailed aircraft maintenance log entry with a view to complete fluid replacement in five years. The time do this is minimal, the cost small, and the preventive savings considerable on an embarrassing failure to stop the aircraft. The insurance excess on a minor ding to our aircraft is more than an hour or two on a maintenance workshop account. ■

Ross St. George
CAA Field Safety Adviser
Palmerston North
October 2003

Our thanks to Bob Jelley, FSA (Maintenance), CAA, for his helpful comments.

Airframe Flutter

In a previous article in the "Ways to Hurt Your Aircraft" series, the subject of airframe flutter was mentioned, but there was insufficient space to discuss it in detail. This articles describes what flutter is, ways to avoid it, and what to do if it is encountered.

What is Airframe Flutter?

Most pilots should be familiar with the fact that aerodynamic loads can bend or twist parts of an aircraft's airframe. If you pull some G, in most aircraft you can actually see the wing bend slightly. If you watch a glider in flight, you will see that the wingtips can bend up a significant amount when the glider is in flight, and this becomes even more pronounced when the glider hits a thermal or rolls into a turn. It would be almost impossible, not to mention very expensive and very heavy, to design an airframe that did not flex at least a little bit in flight. Aircraft designers therefore allow for bending or twisting in the aircraft design. In some circumstances the forces created by these loads can couple with the natural resonant frequencies of the aircraft structure to set up vibrations.

Flutter is the term used to describe airframe and control surface vibrations caused by the interaction between aerodynamic loads on the aircraft and the aircraft's own structural strength or rigidity. In extreme cases, flutter can quickly destroy the aircraft – it will literally shake itself to bits. The really frightening thing about flutter is that it often appears to strike 'out of the blue'. Pilots who have survived flutter encounters often report that the flight was proceeding uneventfully and then, suddenly, the aircraft was vibrating so badly they were struggling to hold on to the controls. Not all experiences are that bad, but they can be pretty traumatic.

Torsional Aileron Flutter

One of the more common forms of flutter is called torsional aileron flutter. Refer to the attached diagrams, which show how a wing can end up in a torsional (or twisting) vibration due to the interaction between wing twisting and aileron position.

- In diagram A the aileron has been deflected downwards, maybe deliberately, or possibly just from encountering some turbulence.
- In diagram B the force generated by the down-going aileron has been sufficient to twist the wing about its torsional axis – likely to be somewhere near the main spar. As the wing twists, the rear edge goes up, but the aileron gets temporarily left behind, because the aileron's centre of gravity is behind the hinge line that attaches it to the wing.
- In diagram C the wing has twisted as far as it is going to go, and the aileron is racing to catch up, and will likely overshoot the neutral position.
- In diagram D the aileron has moved past neutral to an upward deflection, and it will now start twisting the wing the other way. The cycle of twisting reversals can quickly build up to the point that the wing fails.

"In extreme cases, flutter can quickly destroy the aircraft – it will literally shake itself to bits."

The cure for this form of flutter is reasonably simple. Designers put the aileron's centre of gravity in front of the hinge line, usually by using mass balances out in front of the aileron. This doesn't stop the wing flexing, but it does stop the aileron getting out of sync with the wing, so the vibration is quickly damped. As a rule, the faster the aircraft is going, the greater the aerodynamic forces that are generated, so the potential for flutter increases as speed increases.

Airframe Harmonics

To make the problem more complex, all mechanical systems, including airframes, have natural modes or frequencies of oscillation. Imagine a pendulum swinging. It has a natural and easily calculated period of oscillation. If you push on it in time with the swings, the amplitude of the oscillation will increase. If you push out of sync with the swing, it won't resonate quite as well.

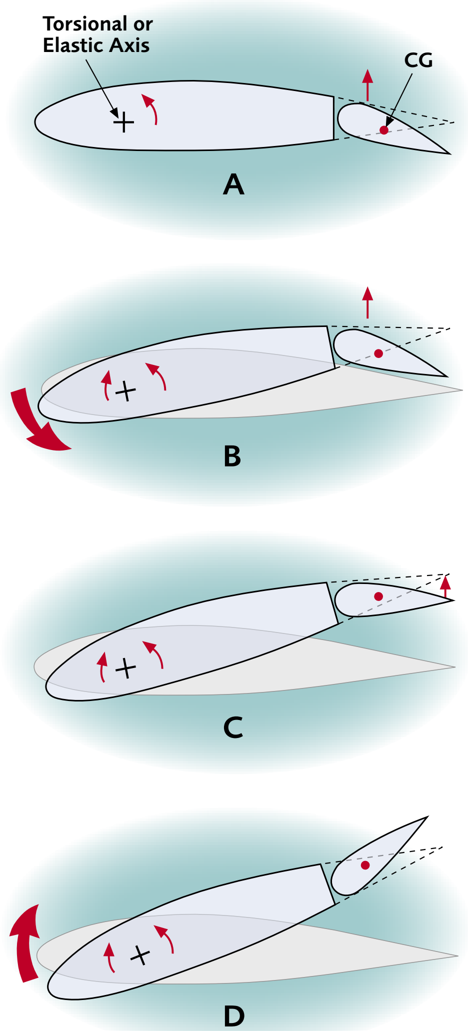
The aircraft's other control surfaces can also suffer from flutter due to similar cycles of twisting or bending and control surface reaction. Design steps taken to alleviate this problem include mass balancing of all controls, and ensuring that the natural frequencies of oscillation would not be reached if operating within the aircraft design envelope. Sometimes designers deliberately put a 'pre-load' or 'dampening' on controls to remove their freedom to vibrate.

How to Avoid Flutter

As a general rule, if you are operating inside the aircraft Flight Manual limits, you should not encounter flutter in a well-maintained aircraft. Note that the speed at which a given structure may start to flutter is normally a function of true airspeed (TAS) not indicated airspeed (IAS). This can be a particular trap for pilots of high performance aircraft or glider pilots, operating at high altitudes, where the TAS is much higher than the IAS. If the Flight Manual has a limit on IAS as altitude increases it is likely to be due to a potential problem with flutter.

Cessna put out a Service Bulletin some time ago for Cessna 200 series aircraft, after tailplane flutter was experienced in some aircraft. The cause of the flutter was found to be failure of the elevator trim attachment bracket at the rear of the aircraft. This enabled the trim to 'float' in the airflow, rather than be fixed in place, and this was sufficient to set up vibrations leading to flutter. There is nothing to say that the same thing can't happen to any other aircraft. It is essential that any abnormal or wear-related movement or 'play' in any control or trim run be corrected before the aircraft flies. Pilots and engineers must be vigilant for signs of excess play when conducting pre-flight or maintenance inspections. During those same inspections, be very sure to inspect any mass balances you can access, to check their security and integrity.

Control surfaces should **never** be modified or tampered with, as this might affect the centre of gravity of the control and make it prone to flutter. Modification includes anything that might change the weight of the surface, including painting. In one accident investigated many years ago, it was found that a home-builder had modified his aircraft by fitting navigation lights. The rear light had been attached to the rear of the rudder, significantly affecting the rudder's centre of gravity, and this was possibly instrumental in a subsequent in-flight break-up of the aircraft.



How to Stop Flutter

If the flutter you encounter is due to a mechanical problem, such as the loss of a mass balance, you probably don't have to worry, because the unfortunate fact is that the chances are the aircraft is going to self destruct very quickly. Sad, but true.

If the flutter is due to some other environmental factor, such as accidentally getting too fast, particularly if you strike some unexpected turbulence, there is some hope. What you need to do is reduce speed, to get out of the flutter range, while avoiding making any unnecessary control movements – these are just as likely to lead to pilot-induced-oscillations (PIOs) and make the problem even worse, or lead to an airframe overstress. So, your best chance probably lies in freezing on all controls – the vibration can be quite severe so this may be difficult – and simultaneously reduce power. Depending on the aircraft's attitude and the local conditions, reducing speed by easing into a gentle climb using the minimum of control input required to do so may be of benefit.

Summary

Airframe flutter is a potential killer. It is caused by a combination of aerodynamic forces interacting with the aircraft to generate rapid and often violent oscillations that can destroy its structure.

To minimise the chances of flutter developing pilots should ensure that they:

- Check control surfaces and mass balances during the preflight to ensure that no excess wear is developing and that they are secure.
- **Do not** fly an aircraft that has had a control surface modified.
- Fly the aircraft **within** its published Flight Manual limits.

In the event that flutter is encountered, reduce speed immediately and minimise control surface movement until the flutter dissipates. Provided the above guidelines are observed there is no reason why flutter should ever be encountered. ■

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Te Araroa Airstrip

The Gisborne District Council (GDC) has approached one of our Field Safety Advisers regarding use of the Te Araroa airstrip, near East Cape. This airstrip is located on the foreshore, just in front of the hotel at Te Araroa.

The airstrip used to be promulgated in the old Visual Flight Guide, and it was previously maintained by the GDC. The ownership of the land on which the airstrip is located is now unclear (being on the foreshore), and GDC advises that they are no longer maintaining it. They do not wish to take responsibility for its upkeep, or accept any liability should an aircraft using it have an accident.

Although there have been instances of aircraft using it in recent years, the Te Araroa airstrip is no longer promulgated in Vol 4 of the AIP. The surface is rough and neglected, and people often use the area for camping.

We therefore recommend, for the reasons given above, that pilots no longer consider using the airstrip at Te Araroa. ■

Letters to the Editor

Readers are invited to write to the Editor, commenting on articles appearing in *Vector*, recommending topics of interest for discussion, or drawing attention to any matters in general relating to air safety.

Nuts!

I was interested in your item on page 7 [*Vector* July/August 2003] about self-locking nuts. It was especially pleasing to see that someone has pointed out that a "C" suffix has a particular meaning, in this case indicating an all-metal feature. However, you missed another lesson that **many** engineers do not know, and that is that the overall specification for the use of self-locking fasteners shows that you are not to reuse them in critical situations. They must be thrown out after each use.

If I was sitting in Aviation House in Lower Hutt right now, I could probably point out the specification number concerned, but I do not have the documents here to help me. I think that if you follow the specifications listed at the bottom of the MS209365 you will find the proper document.

This is not a very well known fact, and it is not taught in New Zealand at all, and I think that it is a failure of the training system for engineers everywhere there. It probably comes down to the fact that, I think, there is not an equivalent British requirement, and too many people are honed to that standard.

By the way, it is incorrect to refer to "Military Standard MS209365" because "MS" means military standard!

It seems to me to be silly, too, to refer to "undercarriage" in the title of an article that is about landing gear parts. Oh, and while I'm nit-picking, they spell it "catalog" not catalogue!

I suppose it is useless to tell you that "Nyloc" is a trade name for a defunct manufacturer of a non-metal locking series of self-locking nuts? No, silly really, everybody calls them nyloc. It's like calling Aspirin "aspirin".

Lin M.Hall
Australia
August 2003

Vector Comment

The Editor asked a CAA staff member engineer for comment:

There are some good points in Lin's comments. In the first instance, however, an engineer should always ensure that the aircraft Manufacturer's Maintenance Manual standard procedures and specific procedures and cautions are met regarding locking nut use and or re-use. Lin is partially correct in that some manufacturers specifically spell out that stiff nuts should be used only once (eg, section 5 of the Rotax 912 Maintenance Manual).

If the manufacturer does not have specific guidance, then it is acceptable to use the guidance material in FAA AC 43-13-1B Section 4 Para 7-64f, or the British Civil Aircraft Airworthiness Information and Procedures CAP 562 Leaflet 2-5 Para 8-1, which has good guidance regarding the use and re-use criteria for self-locking nuts.

"As an apprentice I was taught on this subject." says the staff member.

In day-to-day engineering in general aviation and airlines, there are numerous specific occasions when an engineer is required to check that the minimum running torque on a nylon self-locking nut is within the manufacturer's published limits.

While it is accepted that the Mil Spec will have a number of specifics, a shop engineer should be able to use the Aircraft, Product or Part Manufacturer's guidance, then other CAA Rule Acceptable Data – in that order – as a starting point. One should be able to consider that, at the time of original type certification, the 'correct' type of nut was used. During normal maintenance, the floor engineer generally should not have to delve into the nut manufacturer's standard information.

It is quite a different situation, however, if there is a design change being considered. It would be very important for any maintainer/homebuilder to have access to nut specifications when choosing a nut for use as an alternative to a specified nut. In the case of a non-type-certificated aircraft, there may well be no manufacturer's information, so it could be vital that the 'correct' specification of nut was chosen for the particular role/environment the aircraft is to be operated in. Such considerations as whether the intended use is in a tension or shear application, and whether heat and corrosion will be factors, would all be important when determining which nut type to use.

Where a number of engineers go wrong is that they allow client and/or job pressure to override the fundamental practice of reading the **instructions** before tackling the job. ■

ETD and IFR Flight Plans

A number of airlines file standard (and repetitive) IFR flight plans for flights from unattended aerodromes Unfortunately there are a growing number of instances where there has been a delay of more than 30 minutes after the planned ETD (estimated time of departure) but ATS have not been notified of the delay. This has resulted in the initial stages of overdue action being activated.

The relevant requirements are spelt out in AIP New Zealand Vol 1, ENR 1.10 Flight Planning. Para 1.2.1 (c) requires the pilot of an aircraft on an IFR flight plan to "advise the appropriate ATS unit as soon as possible of any delay exceeding 30 minutes in beginning the flight or departing from any aerodrome of intended landing".

This also applies to flight rules Z (VFR then IFR). Para 2.2.2 explains, that "for SAR purposes, ATS will treat a flight plan, flight rules Z, as an IFR flight plan. An alerting service will be provided based on the ETD of the flight. Pilots must notify ATS of any delay exceeding 30 minutes in beginning the flight for which flight rules Z applies".

Pilots intending to operate into unattended aerodromes, including attended aerodromes outside of ATS hours, must give a contact telephone number (and the name of the person if necessary) that ATS can use to contact the pilot. (Para 2.1.4).

In some cases, a flight has been cancelled, but ATS have not been notified. In one example, the controller was able to ask an inbound aircraft to check, and the pilot did so. In others, it has meant a phone call to the contact number, which is normally the base or chief pilot of each airline.

IFR operators should take note of their responsibilities in this regard and ensure any delay in departure (or cancellation of the flight) is notified to ATS in a timely manner. Ensure you have a system in place that will work. Unnecessary alerting action wastes time and money, and it is a source of frustration for those involved.

At the other end of the flight, some IFR flights proceeding VFR (flight rules Y) into an unattended aerodrome continue to feature in the flight plan overdue statistics.

IFR operators may wish to emphasise these points in any upcoming refresher course for pilots. Individual pilots – take note and stay out of these statistics. ■

Let's Split!

In what phase of flight will your helicopter be, the next time the engine seizes?

Dumb question? Here's a cautionary tale from our recent files.

The helicopter was being ferried after maintenance, when the pilot noticed the oil pressure fluctuating. He had started a descent when the oil chip light came on, and he landed immediately. On shutdown he noticed oil was present throughout the engine bay, while there was none indicating in the oil sight-glass.

Engineering investigation revealed that an oil return line had split, allowing most of the engine oil to be lost in flight.

The oil line was degraded due to age.

Operators who take this incident (it could so easily have been an accident) as a timely lesson, will be keen to replace old oil lines. ■

Accident Notification

24-hour 7-day toll-free telephone

0508 ACCIDENT
(0508 222 433)

CA Act requires notification "as soon as practicable".

Aviation Safety Concerns

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

0508 4 SAFETY
(0508 472 338)

For all aviation-related safety concerns

Planning an Aviation Event?

Do you have a significant event or airshow coming up soon? If so, you need to have the details published in an AIP *Supplement* rather than relying on a NOTAM. (Refer to AC 91–1 *Aviation Events* for operational requirements.) The information must be promulgated in a timely manner, and should be submitted to the CAA with adequate notice. Please send the relevant details to the CAA (ATS Approvals Officer or AIS Coordinator) at least one week before the appropriate cut-off date indicated below.

Supplement Cycle	*Supplement* Cut-off Date (with graphic)	*Supplement* Cut-off Date (text only)	*Supplement* Effective Date
04/01	15 Nov 03	20 Nov 03	22 Jan 04
04/02	3 Dec 03	9 Dec 03	19 Feb 04
04/03	12 Dec 03	18 Dec 03	18 Mar 04

OCCURRENCE BRIEFS

Lessons for Safer Aviation

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

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

Accidents

The pilot-in-command of an aircraft involved in an accident is required by the Civil Aviation Act to notify the Civil Aviation Authority "as soon as practicable", unless prevented by injury, in which case responsibility falls on the aircraft operator. The CAA has a dedicated telephone number 0508 ACCIDENT (0508 222 433) for this purpose. Follow-up details of accidents should normally be submitted on Form CAA 005 to the CAA Safety Investigation Unit.

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

ZK-SKY, Aerostar S-81A, 6 Jul 00 at 12:44, Methven. 13 POB, injuries nil, damage minor. Nature of flight, transport passenger A to B. Pilot CAA licence CPL (Balloon), age 40 yrs, flying hours 1821 total, 37 on type, 37 in last 90 days.

The balloon was conducting a flight from Methven. The flight crew consisted of the pilot-in-command and a pilot under supervision.

Descent was initiated about 35 minutes into the flight so that the pilots could assess the lower winds for landing. As the immediate area was not suitable for landing, the balloon was climbed so as to reposition near a better area to the southwest. The balloon was then descended towards a group of more suitable paddocks and a paddock chosen for landing. A passenger briefing was given.

As the upwind boundary of the chosen paddock was crossed, the descent was checked at about 30 feet agl and the balloon continued in level flight tracking slowly along the paddock. As a satisfactory descent had not been established on reaching the paddock's mid-point, the pilot in command instructed the handling pilot to go around. All three burners were fired and a climb initiated over the top earth wire of a set of high-voltage power lines, which ran across the balloon's track just beyond the end of the paddock

A paddock ahead was selected for another landing attempt, but about this time the balloon started to descend again. The handling pilot operated all three burners, but this failed to restore the climb and the balloon struck the earth wire.

The balloon was held against the earth wire by the light wind. Continued operation of the burners failed to lift the balloon clear, so the pilot in command decided to shut the fuel off and vent the balloon, enabling it to descend between the high-voltage lines beneath it. The balloon fell between the lines and landed upright about one metre away from a diversion race canal, which crossed at that point.

The crew was found to have exceeded the balloon's Maximum All Up Weight by approximately 10 percent.

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

CAA Occurrence Ref 00/2221

ZK-HUC, Westland Scout AH/1, 13 Mar 02 at 12:45, Gisborne. 1 POB, injuries 1 minor, aircraft destroyed. Nature of flight, private other. Pilot CAA licence CPL (Helicopter), age 23 yrs, flying hours 2000 total.

The helicopter was engaged in a private helicopter logging operation 50 NM west of Gisborne. While lifting a log on a 150-foot line, the helicopter descended into the trees, narrowly missing a ground crewman, who fortunately was on hand to release the pilot who was trapped in the wreckage. The helicopter's cabin area was consumed by fire shortly afterwards.

The Scout is powered by a Rolls-Royce Nimbus engine in which it is common to experience some compressor stalling and surging, which is often associated with rapid collective and throttle movement or fuel scheduling difficulties. The pilot described the loss of power as the engine spooling up and down about three times rather than the stalling and surging which he had experienced previously. While he considered the option of releasing the log and attempting to fly away, he decided, due to the engine power problem, to opt for settling the helicopter into the tree canopy.

While some operational and maintenance deficiencies have been identified, a definitive cause of the accident could not be determined.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 02/704

ZK-HKH, Robinson R22 Beta, 15 Jun 02 at 11:30, Minaret Burn. 1 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence CPL (Helicopter), age 28 yrs, flying hours 928 total, 636 on type, 31 in last 90 days.

While hovering around to look for a suitable landing area, the helicopter's tailrotor clipped the top of a cabbage tree, shearing the driveshaft. Tailrotor control was lost, but the pilot managed to make a successful, but hard, forced landing nearby.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 02/1824

ZK-HFW, Hughes 269C, 16 Aug 02 at 12:55, nr Dannevirke. 1 POB, injuries 1 fatal, aircraft destroyed. Nature of flight, agricultural. Pilot CAA licence CPL (Helicopter), age 36 yrs, flying hours 1553 total, 1442 on type, 56 in last 90 days.

The helicopter was engaged in thistle spraying operations at a farm property. During the second spray run of the day, the loader driver lost visual and audible contact with the helicopter. In the meantime, a stock manager on an adjoining property had seen the helicopter descend towards a hillside and not reappear. He drove to the area to find the helicopter destroyed and the pilot fatally injured.

No conclusive reason for the accident could be found. A full report is available on the CAA web site.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 02/2468

ZK-TOO, Micro Aviation Bantam B22S, 24 Oct 02 at 11:00, Glenroy Rv. 2 POB, injuries 2 serious, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age 53 yrs, flying hours 86 total, 38 on type, 1 in last 90 days.

While on approach to a new landing site, the pilot decided to perform a forced landing without power. At about 300 feet agl, full power was applied and an overshoot initiated. While climbing away from the site the aircraft struck a power line, which ran across the valley terrace.

Main sources of information: Accident details submitted by pilot and Police.

CAA Occurrence Ref 02/3114

ZK-NPJ, Cessna 172R, 16 Nov 02 at 13:14, New Plymouth. 2 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 65 yrs, flying hours 220 total, 100 on type, 4 in last 90 days.

While taxiing the aircraft out to the holding point, the pilot accidentally taxied the aircraft into a white marker board and suffered a propeller strike.

Main sources of information: Accident details submitted by operator.

CAA Occurrence Ref 02/3371

ZK-FHV, Eipper Quicksilver MX II, 26 Nov 02 at 09:30, Marton. 1 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence nil, age 70 yrs, flying hours 678 total, 678 on type, 4 in last 90 days.

The microlight's engine started running roughly, so the pilot elected to make a precautionary landing. This unfortunately resulted in a heavy landing and some minor damage to the nose strut area.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 02/3900

ZK-TZC, Piper PA-31-325, 17 Dec 02 at 20:40, Feilding. 3 POB, injuries 3 fatal, aircraft destroyed. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 44 yrs, flying hours 1080 total, 70 on type, 90 in last 90 days.

On Tuesday 17 December 2002 at 2036 hours, ZK-TZC departed from Feilding Aerodrome on a VFR flight to Paraparaumu. The pilot had his two young sons on board.

A few minutes later when the aeroplane was level at 1000 feet near Palmerston North, some problem, probably with the left engine, occurred and the pilot turned back to Feilding. With the left propeller feathered, the pilot flew an irregular low-level circuit in an attempt to land. During a left base turn, with the flaps and undercarriage extended, he lost control of the aeroplane. The aeroplane rotated away from the aerodrome and struck the ground nose first in a near-vertical attitude. The pilot and his sons died in the unsurvivable accident.

No conclusive explanation was found to explain why the left propeller was feathered. The pilot's actions in the handling of the emergency and his attempt to land at Feilding with one engine inoperative are unaccountable.

No new safety deficiencies were identified.

A full accident report is available on the TAIC web site.

Main sources of information: Abstract from TAIC Accident Report 02-015.

CAA Occurrence Ref 02/3650

ZK-ELX, Piper PA-28-151, 20 Jan 03 at 18:15, Tauranga Ad. 2 POB, injuries nil, damage substantial. Nature of flight, training dual. Pilot CAA licence CPL (Aeroplane), age 36 yrs, flying hours 1000 total, 100 on type, 139 in last 90 days.

The aircraft was engaged in circuit training in crosswind conditions, when it encountered a downdraught on short finals and landed about 100 metres short of the runway threshold. In doing so, it flicked up a threshold-marker tyre, which caused damage to the tailplane and elevator.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 03/247

ZK-JDU, Airborne Windsports Edge 582, 29 Jan 03, Rarotonga. 2 POB, injuries 2 minor, damage substantial. Nature of flight, training dual. Pilot CAA licence PPL (Aeroplane), age 35 yrs, flying hours unknown.

The student was receiving circuit training instruction from the microlight's owner. On the second circuit, passing 50 feet agl on finals, the student made control inputs that caused the microlight to go into a dive. The instructor tried to recover control, but the microlight hit the runway hard and skidded for about ten metres.

Main sources of information: Accident details submitted by operator.

CAA Occurrence Ref 03/292

GA Defect Incidents

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

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

Key to abbreviations:

AD = Airworthiness Directive

NDT = non-destructive testing

P/N = part number

SB = Service Bulletin

TIS = time in service

TSI = time since installation

TSO = time since overhaul

TTIS = total time in service

AS350BA

Light assembly base clamp worn, P/N 356H28-01

It was discovered that the anti-collision light lens assembly base fitting had worn to such an extent that the whole light assembly fell off the vertical stabiliser during flight.

The lens clamp was worn and had loosened. The clamp can also be inadvertently fitted upside-down, which would cause increased wear. It is suggested that the lens assembly be physically checked for security during scheduled maintenance.

ATA 3300 CAA Occurrence Ref 03/2188

Cessna 177

Lycoming O-360 A1F6 broken carburettor float bracket, P/N 136-62

The engine began running roughly while the aircraft was on approach to land. The pilot found that he could not achieve more than 1700 rpm.

Engineering investigation found that the carburettor was flooding because the float bracket mounting arm had broken.

ATA 7300 CAA Occurrence Ref 03/2175

Gippsland GA200

Magneto performance degrades

The aircraft engine lost power while in the cruise, which resulted in a successful forced landing into a nearby paddock.

Engineers discovered that both magnetos had degraded in performance. They replaced the capacitors and the aircraft was returned to service.

ATA 7400 CAA Occurrence Ref 01/2118

Kawasaki BK117A-4

Cabin roof reinforcing channel cracks

During a 1200-hour inspection, the upper-deck nose cowl locating pin was found loose.

Further investigation revealed that the channel under the cabin roof supporting the pin was badly cracked. This was possibly caused through misalignment of the cowling assembly (P/N 117-23101-01), as the cowling locks on a pin (P/N 117-23101-12) at its forward point. It was repaired by replacing the broken channel and pin and realigning the upper cowling.

ATA 5300 CAA Occurrence Ref 01/2185

Piper PA-23-250

Forward exhaust section clamp comes loose

After takeoff from Auckland, the aircraft returned to the aerodrome due to white flashes and excessive noise coming from the lefthand engine.

On inspection, it was found that the forward section of the engine exhaust system had become detached. The maintenance provider resecured the exhaust section and fitted a new clamp.

ATA 7800 CAA Occurrence Ref 01/2597

Piper PA-34-200T

HSI slaved DI drifts

While en route NS-WN, the pilot became aware of a problem with the HSI slaved DI. When intercepting the Runway 34 localizer at Wellington with the DI switched to manual mode, the controller advised that the localizer had been overflown.

The HSI indicated that the aircraft was within 1/2 degree of the inbound track with no warning flags. The controller advised a heading to fly, and the aircraft became visual at 1100 feet amsl to the right of the runway centreline. Once established on the centreline, the HSI indicated that the aircraft was 1.5 degrees right of track.

An engineering inspection showed that the incorrect CDI indication was caused by a low voltage situation due to a depleted battery. A directional gyro imbalance caused the DI to drift with the slaving unit unable to keep up. The absence of a warning flag could not be explained, but it was possibly due to a mismatch of a loan HSI with the rest of the system.

ATA 3420 CAA Occurrence Ref 01/2467

Robinson R22 Alpha

Sprag clutch worn, P/N A188-2

The helicopter was passing through transitional lift to land when it experienced power surging and yawing. The pilot lowered the collective and landed, stopping after sliding a short distance.

It was determined that the sprag clutch was very worn, with a number of failed sprags. This could have caused the momentary loss of drive.

The defective sprag clutch was inside the serial number range of AD DCA/R22/37 and should have been replaced previously. The certifying engineer had not physically checked the serial number of the clutch. He had wrongly assumed that because another AD (DCA/R22/36), which applies to the same sprag clutch, had been signed off in error as 'not applicable' that AD DCA/R22/37 did not apply. The engineer believed that the clutch had done far more operating hours than had been recorded.

TSO 1161 hrs.

ATA 6310 CAA Occurrence Ref 01/2504

International Occurrences

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

Australia

Occurrences

The following are a selection of occurrences that come from the ATSB's (Australian Transport Safety Bureau) *Aviation Accident/Incident Database* contained on their web site www.atsb.gov.au/aviation/occurs/index.cfm.

Boeing 737-376

Loss of directional control on landing

The Boeing 737-376 was conducting an ILS approach at night and in conditions of reduced visibility due to rain. The ATIS reported that the visibility at the airport was 6,000 metres in rain. The runway was wet and a previous arriving aircraft had reported that the runway braking action was 'good'. The runway approach lighting was selected to maximum intensity. The crew elected to conduct a 'monitored approach', with flap 40 and autobrakes set to level 3.

The co-pilot was the handling pilot for the initial part of the approach. The aircraft was flown with both autopilots engaged and coupled to the ILS. The pilot-in-command monitored the approach visually.

The aircraft was established on the ILS and the parameters of the approach were stable. The pilot-in-command reported that the approach lights were visible from a height of about 1,000 feet. At the decision height (290 feet pressure altitude) the pilot-in-command could clearly see the runway lights ahead and decided to continue the approach. The pilot-in-command took over control of the aircraft and, at approximately 160 feet agl, disconnected the autopilot. The aircraft's flight data recorder indicated that, following disengagement of the autopilot, the aircraft commenced drifting right of the runway centreline.

The aircraft touched down heavily, just beyond the normal touchdown zone, approximately 520 metres from the threshold of the runway. The right-main landing gear touched down on the sealed runway surface, about two metres from the right edge of the runway. The pilot-in-command was unable to prevent the aircraft from leaving the sealed runway surface. The right-main gear departed the runway about 590 metres from the threshold, at a groundspeed of approximately 120 knots. The left-main landing gear departed the runway about 760 metres from the threshold, at a groundspeed of about 110 knots. Control inputs by the pilot-in-command returned the aircraft to the sealed runway surface, with all wheels back on the runway by about 1,130 metres from the threshold of the runway.

During the runway excursion the aircraft sustained damage to its tyres, damage to the left engine due to ingestion of runway light fragments and other debris from the runway edge, and minor damage to the surfaces of the wing flaps.

The runway is 60 metres wide, with the central 45 metres grooved to assist with wet-runway braking characteristics and tyre adhesion. The runway is not equipped with centreline lighting or touchdown zone lighting, nor is any required for runways equipped with a Category 1 ILS.

Ten-second data from the Bureau of Meteorology's Low-Level Windshear Alerting System (LLWAS) did not reveal any significant wind gusts in the period immediately preceding the aircraft's arrival at the runway threshold. The LLWAS threshold wind recorded for the runway was 3 to 4 kts.

Boeing 747-436

Smoke in the cockpit

Shortly after departure, the flight crew became aware of the smell of smoke in the flight deck. Approximately one minute later, the forward cargo fire warning message was displayed on the EICAS screen. At this time, the Cabin Service Director called the flight crew and reported smoke mist visible in the passenger cabin. The flight crew reported that they actioned the appropriate check list, activated the fire suppression system, and transmitted a MAYDAY. The crew subsequently returned the aircraft to the departure aerodrome, conducting an overweight landing.

While on final approach, the fire warning ceased. Cabin crew reported that there was no longer smoke in the cabin, but the smell was still evident. After landing, the aircraft was stopped on the runway, where the emergency services were able to confirm that no fire was visible. The passengers were then disembarked via mobile stairs placed at the front left door.

An inspection of the forward cargo bay found signs of heat damage to a section of the sidewall lining adjacent to the main deck galley chiller boost fan. On removal of the lining, the fuselage insulation blanket between body stations BS880 and BS900 was found burnt, with the fuselage skin, stringers and frame structure also showing signs of being heat affected.

The boost fan was found to have a hole burned in its housing adjacent to the electrical connector, with four of the seven electrical wires burned through. All of the fan impeller blades were also found to have failed.

United States of America

Occurrences

The following are a section of occurrences that come from the NTSB's (National Transportation Safety Board) *Aviation/Incident Database* contained on their website www.ntsb.gov/ntsb/month.asp.

Piper PA-18-150

Baulked landing results in ground loop

On 11 October 2003, about 12:30 Alaska daylight time, the Piper PA-18-150 sustained substantial damage following a loss of control on the ground during an aborted landing at the Ketchikan Airport, Ketchikan, Alaska. The solo private pilot was not injured. Visual meteorological conditions prevailed, and no flight plan was filed.

The pilot said he was performing touch-and-go landings and that the aeroplane landed hard and bounced. He applied power to abort the landing, but the aeroplane settled onto the runway and ground looped. The aeroplane sustained damage to the landing gear, right wing, and fuselage.