November / December 2002

VECTOR

Pointing to Safer Aviation

Airmanship – Measuring Up

In-Flight Fin Failure

Modification Approval Required?

Carburettor Icing?

CIVIL AVIATION AUTHORITY
OF NEW ZEALAND

VECTOR

Managing Editor, Cliff Jenks

Vector Editors, Pam Collings, Barnaby Hill, Jim Rankin.

CAA News Editors, Peter Singleton, Phillip Barclay.

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We all know that airmanship plays an integral part in human factors and aviation safety. But, what exactly is it and how should it be applied to the flying we do? This article addresses these questions and provides a self-assessment questionnaire to help you gauge your present level of airmanship.

Recently, the vertical fin of a Fletcher departed the fuselage due to a fatigue crack in the aircraft's skin following the incorrect installation of a rubber abrasion strip.
This article highlights how even the simplest of modifications to an aircraft can result in a fatal accident.

A pilot recounts his experience of carburettor icing, and the subsequent forced landing, while flying south over the McKenzie Country. A refresher on the basics of carburettor icing follows his account.

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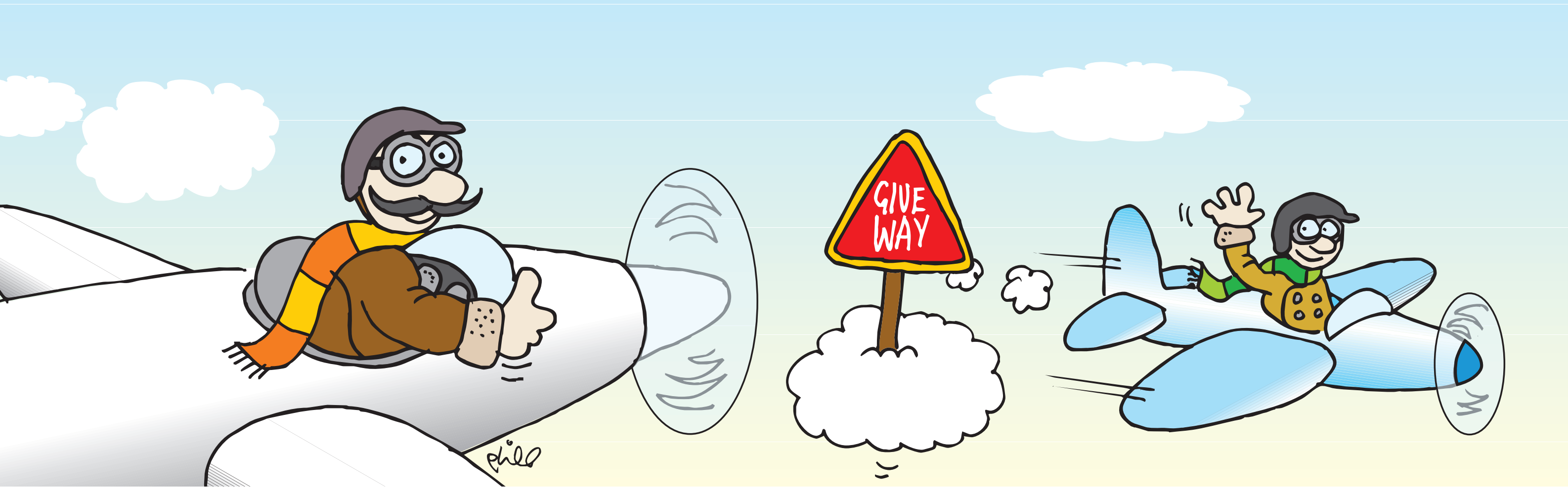
Cover Photo:
A Schweizer 269C hovers over a wind-swept ridgeline in the Tararua Ranges during a photographic shoot for the latest CAA GAP booklet *Helicopter Performance*.



Airmanship – Measuring Up

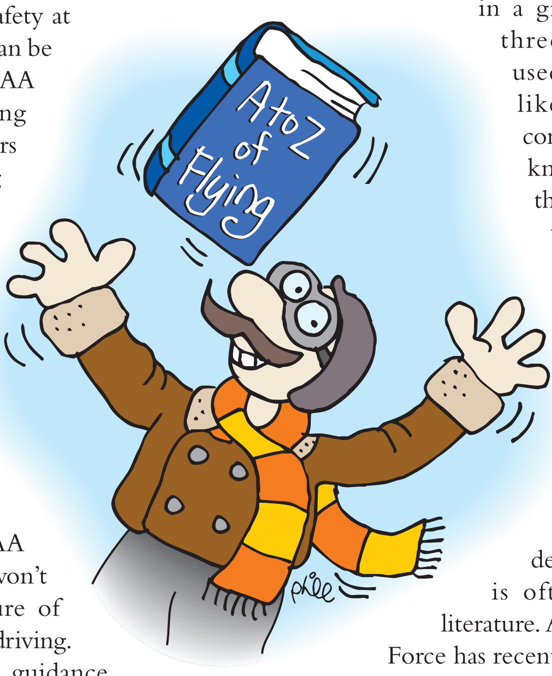
If you attended one of the CAA's Av-Kiwi Safety Seminars in 2001, you will be familiar with the term 'Measuring Up'. The aim of the seminars was to discuss airmanship and give pilots a chance to gauge their own level of airmanship development, and to determine which aspects they might want to improve. For the benefit of those who were unable to attend, this is the first in a series of articles that discuss what was covered in the seminars.

The Importance of Airmanship

You will no doubt have heard the statistic that 80 percent of all aircraft accidents have 'human factors' as one of their main causes. As aircraft have become increasingly sophisticated and reliable, accidents have become less likely to result from mechanical failure and more likely to be caused by human error.

The task of the CAA is to 'promote safety at reasonable cost'. Since most accidents can be attributed to the human element, then CAA obviously has an interest in reducing human error, or other fallibilities, as factors in accidents. A comprehensive licensing system is part of this process. The aim is to ensure that all pilots or other licence holders (such as engineers and air traffic controllers) have received the requisite training and experience to perform tasks safely, and have demonstrated that ability to an examiner.

A similarly comprehensive set of rules is another way that the CAA promotes safety. If you operate within the CAA Rules there is no guarantee that you won't have an accident – that is the nature of aviation, just like other activities such as driving. If, however, you operate outside the guidance provided in the Rules, then the chances of something going amiss demonstrably increases.



Skills

Despite these systems of licences and rules, the CAA has little control over what happens on any given flight. That is up to the pilot. Most flights in this country, particularly in general aviation, occur without any direct oversight from CAA, or indeed any other regulating body or organisation. The pilot's decision-making, skills and discipline are therefore the key to the successful and safe outcome of most flights – in short the pilot's 'airmanship'.

What is Airmanship?

It is very difficult to get a consensus amongst pilots about what the term airmanship actually means. Ask three pilots and you will get four answers. One interesting experiment is to ask a group of pilots to write down the three single words that represent airmanship to them, then compare the lists. What would **you** write? It is a near certainty that no two people in a group will write down the same three words! Some words do get used more frequently than others, like professionalism, awareness, consideration, experience, cooperation, knowledge or discretion. None of these is wrong, but neither do any of them tell the whole story about what airmanship is. To put it another way, we can all recognise good airmanship when we see it, and also bad airmanship, but we have a hard job defining it.

That hasn't stopped a lot of people from trying to define airmanship, or coming up with models to illustrate it. NASA has developed the 'NASA Paradigm' that is often quoted in more academic literature. As another example, the Royal Air Force has recently developed the 'RAPDA' model, standing for **Recognise–Analyse–Prioritise–Decide–Act**. The CAA has no particular definition or model that it advocates. This article considers another model developed in the United States*, but with a few variations that make it more appropriate for use in New Zealand. It is by no means the only one in common use, and this article in no way recommends this over any other one you or your organisation may care to use. This model is being used because it has the advantage of being fairly easy to understand and able to be practically used by pilots and instructors.

* *Redefining Airmanship* by Tony Kern.

Continued over ...

... continued from previuos page

An Airmanship Model

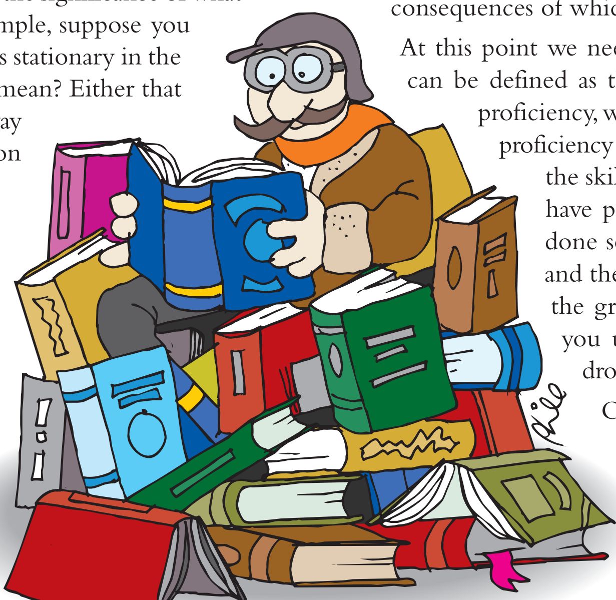
The key to this model is the premise that airmanship is primarily concerned with decision-making – making the right decision at the right time. Poor airmanship is often illustrated by poor decision-making, or even a failure to make any decisions at all. The decision-making process can often be a very complicated one, involving many variables, consideration of the various courses of action available, and assessment of relative risks. The subject of decision-making will be discussed in more detail in the next article in this series.

A failure to make decisions can be as a result of incomplete or inaccurate information. An example used to illustrate this is the aircraft that crashed following loss of oil pressure, which eventually led to an engine failure. Had the pilot been aware of the loss of oil pressure, the aircraft would most certainly have been landed immediately. Unfortunately, the pilot did not know that the oil pressure had dropped until the engine failed and it was too late. The accident could therefore be attributed to a loss of situational awareness.

Situational Awareness

Situational awareness is prerequisite for good decisions. You can't make decisions unless you know you have to make one! Recognising that something is happening, however, is not enough unless you know the significance of what has been observed. For example, suppose you notice an aircraft that appears stationary in the windscreen. What does this mean? Either that aircraft is flying directly away from you, or it is on a collision course! How do you know?

This is a relatively simple situation that we can normally appreciate intuitively, or as a result of our experiences in other aspects of our life. We have learnt through experience that lack of relative motion means converging paths. There are, however, a lot of situations that are unique to the aviation environment that we have to know about to be able to correctly determine the significance of what we see. What do you think pilots need to know about to be able to operate effectively?



Knowledge

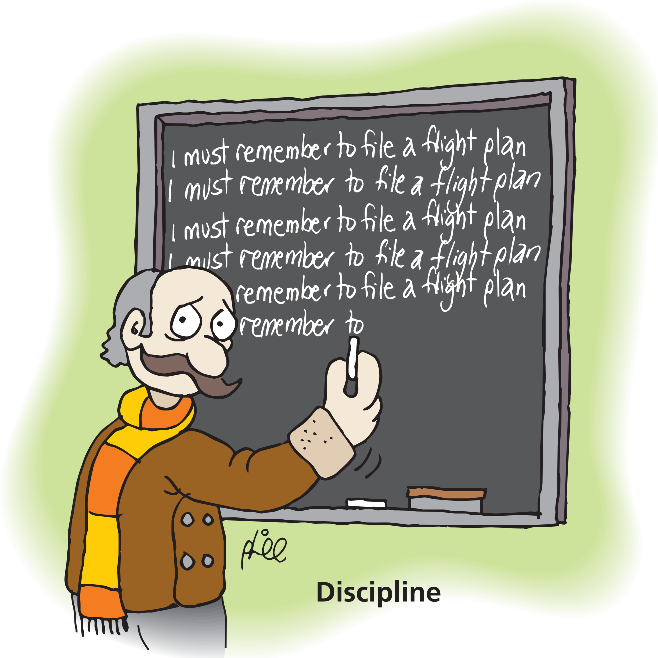
The *Vector* team has come up with the following list, in no particular order of priority:

- **Yourself** – You need to know your own limits, abilities, and how well you are performing on a given flight.
- **Other People** – You will always have to interact with other people in the aviation industry, such as other pilots, ATC, engineers, loaders and so on. To do your job effectively, you will need to know a bit about them – what they do, the problems they have doing their jobs, and maybe a little bit about them as individuals, depending on how closely with them you work.
- **Your Aircraft** – You need to know your aircraft well, its systems, performance, handling and emergency procedures.
- **The Environment** – We can talk of three different environments in which you operate: the physical environment, which includes terrain, weather, airspace, obstacles and other tangibles; the regulatory environment, which means the rules and procedures under which you operate; and the organisational environment, because different organisations, such as clubs, companies, schools or airlines all have their own way of doing business.
- **Task, Customer and Risk** – To do the job effectively and safely you need to know all about the task you have to do, what your customer wants, and the risks inherent in the job. Flying a Boeing 747 to Los Angeles is a totally different task from spreading fertiliser on a hill, with different customer expectations and significantly different risks! The pilot needs to know about those that relate to the job he or she is doing.

That is a long list of things the pilot has to know about to do the job effectively and safely. It takes time and a lot of experience to gain that knowledge. Something else that takes time to acquire is the skill required to do what you have to. Suppose that your instrument scan has detected the fact that the oil pressure is low. You have determined from your experience that a precautionary landing is required and decide to do so. Unfortunately, you haven't done one since your BFR nearly two years ago, and so lack the skill to do so safely – the consequences of which need little elaboration.

At this point we need to distinguish between skills, which can be defined as things you have learnt how to do, and proficiency, which is how well you can do them. Your proficiency depends upon how well you were taught the skill in the first place, how many times you have practised it, and how recently you have done so. The better you were taught the skill, and the more often you have practised it, then the greater the time that can elapse without you using the skill before your proficiency drops to an unacceptable level.

One last factor that we need to consider is discipline. This can be defined as the attitude of the pilot towards rules, personal or organisational limits, and the extent to which the pilot will go to, to fly as accurately and correctly as possible. A disciplined pilot will turn back when preset personal minimums are reached. Disciplined pilots never take short cuts when planning flights, and they don't leave things to chance. Ask a group of pilots how disciplined they are, and you will normally get nods



Discipline

indicating a high level. Then ask how many have recently exceeded 100 km/h on the open road. Most will sheepishly admit to having done so. Does this indicate a lack of discipline? Most drivers would say that they act within the spirit rather than the letter of the law. They might exceed the speed limit occasionally, but only when they deem it safe to do so. Where do we draw the line on what is safe and what is not? Is an occasional speed excursion just the thin end of the wedge, so that speeding eventually becomes the norm? The fact remains that a well-disciplined pilot is more likely to be a safe pilot who demonstrates better airmanship than a less-disciplined one.

Summary

The above airmanship model can be summarised as follows:

- **Airmanship** is all about making good decisions, which requires a high degree of
- **Situational Awareness** to detect what is going on, combined with the
- **Knowledge** to determine the significance of what you observe, the
- **Skills** to do the things you have to do, and the
- **Discipline** to do the right thing.

Another way of expressing this in a different order, but an easy one to remember, is:

Detect – Determine – Decide – Do – Discipline.

As previously stated, this is by no means the only model of airmanship you might see.

You may put more or less emphasis on some parts of the model, or have other factors you wish to add in. This model is still a very useful tool for helping us to assess and teach this concept we call airmanship. Future articles in this series will focus on what you can do about improving your performance in each of the aspects discussed. ■

A pull-out 'Measuring Up' questionnaire to assess your own level of airmanship development is provided on page 9.

A Safe Height

A recent helicopter accident has prompted this reminder about the rule relating to minimum heights for VFR flight.

The helicopter was positioning for agricultural operations. To get to the area, the pilot was following a river at low level in poor weather (low cloud and drizzle). At the junction with another river, the helicopter collided with a domestic power line spanning the river. The height of the line was estimated at 10 metres above the riverbed. The helicopter landed heavily, resulting in serious injuries to the pilot and substantial damage to the machine. A costly mistake.

We hope your first reaction is "What on earth was he doing there" rather than "gosh, he was unlucky". Good airmanship and a healthy chunk of fear and trepidation for our own safety should ensure that pilots do not set off in marginal weather. Helicopter pilots may gain a false sense of security, and be tempted to launch in marginal conditions, and to push on "just a bit further", because they have more scope than fixed-wing to be able to pause and suss things out – and land if necessary.

But they are not infallible or bullet-proof – as this pilot now knows. Sadly we have also had cases of fixed-wing pilots pushing on in bad weather, with almost invariably fatal results.

Common sense and good airmanship should be the main factors governing your decision, but the weight of the law also dictates a safe approach to the matter.

Rule 91.311, *Minimum heights for VFR flights*, states that one must not operate an aircraft under VFR (away from towns and congested areas) "at a height of less than 500 feet above the surface or at a horizontal distance of less than 500 feet from any obstacle, person, vehicle, vessel or structure".

The law is quite clear and the minimum heights apply both before takeoff and en route. Some older pilots may still believe that an exception in the old regulations where the minimum heights did not apply in cases of "stress of weather encountered en route or any other unavoidable cause" still applies. **It does not**. And prudent pilots should not have needed to rely on that exception in the past.

The current rule includes an exception if the *bona fide* purpose of the flight requires a lower height or lesser horizontal distance, and provided other conditions are met. This clause is included to cover such operations as power-line inspections, aerial lifting and aerial photography, and there are strict requirements governing aircraft using this exception. Needless to say, positioning flights are not included.

So, the law tries to keep you safe. But, ultimately, the decision is yours; if you are applying personal minimums, as you should be, then you are unlikely to need to be worrying about whether you are also meeting legal requirements. ■

In-Flight Fin Failure

Tail Fin Failure

The Fletcher FU-24 was commencing a topdressing run when its vertical fin departed from the fuselage. The aircraft continued in flight, but the pilot was unable to manoeuvre clear of the valley in which he was operating. The pilot was killed when the aircraft struck the ground just below the ridgeline.

Investigation revealed that the fin failed due to a fatigue crack in the skin near the base of the leading edge. The crack progressed until the skin failed suddenly, immediately aft of the forward attachment fitting. Without the support of the forward fitting, the rear-mounted spar was unable to resist the aerodynamic loads and the fin departed over the left side of the aircraft.

The bottom of the fin fracture on the starboard side showing the cut mark, as indicated by the arrows (at x 35 magnification).

Examination of the fracture surfaces revealed the fatigue crack had initiated from a score mark in the 0.020-inch skin of the leading edge. The score mark appears to have been caused by the knife used to trim the anti-abrasion rubber strip that had been applied to the leading edge of the vertical fin (refer to the accompanying photographs).

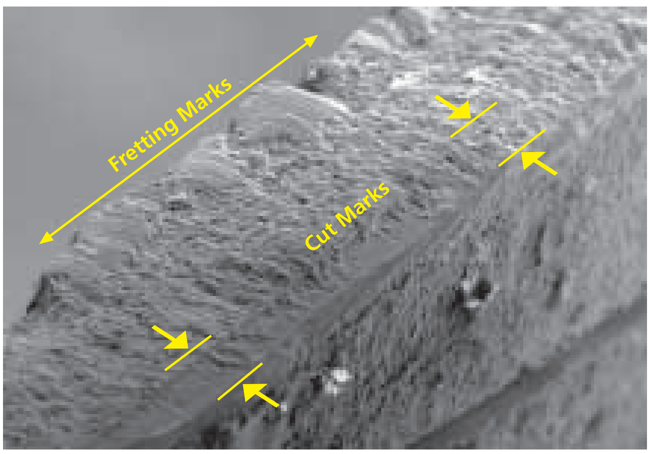
The forward fin fitting is known to be a critical area on the Fletcher, and Airworthiness Directive DCA/FU24/172 requires the root fairing to be removed every 12 months to enable the fin fitting to be inspected. To permit removal of the accident aircraft's fin fairing, it appears the rubber abrasion had been trimmed in situ, using the fairing, or similar, to provide a straight edge. Although this method certainly produced a neat job, the knife scored the skin beneath the rubber. The fairing was replaced and the joint carefully sealed with PRC, inadvertently hiding the score mark and the subsequent crack progression. (Refer to the diagram of the FU-24 vertical fin assembly for details).

The CAA accident report (CAA Occurrence Ref 02/1167) into this occurrence can be viewed on the CAA web site by clicking on **Accidents and Incidents/Fatal Accident Reports/02/1167.**

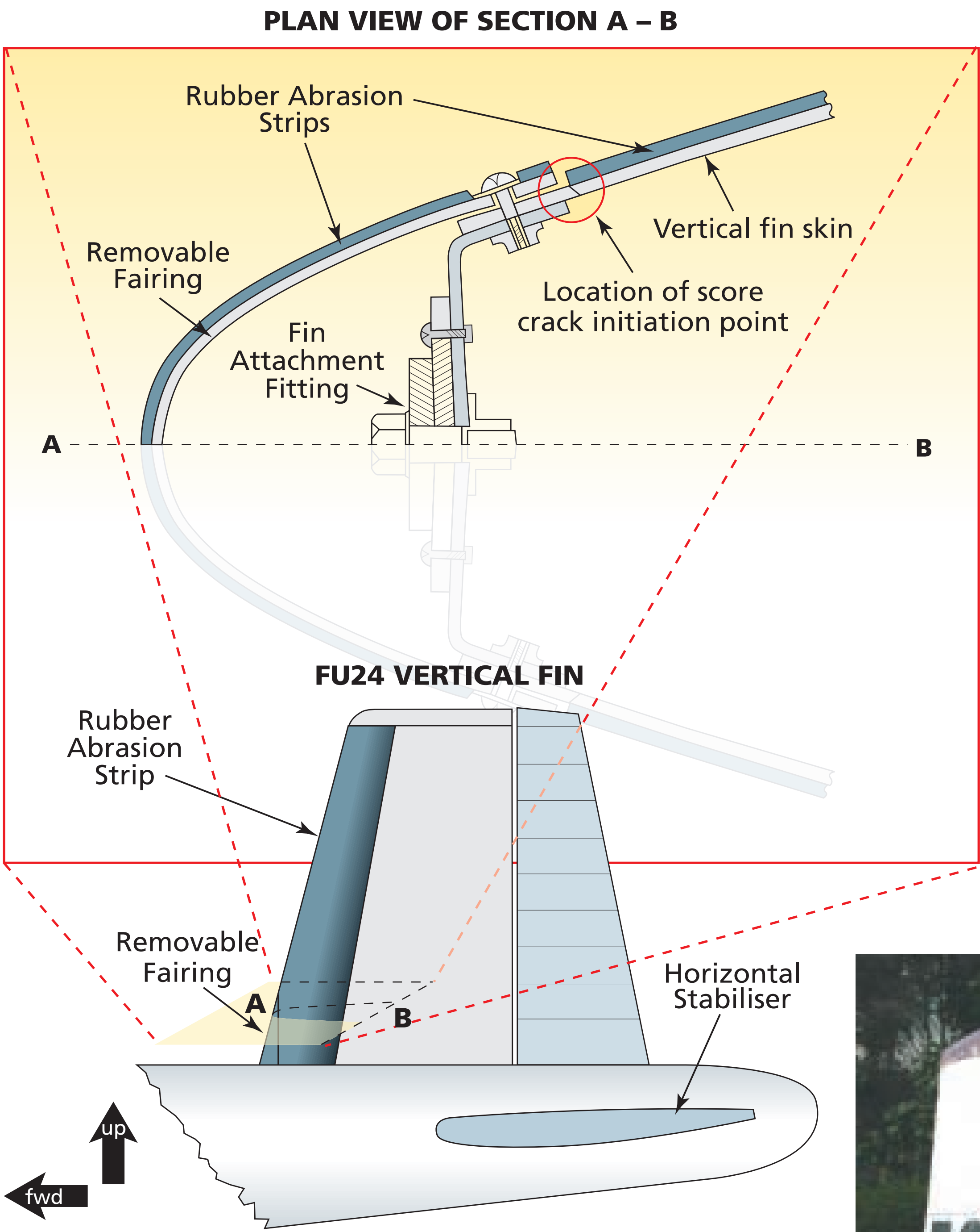
Lessons Learnt

This accident highlights the sensitivity of aircraft structure to poor maintenance practices and the sometimes-unexpected results of simple modifications. Stressed skin construction means just that, the skin is under considerable stress, which is constantly fluctuating due to the flight loads or ground-air-ground cycles imposed on it. Metal aircraft rely on the integrity of the skin to carry the majority of the loads placed on the airframe and are thus vulnerable to fatigue cracks in the skin. Sharp-edged surface defects, scratches, or corrosion pits all accelerate the initiation of fatigue cracks.

When the cause of the accident became apparent, an emergency AD was issued. Subsequent to this, two more aircraft were found to have sustained skin damage during the application of the rubber



The fin fracture surface showing the cut mark and fretting marks, as indicated by the arrows (at approximately x 60 magnification).



leading-edge abrasion strips. As the skin on the vertical fin's leading edge is only 0.020 inches (0.51 mm) thick, repair was not possible, and in both of these instances the damaged skin was replaced.

The CAA's North Island Field Safety Adviser (Maintenance) has since visited a number of maintenance providers, with one of the damaged skins, to illustrate the sensitivity of metal-skinned aircraft to this sort of damage. While most licensed engineers are well aware of the potential dangers, it is worth considering that non-LAME tradespeople (eg, painters, upholsterers and electricians) may sometimes have access to the airframe and could inadvertently damage it. This should be of particular concern if you are supervising a non-licensed or apprentice tradesperson.

This accident also highlights the requirement to obtain approval for all modifications to an aircraft. When is a mod a mod? Although there are a couple of exceptions, a rule of thumb is, if the item in question **does not** appear on the aircraft OEM (Original Equipment Manufacturer) drawings, then it's probably a mod.

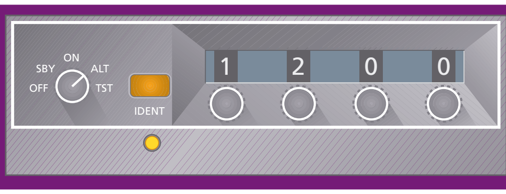
Although erosion by fertiliser particles on the Fletcher can be quite severe, its OEM does not provide for the fitment of anti-abrasion protection. All anti-abrasion strips fitted to the FU-24 series are thus modifications. They should be installed and maintained in accordance with approved data.

Regardless of whether this vertical fin loss can be attributed to poor maintenance practices or a badly thought out modification, it is worth remembering that aircraft of all-metal construction can still succumb to one of their oldest foes – metal fatigue. ■

The failed tail fin.

Transponder Basics

FOLLOW-UP



In the September/October issue of Vector we published an article on transponder basics. We omitted to include a recent change in procedure regarding transponder use in the circuit at a controlled aerodrome. A couple of additional errors also slipped through. So, wiping the egg off our face, we ask you to please take note of the following:

Operations Within a Controlled Aerodrome Circuit

In the previous article, the reference to using the SBY mode while operating in the circuit of a controlled aerodrome is incorrect.

Within the circuit of a controlled aerodrome, pilots should set their transponder to a code of **2200** with the **ALT** mode selected, unless otherwise directed by ATC. There are two exceptions to this:

- When the aircraft has been assigned a permanent designated transponder code, in which case this code should be retained with the ALT mode selected.
- When operating within the 02/20 grass circuit at Christchurch, in which case 2200 should be set with the SBY mode selected.

For more detailed information refer to AIP *Supplement* 19/02 (effective 21 February 2002).

The Other Two Errors

- A transponder code of 3927 was used in a phraseology example. It has been pointed out to us that the figures 8 and 9 do not feature in transponder codes.
- An error in the transponder panel illustration, although initially picked up, somehow then slipped through our checking process. The word beneath the transponder interrogation light should, of course, read IDENT, not INDENT. Did you spot it?

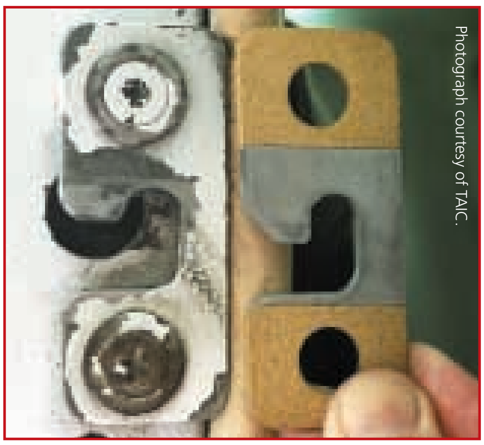
A Further Tip

One of the readers who pointed out errors, also re-iterated and expanded on the advice given about changing transponder codes. Namely, to switch the transponder to SBY first, then change the code and then switch back to ALT to avoid cycling through any of the emergency codes. You then don't have to worry about watching carefully the sequence of numbers in the code, particularly in small aircraft with transponders in awkward places in the cockpit. For aircraft with the older type of transponder which don't have the standby function he suggests switching it off, then changing codes and then switching it back on (to ALT setting).

Regarding finding errors, he added the comment that on the plus side, at least it demonstrates that people do read *Vector* and *CAA News* closely! We agree – and we appreciate any feedback, both positive and negative. ■

Watch that Latch!

Following an incident where a passenger aircraft cabin door opened in flight, the Transport Accident Investigation Commission (TAIC), in its subsequent occurrence report, identified the need for a better awareness among engineers, operators and pilots of the deterioration of mechanical items such as door mechanisms.



Photograph courtesy of TAIC.

This incident resulted from wear and distortion of the aircraft's door latch components, which had not been detected during routine maintenance. The TAIC report identified that the forward striker plate was grossly worn, with 40 percent of the engaging tongue missing compared with that of a new plate. This wear was considered to be the main cause of the door unlatching in flight. The door's safety latch was also found to be dysfunctional, due to accumulated wear and damage incurred from misuse of the door over a long period of time.

Even though the safety latch mechanism was not readily accessible for inspection and servicing, the wear on the striker plate was easily visible. The responsibility for monitoring wear of such mechanical components lies predominantly with maintenance staff, but all personnel associated with the operation of an aircraft should be vigilant for any such defects that may arise.

Preventive maintenance is the key.

The replacement or repair of components during routine inspections and servicing of the aircraft is far more appropriate than waiting for an abnormality to be discovered 'in the field' or, worse still, after an incident. While it is recognised that some wear can be tolerated, the extent of wear must be diligently monitored – the use of a new part as a reference template is one means of achieving this.

Finally, it must be remembered that 'on-condition' maintenance of components does not mean, 'fit until failure'.

The full report on the incident can be viewed by visiting the TAIC website www.taic.org.nz, clicking on **Aviation/2001**, and then selecting report number 01-010. ■

Cut here and retain

Measuring Up – The Pilot

This pull-out 'Measuring Up' questionnaire is provided for you to assess your own level of airmanship development. We suggest that you remember the last significant flight you carried out, then fill in the form, giving an honest appraisal of your performance. Having done so, fill in the form again with the grades you think you **should** have, given the type of flying you do, your overall level of experience, and the position you hold in your flying organisation. We could reasonably expect that an instructor should score a bit better than a new PPL, for example.

In the groups visited as part of the Av-Kiwi Seminar series, almost everyone found that there were gaps between their score and what they thought they should score in some areas. Knowledge and skills were the areas most often noted as requiring a bit of work. It is not intended that this exercise should make you feel bad, rather it is intended to help you identify areas of your airmanship that might need some work. A suggestion from the *Vector* team is to take the form and put it in your logbook. Have a look at it occasionally when filling in the logbook, just to remind yourself of the airmanship elements you might want to improve.

The purpose of this tool is to give you an opportunity to reflect on your current state of airmanship development. This is for your personal use and will not be collected or seen by anyone else, so be honest with yourself. Scores are from 1 to 10, 1 being a low level and 10 being a Chuck Yeager test pilot.

Judgement

How confident are you about your decisions? How often do you wish you had done something different? Do others question your decisions?

1 2 3 4 5 6 7 8 9 10

Nobody will fly with me — Mostly OK — Seldom if ever wrong

Situational Awareness

Are you completely aware of what is going on around you?
How often are you surprised by unexpected events? Can you anticipate events?

1 2 3 4 5 6 7 8 9 10

What situation? — Aware of most of the traffic and events – I think — Totally aware

Knowledge of Self

How well do you know your own capabilities and limitations when flying?
How often do you find yourself 'maxed out'? Do you have Personal Minimums?
How will you know when you have gone too far? Do you think you would be surprised to find out what others think of you as a pilot?

1 2 3 4 5 6 7 8 9 10

My therapist says I'm OK — Confident but not overconfident in my abilities

Knowledge of Team

How well do you know the people with whom you operate, and the job they do?
Do you know about or understand any problems they have?

1 2 3 4 5 6 7 8 9 10

Who cares? — I'll talk to them if I have to — Know them and what they do — Could do their job

Knowledge of Aircraft

How well do you know your aircraft, its systems, capabilities and its limits?

1 2 3 4 5 6 7 8 9 10

Can find it on the airfield most times — Know what most of switches and knobs do — I could write the Flight Manual

Continued over ...

Knowledge of Physical Environment

How well do you understand the weather conditions in your area? How about local terrain, hazards (eg. wires), airspace, etc?

1 2 3 4 5 6 7 8 9 10

Not too well (But I'm new here) | I watch Jim on TV and ATC will keep me safe | Know the area and weather well

Knowledge of Regulatory Environment

How well do you know the Rules of the Air? How familiar are you with Civil Aviation Rules that affect you? The AIP?

1 2 3 4 5 6 7 8 9 10

What's the AIP? | Can use my VFG | I could write the AIP

Knowledge of Organisational Environment

How well do you know the structure, priorities and processes of your organisation, its strengths and faults?

1 2 3 4 5 6 7 8 9 10

I'm looking for a new club | Leave that to the CFI | I'm on the committee

Knowledge of Risk

How will the next accident in your club occur? What is the riskiest thing you personally do? What do you avoid doing if possible?

1 2 3 4 5 6 7 8 9 10

She'll be right, mate | Sometimes not too happy | All risks identified and either avoided or mitigated

Proficiency

How often do you fly – as much as you need to? Could you perform everything required for a BFR right now? What exercises do you avoid or scare you?

1 2 3 4 5 6 7 8 9 10

I haven't flown in ages | I fly regularly, but don't get the chance to practise everything | Could fly a BFR now

Flying Skills

Can you perform every manoeuvre or procedure of which your aircraft is capable? Would you sit in the back of an aircraft flown by a pilot of similar skill?

1 2 3 4 5 6 7 8 9 10

Can safely land two times out of three | Could handle any normal exercises on a good day | Can happily fly the aircraft to its limits

Discipline

How often do you knowingly bend or break the rules? What do you really think about pilots who flout the rules or push the limits?

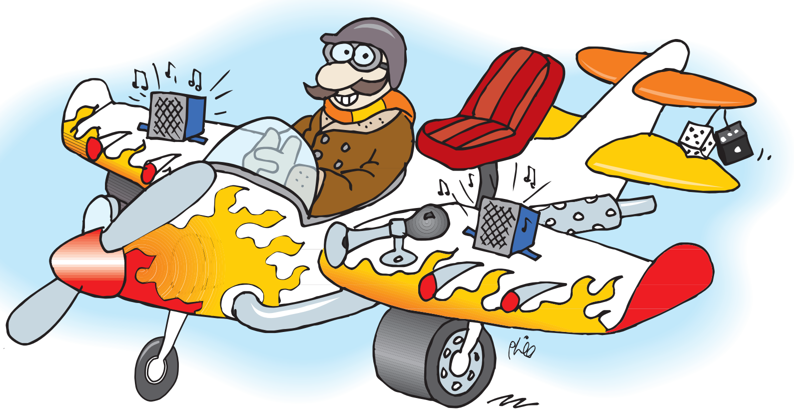
1 2 3 4 5 6 7 8 9 10

Rules are for sissies who can't fly | I wouldn't do anything dangerous but follow the spirit rather than letter of the rules | I never break any rules or personal minimum

Get-home-itis can be fatal!

Modification Approval Required?

This article discusses mods (modifications), but the approval requirements are equally applicable to repairs. Mods and repairs are both design changes and must be approved in accordance with rule 21.505. This rule makes no distinction between a mod and a repair – they both require one of the types of Acceptable Technical Data listed in Appendix D to Part 21. The only difference between a mod and a repair is the intent. A repair usually restores some aircraft capability that has been lost or damaged, while a mod adds some capability that the original design lacked.



The question has recently arisen, when does maintenance or repair work become a mod and when is a mod approval required?

It is easy to identify large mods, such as the addition of a cargo door, but the situation becomes less obvious as they get smaller. Unfortunately, even the smallest of mods can affect how the aircraft behaves in surprising ways. Several years ago, a Cessna operator fitted a mirror to the wing strut of their aircraft to assist the pilot during parachute operations. The extra drag was negligible, but the elevator buffeting certainly wasn't!

Because such unapproved mods can have an adverse effect on flight safety, this article aims to outline briefly why the mod approval process is so important when an engineer wishes to embody a new installation.

Is an Approval Required?

Any new installation on an aircraft must be carried out in accordance with the Acceptable Technical Data.

Technical Data is a generic term for all drawings, wiring diagrams, installation instructions or other documents that describe the mod.

The Acceptable Technical Data is defined in Appendix D to Part 21 *Certification of Products and Parts*, and includes, among other things, Supplemental Type Certificates (from the USA, Canada or Australia), the aircraft's Type Design Data, and FAA *Advisory Circular* 43.13-1B. Type Design Data is really just a fancy name for the aircraft's engineering drawings, but it also includes other associated publications that define the aircraft's approved configuration, such as the manufacturer's Service Bulletins and Standard Repairs as detailed in the applicable Maintenance Manual.

Technical Data that comes under the category of Appendix D of Part 21 is Acceptable Data and does not require an approval.

Other data, such as overseas modification approvals, which are not Supplemental Type Certificates, require approval in New Zealand before they can be embodied.

Clearly, for a new installation that you are developing yourself, there will not be any existing Technical Data, and you will have to produce this yourself. It will then require approval as a mod by the CAA or a Part 146 Aircraft Design Organisation. (A Part 146 Aircraft Design Organisation can also produce the Technical Data for you if you choose, but the CAA will not do this.)

Why is Approval Required?

If a licensed aircraft maintenance engineer (LAME) can maintain an aircraft, why can't he or she modify it?

The basic answer is that an aircraft is certificated against a detailed set of airworthiness design standards, so when an aircraft is modified, the modified configuration must be shown to meet those original design standards. Design standards are not something a maintenance engineer has at their fingertips or refers to every day. This is why it requires a professional engineer trained in, and familiar with, the design standards to determine compliance and then issue an approval.

This requirement is legally embodied in rule 21.505 *Form CAA 337 – Approval of Technical Data*, which requires design changes to be approved by the Director or a delegated engineer.

Development vs Approval

Design and development of the mod requires an understanding of the aircraft in question. Although anyone can submit a Form 337, it is usually best done by an engineer who is familiar with the aircraft type. A LAME can help you develop the mod and prepare the descriptive Technical Data. (If, however, flight testing is required as part of the development process, a Special-Experimental Airworthiness Certificate issued specifically for the purpose will be required). The Technical Data is then attached to the Form 337 and submitted to the CAA, or to a Part 146 Aircraft Design Organisation, for approval.

Approval of the mod first requires identification of the applicable rules and airworthiness standards to which the aircraft was designed. Then compliance with the individual requirements must be determined. Compliance can be determined by calculation, test or inspection.

Summary

The approval of a mod **is not** about determining whether the mod works – that should have been well and truly established during the development stage of the mod. Instead, it is about determining if the modified aircraft continues to comply with the airworthiness design requirements the aircraft was originally certified against, and therefore whether or not it is still safe. That is not to say the modified aircraft can't hurt you, just that it is no more likely to hurt you than before you modified it.

Questions about modifying an aircraft or its components can be directed to one of the CAA Aircraft Certification Unit's engineers by emailing them via the CAA web site at **info@caa.govt.nz**. ■

How-to… fill the gap

The CAA publishes two series of information booklets.

The **How-to…** series aims to help interested people navigate their way through the aviation system. The following titles are available:

Title	*Latest Version*
How to be an Aerodrome Operator	2002 (web site only)
How to be an Aircraft Maintenance Engineer	2000
How to be a Pilot	2000
How to Charter an Aircraft	1999
How to Deal With an Aircraft Accident Scene	2001
How to Navigate the CAA Web site	2000
How to Report Your Accidents and Incidents	2002

The **GAP** (**G**ood **A**viation **P**ractice) series aim to provide the best safety advice for pilots. The following titles are available:

Title	*Latest Version*
Aircraft Icing Handbook	2000
Bird Hazards	1998
Chief Pilot	2000
Flight Instructor's Guide	1999
Fuel Management	2002
Helicopter Performance	2002
In, Out and Around Milford	2001
In, Out and Around Queenstown	2001
Mountain Flying	1999
Takeoff and Landing Performance	2002
Wake Turbulence	1998
Weight and Balance	1999
Winter Flying	2001

How-to… and **GAP** booklets (except *Flight Instructor's Guide* or *Aircraft Icing Handbook*) are available free from most aero clubs, training schools or from Field Safety Advisers (FSA contact details are usually printed in each issue of *Vector*). Note that *How to be a Pilot* is also available from your local high school.

Bulk orders (except for *Flight Instructor's Guide* or *Aircraft Icing Handbook*) can be obtained from:

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

*The ***Flight Instructor's Guide*** and ***Aircraft Icing Handbook*** can be purchased from either:

- **Expo Digital Document Centre**, P O Box 30–716, Lower Hutt. Tel: 0–4–569 7788, Fax: 0–4–569 2424, Email: expolhutt@expo.co.nz
- **The Colour Guy**, P O Box 30–464, Lower Hutt. Tel: 0800 438 785, Fax: 0–4–570 1299, Email: orders@colourguy.co.nz

Helicopter Performance

Performance-related helicopter accidents continue to occur frequently in New Zealand, with light piston-engine helicopters featuring prominently in the accident statistics. Most of these accidents are happening in the takeoff and landing phases and usually involve a failure by the pilot to adequately determine that the power required for the intended manoeuvre is available, given the prevailing conditions.

Helicopter Performance examines a wide range of factors affecting performance and provides guidance, via a balanced discussion of basic helicopter performance theory and practical advice, to help pilots ensure that a proposed operation can be accomplished safely. It also steps pilots through worked hover ceiling graph examples and includes practice performance problems and answers.

This booklet has been developed in conjunction with a number of senior industry helicopter instructors and offers something for every helicopter pilot, regardless of their ability or experience level.

Takeoff and Landing Performance (Revised Edition)

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

Takeoff and Landing Performance discusses the many factors that affect takeoff and landing performance and outlines how to allow for them through performance calculations. This GAP steps you through how to use a Flight Manual Performance Graph and the Group Rating system (worked examples are included) in order to determine takeoff and landing distances.

Several of the performance-related rules-of-thumb referred to in the first edition of the booklet have been revised to reflect more accurately how individual factors affect aircraft performance. ■

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.

Erroneous ILS Indications

Regarding your article in the latest *Vector* magazine, you have omitted to mention a few salient points.

I think you will find that the glide path was NOTAMed as unmonitored or on test at the time of the incident.

We [the writer's airline] were not using ILS approaches at that time. We were using VOR approaches during the time the airport was working on the ILS due to the runway extension.

You have omitted to mention the importance of checking the glide path vs the DME when completing an ILS that has no OM or Locator (such as Faleolo 08 ILS). I would have thought this is mandatory for all ILS approaches.

Imagine if an aircraft was 1500 feet below the glide path at the check height during an ILS on 16 at Wellington.

According to the profile, NZ60 was approx 350 feet agl, when the DA is something like 680 feet (from memory). Why were they so far below DA? What were they seeing at 5.8 NM from the threshold?

Your article, in a magazine that represents CAA, irks me. The crew is credited with preventing a tragic accident. I cannot see how they can have so blindly followed the glide path with no reference to DME distance.

What example does this set for New Zealand licence holders?

Robert Steele
Airline Captain
Wellington
October 2002

Vector Comment

Before anyone comments, they should read the full report, but we will answer some of your questions.

This article was intended to be a general heads-up to advise readers of the availability of the report, which of course contains all the details. As a result, the article was a little short on detail.

Yes, the ILS was NOTAMed unmonitored, as was the VOR "FA". The exact meaning of "unmonitored" was discussed amongst the crew and the dispatcher. The investigators subsequently found that this terminology was not well understood by the pilot population.

Your point about DME vs distance is valid, and the report details how the crew were reacting to the DME readouts at the various stages of the approach, and why they continued the approach.

Your memory has failed you with regard to Decision Altitude. On the Jeppesen plate that was valid at the time of the event, the DA was 358 feet with a DH of 300 feet. The aircraft did not descend below the DA(H).

The CAA has been at pains to see that this incident gets wide exposure. We sent a letter to all IFR pilots in October 2000, soon after the event. The CAA investigator-in-charge has presented the information to major aviation bodies on four continents, and the FAA, Boeing and ICAO have all been working hard on ways to prevent this type of occurrence. This year we have published a short article in our annual *Profile 2001*, produced a comprehensive and widely acclaimed Incident Report (made available in full on our web site), assisted Air New Zealand in making a training video, and published the brief article in our last *Vector*.

Some would criticise the crew. The following extracts from the Incident Report put the matter in perspective.

"The crew was well briefed and prepared for the approach. They took measures to mitigate the effect the failure of an 'unmonitored' aid would have on the approach, with the assumption that they would be alerted by the identification signal ceasing, the equipment monitor removing the aid from service, and the aircraft displaying appropriate warnings …"

"When the aircraft captured the glideslope the crew were presented with a situation that was outside their knowledge, experience or expectation. Any warning that the crew could reasonably expect to be displayed was not presented to them. …That the crew were able to unlock their mental set in the time they had available – approximately 15 to 20 seconds from the end of landing checklist to autopilot disconnect – is testimony to their functioning as a cohesive group.

"Whilst it is acknowledged the crew had an opportunity to detect the erroneous glideslope prior to making the go-around decision, it is the view of the investigation that a high proportion of line crews would have made the same decision at glideslope capture. Human error caused the incident, but it must also be recognised that human factors prevented a more serious outcome."

Because the Incident Report is a daunting 203 pages, on the web site we have split it into 13 files for ease of reading. The first file includes pages 3 to 7, the table of contents. The quotes above come from **2.9.5 Analysis Summary**, on pages 146 to 149. The report can be viewed on the CAA web site (www.caa.govt.nz) by selecting **Accidents and Incidents/ Occurrence Report – NZ60…**).

Maintenance Mistakes

Regarding your article "Maintenance Mistakes and Systems Solutions" in the September/October issue.

This is a step in the right direction; normally you don't carry out in-depth looks at the area of the engineer. I found this a very thoughtful provoking and informative article, and can assure you that most LAMEs will read it.

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Regarding the comment from the 'senior' airline manager that "Maintenance engineers are like torque wrenches: they need to be calibrated from time to time." I would suggest that this manager has not been a practising LAME for quite some time or been near the 'front line'.

In this day and age, LAMEs are continuously being tested and examined on such subjects as ETOPS, engine ground run refresher courses, aircraft systems analysing defects and rectification differences courses on airframe engines and avionics, and of course legislation changes for regulations in New Zealand, Australia and JARs to name a few.

Thank you for a great magazine, I am also an aviation enthusiast from way back, and I like your photos and articles on any facet to do with aircraft.

Ron McLellan
Christchurch
October 2002

Vector Comment

Thank you for your comments and the positive feedback on the contents of *Vector*. We are conscious of the need to cater for all areas of the aviation community with the safety information that we publish. Maintenance doesn't normally feature largely, but we certainly keep the need in view. ■

Field Safety Advisers

Don Waters
(North Island, north of line, and including, New Plymouth- Taupo-East Cape)
Ph: 0–7–827 6997
Mobile: 025–852 096
watersd@caa.govt.nz

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

Owen Walker
(Maintenance, North Island)
Ph: 0–7–866 0236
Fax: 0–7–866 0235
Mobile: 025–244 1425
walkero@caa.govt.nz

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

Bob Jelley
(Maintenance, South Island)
Ph: 0–3–322 6388
Fax: 0–3–322 6379
Mobile: 025–285 2022
jelleyb@caa.govt.nz

Logging Time Correctly?

Over a year ago (July/August issue of *Vector*) we ran an article, "Pilot's Logbook", outlining the correct methods of logging flight time, and in particular covering some of the areas that pilots have difficulty with.

CAA Personnel Licensing staff are still finding many anomalies. In the flight-training sphere, it is important that instructors are fully conversant with the correct methods of logging time. They should show their students and then check that they are entering the time correctly. In later role-type flying, chief pilots must ensure that correct logging of time is demonstrated and checked with new pilots in their organisation.

Some of the anomalies and errors found are basic errors, which should not occur if pilots are taught correctly in the first place.

Typical Errors

General

- Pages being totalled separately rather than continued from the previous page. (For each column, the total at the bottom of each page should be brought forward to the top of the next page.)
- Columns 1 to15 being added up for the total or, conversely, only Columns 1 and 2 being added. (Logbook clearly states, "Total flight experience: Columns (1) to (12) inclusive.")

Cross-country Training

- Time counted towards cross-country hours for a PPL or CPL where the flight has not been "more than 25 nautical miles in a straight-line distance from the centre of the aerodrome of departure". Some just describe an arc around the takeoff point!
- Use of abbreviations for places on cross-country flights, which the flight examiner often is not familiar with and does not always have the time to check. They must trust the instructor's and candidate's honesty. (Abbreviations should be used only for published aerodromes.)

Night Flying

- Night time logged in both the night and day columns.

Instructors

- Instructors (fixed-wing and helicopter) logging instruction in basic instrument flying as instrument time, instead of just pilot-in-command and instruction time.
- Flight test for the C-category instructor rating being counted towards instructional time.

Role Flying

- Sling load, supply dropping, forest survey, mustering, etc, being counted as agricultural time towards an ag rating

Helicopter and Fixed-wing Time

- In a mainly fixed-wing logbook, helicopter time logged in Column 16 and not in the pilot-in-command or dual columns. For pilots with, or aiming for, both helicopter and fixed-wing licences, it is probably easier to have two logbooks. Otherwise it is difficult to readily determine the relevant flight experience required towards a qualification.

You may wish to refresh your knowledge of the earlier article. If you do not have your *Vector* magazine filed ready to hand, remember that you can refer to back issues on the CAA web site (www.caa.govt.nz) by clicking on **Safety Information/Publications/Vector**. ■

Carburettor Icing?

Readers are encouraged to share their aviation experiences in order to alert others to potential pitfalls. We do not accept anonymous contributions. If you tell us who you are, we will not publish your name unless we have your permission.

The following contribition comes from Kevin Langford of the Air New Zealand Flying Club, who recounts a carburettor icing experience.

On 13 April 2002 I departed Christchurch in a Cessna 150 at approximately 10:45 am, bound for Pukaki airfield. Passing Geraldine at around 5500 feet, I could see that about two thirds of the McKenzie Basin was covered in low cloud and fog. A landing at Pukaki would not be possible, so I called some friends at Wanaka on my cellphone and found that the weather there was clear and calm. No problem. I would continue to Wanaka and call in at Pukaki on my way home, by which time the fog would be gone. So I continued on my present course climbing slowly to clear the high terrain at McKenzie's Pass.

I was over McKenzie's Pass at 6000 feet at around midday when I noticed a slight vibration in the engine. At first I thought it was my imagination, but no it was definitely there. I assumed I had picked up a little carburettor ice, so applied full carburettor heat for around 10 seconds. The engine smoothed out and the carburettor heat knob was pushed back in again. The vibration returned almost immediately, accompanied with a drop of about 100 rpm. I quickly reapplied carburettor heat and checked the mixture. The engine smoothed out a bit, but with even less power this time. The mixture adjustment hadn't made any difference.

I was descending by this time and becoming fairly interested in getting full power restored. I tried returning the carburettor heat to COLD again, only to have power fade away completely and the engine start shaking. I was getting a bit worried by this time so turned the aircraft towards Tekapo, as it was the nearest airfield and only about 10 nautical miles away. I was now down to 5500 feet.

Carburettor heat was re-applied and partial power returned. I then tried various combinations of carburettor heat, throttle and mixture, but the more I did the worse it seemed to be. So, with carburettor heat full HOT and enough power to just maintain height, I decided to set the transponder to 7700 and call Christchurch Information and advise them of my predicament.

After reporting my problem, position and intentions, they acknowledged the situation and said that they would try and get me on radar. I guessed they could see me because the transponder reply lamp was flashing, but I heard nothing more from them. I thought they might have called me back to check my progress, but after a minute or two I had heard nothing so decided to tune to Tekapo Traffic on 118.6. MHz.

I broadcast my problems and intentions and immediately received a reply from the Air Safaris people who invited me to do a straight-in approach for Runway 29. Finally, I was able to make a gentle descent on a long final for Runway 29. As I neared the airport, I found myself a bit high and was obliged to make an orbit and lose the last of my height. An easy landing was made and I taxied in, the engine still running.

After parking the aircraft, I did a quick engine run-up and was amazed to find that it was now running normally. I could hardly believe it. I shut down the engine and got out of the machine only to find all manner of emergency services waiting for me.

I arranged for the Flying Club's Chief Engineer to come and check the engine the next day. He found nothing wrong with it. Only one test left – a circuit. After receiving a very handy briefing from the Air Safaris Chief Pilot on useful places to go if the engine goes quiet, I took off and flew an uneventful circuit.

Later I flew the aircraft back to Christchurch without any trouble.

After talking about my experience with Club instructors and engineers, it is now generally agreed that the engine had suffered from a bad case of carburettor icing, which I had been unable to clear. It may be interesting to note that I have since made the same trip in the same aircraft on several occasions in similar, and different, conditions and have not had any trouble.

Vector Comment

Thank you for sharing this experience with readers, and well done for handling the situation so decisively.

We agree, it is highly likely that you experienced a severe case of carburettor icing. Your club's engineering report indicates that the ambient air temperature and dew point in the Tekapo area around the time of the incident were within 1°C of one another. This supports your conclusion of carburettor icing. Although the weather conditions might have seemed relatively benign at the time, the air temperature and moisture content were extremely conducive to carburettor refrigeration icing.

This incident certainly highlights the importance of always being alert to the possibility of carburettor icing, proactively

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checking for it at regular intervals, recognising its symptoms, and reacting promptly if it develops.

It is possible to pick up carburettor icing (normally refrigeration icing) even when operating well clear of cloud at cruise power settings – not just at low power settings during descent or on approach (normally throttle butterfly icing).

The following information is intended as a refresher on the basics of carburettor icing for pilots who fly aircraft with normally aspirated engines:

Carb Icing-Conducive Conditions

Both refrigeration icing and throttle butterfly icing in float-type carburettors can occur within the ambient air temperature range of –10°C to +35°C at relative humidities above 50%. A good indicator of relative humidity is the air temperature and dew point relationship. Values within a few degrees of one another indicate a high relative humidity and therefore an increased likelihood of developing carburettor icing.

Symptoms and Remedy

Carburettor icing is usually characterised by rough running and a drop or fluctuation in engine rpm for a fixed-pitch propeller, and a drop in manifold air pressure (MAP) for a constant speed unit (CSU) installation. The CSU will maintain the pre-set rpm even when the MAP is reduced by ice build-up. It should be noted, however, that if any ice is dislodged, the rpm will fluctuate slightly as the CSU 'hunts' to balance the propeller torque reaction against the fluctuating engine torque produced by the ingestion of the ice.

While rough running might be an obvious symptom, a decrease in engine rpm or drop in MAP might be more subtle and can be mistakenly attributed to factors such as a loose throttle friction nut, or turbulence and variations in airspeed in the case of a fixed-pitch propeller. Always check, however, for carburettor icing as a potential cause of any slight drop in rpm or MAP.

When icing is suspected, apply full carburettor heat until the symptoms clear or are confirmed as not being carburettor icing (this may take quite some time). If ice is present, the selection of hot air will result in a drop in rpm followed by rough running and fluctuating rpm while the ice is cleared and the engine ingests the resulting water or chunks of ice. Smooth running at a slightly lower-than-normal rpm due to the selection of hot air will normally then follow.

Note that for CSU installations, the MAP may fluctuate before it steadies at a higher value, and the rpm may fluctuate during the clearance process before it steadies at the pre-set value.

If no ice is present, the application of carburettor heat will result in drop in rpm only for a fixed-pitch propeller and a slight drop in MAP for a CSU installation.

Partial heat should not be used, as it can actually promote the formation of carburettor icing.

If there has been a large ice build-up, the engine may run very roughly until the ice has fully melted. If ice forms again, the process must be repeated. In extreme conditions (as were probably experienced in this incident) it may be necessary to apply full heat continuously until you can fly out of the icing conditions. Refer to the aircraft Flight Manual for any limitations placed on the prolonged use of carburettor heat at high power settings.

The application of hot air will richen the mixture, and in some cases it may be necessary to lean the mixture to assist smoother running.

Engine Handling Techniques

Apply carburettor heat as part of regular cruise checks (eg, SADIE, CLEAR, etc) or whenever carburettor icing is suspected. The frequency of carburettor icing checks should be increased when operating in conditions of high relative humidity, such as when temperature and dew point are close together.

Make full use of a carburettor temperature gauge if fitted – it will provide a good indication of whether conditions are conducive to carburettor icing, particularly when in the cruise, and therefore how frequently heat should be applied. ■

AIP Supplement Cut-off Dates

Do you have a significant event or airshow coming up soon? If so, you need to have the details published in an AIP *Supplement* instead of relying on a NOTAM. This information must be promulgated in a timely manner, and should be submitted to the CAA with adequate notice (within 90 days of the event). Please send the relevant details to the CAA (ATS Approvals Officer or AIS Coordinator) at least one week before the cut-off date(s) indicated below. Note: If your AIP *Supplement* requires an illustrated graphic, allow a further five working days.

Supplement Cycle	*Supplement* Cut-off Date (with graphic)	*Supplement* Cut-off Date (text only)	*Supplement* Effective Date
03/01	21 Nov 02	28 Nov 02	23 Jan 03
03/02	30 Dec 02	7 Jan 03	20 Feb 03
03/03	16 Jan 03	23 Jan 03	20 Mar 03

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

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.

ZK-CKT, Cessna 185D, 10 Jun 00 at 12:30, Mercer. 2 POB, injuries nil, damage substantial. Nature of flight, parachuting. Pilot CAA licence CPL (Aeroplane), age 33 yrs, flying hours 493 total, 57 on type, 82 in last 90 days.

The aircraft was negotiating a bridge over a drain on the operator's property, when it came off the bridge to one side. The propeller stuck the bridge decking, resulting in significant damage to it and the engine. The righthand wingtip and righthand side of the fuselage were also slightly damaged.

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

CAA Occurrence Ref 00/3722

ZK-ELO, Cessna R172K, 15 Jul 00 at 12:00, nr Kimbolton. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 32 yrs, flying hours 180 total, 90 on type, 5 in last 90 days.

The aircraft had landed well into the private airstrip. During the landing roll, the pilot lost directional control on the slippery surface, and the aircraft slid sideways into a shallow drain. The left wing and propeller were damaged in the accident.

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

CAA Occurrence Ref 00/2437

ZK-DXO, Cessna 172M, 22 Oct 00 at 17:20, Hamilton. 2 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 48 yrs, flying hours 174 total, 50 on type, 10 in last 90 days.

The aircraft arrived in Hamilton to drop off some passengers. When it took off again to return to Pauanui, the pilot reported a partial engine failure and returned to Hamilton for an uneventful landing. After draining some water from the fuel drain points, and carrying out a full-power check, the pilot decided to take off. Once airborne, however, the aircraft lost power again. The pilot decided to land back on the grass runway, but during the landing roll the aircraft departed the runway to the right into a crop of lucerne. Minor damage was sustained to the right wingtip and wheel spat.

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

CAA Occurrence Ref 00/3382

ZK-CTV, Taylor Monoplane U/L, 26 Nov 00 at 17:50, New Plymouth. 1 POB, injuries 1 minor, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age 75 yrs, flying hours 322 total, 54 on type, 0 in last 90 days.

The pilot reported difficulties after takeoff and that altitude could not be maintained. The aircraft was seen to impact with trees approximately half a mile from the airfield.

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

CAA Occurrence Ref 00/3717

ZK-GBD, PZL-Swidnik PW-5 "Smyk", 30 Nov 00 at 12:00, Matamata. 1 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours 150 total, 50 on type, 40 in last 90 days.

The glider was completing an outlanding in a paddock near Matamata when it collided with a water trough during the landing roll. This resulted in minor damage to the glider's nose section.

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

CAA Occurrence Ref 00/3729

ZK-BRY, Piper PA-18A-150, 9 Dec 00 at 17:40, Whenuapai. 1 POB, injuries nil, damage minor. Nature of flight, training solo. Pilot CAA licence PPL (Aeroplane), age 49 yrs, flying hours 138 total, 7 on type, 10 in last 90 days.

Just after landing the starboard wingtip struck the ground causing minor damage. The student's instructor believed that a wind gust may have been responsible.

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

CAA Occurrence Ref 00/3961

ZK-ROY, Rans S-6ES Coyote II, 9 Dec 00 at 18:46, Nelson Ad. 1 POB, injuries nil, damage substantial. Nature of flight, flight test. Pilot CAA licence PPL (Aeroplane), age 59 yrs, flying hours 200 total, 100 on type, 10 in last 90 days.

The aircraft suffered a total engine failure at approximately 80 feet agl after takeoff. It landed very heavily on one side of its undercarriage during the subsequent forced landing.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 00/3964

ZK-XIF, Micro Aviation B20 Bantam, 10 Dec 00 at 11:30, Manawatu. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age 33 yrs, flying hours 160 total, 40 on type, 10 in last 90 days.

The aircraft suffered a partial engine failure during the cruise. The pilot attempted a precautionary landing into a paddock, but hit a deer fence on short finals. The cause of the engine problem could not be determined.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 00/3963

ZK-DIR, Piper PA-23-250, 14 Dec 00 at 18:04, Gisborne. 4 POB, injuries nil, damage substantial. Nature of flight, transport passenger A to B. Pilot CAA licence CPL (Aeroplane), age 30 yrs, flying hours 780 total, 80 on type, in last 90 days.

On Thursday 14 December 2000, at 1804, Piper PA23-250D Aztec ZK-DIR landed at Gisborne Aerodrome. Shortly after landing its nose undercarriage leg collapsed aft. The pilot and 4 passengers on board the aircraft were uninjured.

Nothing conclusive was found showing why the undercarriage leg collapsed. Three scenarios are discussed as possible causes. The more likely possible cause was that play in the drag strut bushes somehow contributed to a mechanical down-lock malfunction, but this could not be replicated during testing. No safety issues were identified.

Main sources of information: Abstract from TAIC Accident Report 00-014.

CAA Occurrence Ref 00/4087

ZK-SUB, Fisher Dakota Hawk, 18 Dec 00 at 11:15, Dargaville. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours 100 total, 20 on type, 20 in last 90 days.

The homebuilt aircraft was on a test flight (first-of-type) programme when the accident occurred. The aircraft had been undergoing modification at the owner's property when, during ground runs, the aircraft became airborne. The pilot decided to proceed to Dargaville for a landing. Control was lost on landing, causing substantial damage to the undercarriage and wings.

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

CAA Occurrence Ref 00/4117

ZK-GCK, Schempp-Hirth Ventus-2cT, 20 Dec 00 at 17:30, Drury. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours 1550 total, 3 on type, 18 in last 90 days.

On short final to land the glider encountered increased sink. The pilot closed the airbrakes but was unable to prevent the glider sinking and colliding with a fence 15 metres short of the airfield.

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

CAA Occurrence Ref 00/4418

ZK-PFD, Quickie Aircraft Quickie, 28 Dec 00 at 07:00, Kaikoura. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 34 yrs, flying hours 154 total, 40 on type, 5 in last 90 days.

The homebuilt aircraft did not perform as well as expected by the pilot after takeoff and, during a turn back to the airfield, settled in the sea short of the runway.

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

CAA Occurrence Ref 00/4289

ZK-PGH, Gippsland GA200C, 11 Jan 01 at 08:15, Amberley. 1 POB, injuries 1 minor, aircraft destroyed. Nature of flight, aerial application/dropping. Pilot CAA licence ATPL (Aeroplane), age 63 yrs, flying hours 21200 total, 314 on type, 127 in last 90 days.

The aircraft had just completed a downhill spray run when it collided with terrain as it was climbing up the other side of the gully.

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

CAA Occurrence Ref 01/41

ZK-CML, NZ Aerospace FU24-950M, 22 Jan 01 at 11:30, Honikiwi. 1 POB, injuries nil, damage substantial. Nature of flight, agricultural. Pilot CAA licence CPL (Aeroplane), age 54 yrs, flying hours 12087 total, 2806 on type, 170 in last 90 days.

The topdressing aircraft landed into the wind on a slight down-sloping airstrip. The grass, however, was slightly wet, and the aircraft skidded off the end of the airstrip and over a bank.

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

CAA Occurrence Ref 01/191

ZK-DIP, Piper PA-28-140, 28 Jan 01 at 14:40, Patumahoe. 1 POB, injuries nil, damage substantial. Nature of flight, other aerial work. Pilot CAA licence PPL (Aeroplane), age 39 yrs, flying hours 305 total, 35 on type, 61 in last 90 days.

While carrying out aerial photography of farmland at 600 feet, the engine began running roughly and losing power. With little time available for trouble checks, the pilot carried out a forced landing into a paddock. During the landing roll the main landing gear collapsed.

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

CAA Occurrence Ref 01/305

ZK-HVK, Westland Wessex HC Mk 5C, 12 Feb 01 at 08:00, nr Motueka. 1 POB, injuries 1 fatal, aircraft destroyed. Nature of flight, private other. Pilot CAA licence CPL (Helicopter), age 39 yrs, flying hours 2642 total, 321 on type, 232 in last 90 days.

During heli-logging operations, the helicopter picked up a log and almost immediately placed it back on the ground. The helicopter then adopted a steep nose-down attitude and descended parallel to the terrain, colliding with the ground some 400 feet below the pick-up site.

A full report is published on the CAA web site, under 'Fatal Accident Reports'.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 01/451

ZK-GIU, Glasflugel Standard Libelle 201B, 2 Mar 01 at 18:00, Omarama. 1 POB, injuries 1 serious, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours 95 total, 5 on type, 20 in last 90 days.

The pilot, who was a visitor to New Zealand, landed the glider heavily on returning to Omarama airfield.

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

CAA Occurrence Ref 01/686

ZK-HMN, Hughes 369D, 23 Mar 01 at 07:10, Milford Sound. 2 POB, injuries nil, aircraft destroyed. Nature of flight, hunting. Pilot CAA licence CPL (Helicopter), age 29 yrs, flying hours 3150 total, 800 on type, 150 in last 90 days.

On Friday 23 March 2001, at 0705, Hughes 369D helicopter ZK-HMN experienced an engine flameout as the pilot applied collective control normally to arrest the helicopter's descent. The pilot landed the helicopter in trees on a mountain slope at about 3000 feet, some 12 km northwest of Milford Sound. The pilot and the crew member on board the helicopter were not injured.

Investigation showed a defective engine fuel control unit was responsible for the flameout. The fuel control unit had been repaired by an Australian component overhaul facility and released to service. After the fitment of the fuel control unit, the maintenance providers did not trace repeated engine overspeeding problems to the fuel control unit.

Because of the involvement of an Australian component overhaul facility, the Australian Transport Safety Bureau was invited to join the investigation. Because of initial concerns of a quality assurance problem with the facility, the Australian Transport Safety Bureau initiated a systemic investigation into its performance. The Bureau will report on the investigation results separately.

A survey of the main New Zealand maintenance organisations, and Civil Aviation Authority records, did not reveal other similar incidents involving fuel control units and power turbine governors. Other safety issues identified were trouble-shooting procedures by maintenance providers, and the monitoring of service bulletins.

Main sources of information: Abstract from TAIC Accident Investigation Report 01-003.

CAA Occurrence Ref 01/912

ZK-FQF, Micro Aviation B22 Bantam, 25 Apr 01 at 16:00, Bellhill. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age 49 yrs, flying hours 261 total, 111 on type, 9 in last 90 days.

The pilot reported that the engine stopped during a local flight. A forced landing was made into a swampy clearing.

Subsequent to the accident, the operator sent the Rotac engine for further investigation in an effort to establish cause for the sudden power loss.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 01/2087

ZK-ETP, Cessna T210N, 17 May 01 at 08:00, Ardmore. 0 POB, injuries 1 minor, damage substantial. Nature of flight, private other. Pilot CAA licence CPL (Aeroplane), age 59 yrs, flying hours 6000 total, 2000 on type, 100 in last 90 days.

After starting the engine, the handbrake was applied to permit the pilot to leave the cockpit to converse with another person. The aircraft was then noticed to be moving. Attempts by the pilot to halt the aircraft's progress proved unsuccessful. In fact, he was slightly injured during the attempt. The aircraft continued on through a fence, resulting in the nosegear collapsing and damage to the propeller and wing. The pilot considered that the handbrake lever may have been inadvertently knocked as he exited the cockpit.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 01/1768

ZK-CSD, Cessna A188, 7 Jul 01 at 14:20, Akaroa. 1 POB, injuries nil, aircraft destroyed. Nature of flight, agricultural. Pilot CAA licence CPL (Aeroplane), age 60 yrs, flying hours 21800 total, 120 on type, 138 in last 90 days.

The aircraft failed to get airborne off a farm airstrip and slid down a bank.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 01/2305

ZK-HWI, Bell 206B, 11 Sep 01 at 11:30, Mt Pisa Station. 2 POB, injuries nil, damage substantial. Nature of flight, agricultural. Pilot CAA licence CPL (Helicopter), age 52 yrs, flying hours 19500 total, 3000 on type, 103 in last 90 days.

On Tuesday, 11 September 2001, at about 1130, ZK-HWI, a Bell Jetranger 206B II helicopter took off normally for a chemical spraying flight. On board the helicopter were an instructor pilot and a trainee who was the pilot flying the helicopter. Shortly after takeoff, when the helicopter was climbing away, the drive to the engine power turbine tachometer generator failed, causing the power turbine gauge indication to decrease. The instructor pilot, believing the helicopter was losing power, immediately took control of the helicopter and instinctively lowered the collective lever. The helicopter descended and impacted the ground heavily with some forward speed, before lofting back into the air and again descending to the ground. The helicopter was extensively damaged. The two pilots were not injured.

A safety issue identified was the need for the helicopter maintenance company, in conjunction with operators it provides services for, to establish a robust system that ensures any additional maintenance due is recorded correctly, so additional maintenance is completed fully at the earliest opportunity.

Main sources of information: Abstract from TAIC Investigation Report 01-009.

CAA Occurrence Ref 01/3071

ZK-GBX, Slingsby T.41B Skylark 2B, 13 Oct 01 at 15:13, Taupo. 1 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours unknown.

The gliders collided while on final approach to land, due to confusion existing as to which glider was 'number two' to a third glider already established on the same approach.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 01/3519

ZK-JGI, Cessna A185E, 29 Nov 01 at 09:35, Motueka Ad. 6 POB, injuries 5 serious, 1 minor, damage substantial. Nature of flight, parachuting. Pilot CAA licence CPL (Aeroplane), age 32 yrs, flying hours 1592 total, 102 on type, 102 in last 90 days.

On Thursday 29 November 2001, at about 0930, Cessna A185E Skywagon ZK-JGI took off from Motueka Aerodrome on a local parachuting flight. Shortly after takeoff, at about 100 feet, ZK-JGI had a sudden and total power loss. Unable to re-establish power, the pilot guided the aircraft to a nearby kiwifruit orchard. After clipping trees the aircraft struck the ground heavily, resulting in the pilot and four parachutists receiving serious injuries and one parachutist sustaining minor injuries.

The power loss was due to the pilot inadvertently selecting the fuel OFF before the flight. The safety issues identified were the certification of the aircraft with a modified fuel selector, pilot actions for a sudden power loss after takeoff, and the non-fitment and wearing of safety restraints by parachutists.

Safety recommendations were made to the Director of Civil Aviation to address these issues.

Main sources of information: Abstract from TAIC Accident Report 01-011.

CAA Occurrence Ref 01/3953

ZK-BEC, De Havilland DH 82A Tiger Moth, 22 Dec 01 at 18:11, Thames Ad. 2 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 57 yrs, flying hours not known.

The aircraft tipped upside down while accelerating for takeoff because the joystick was not properly reinstalled and came out in the pilot's hand.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 01/4198

ZK-PRO, Quad City Challenger II, 2 Jan 02 at 12:00, Coromandel. 1 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours unknown.

The microlight's engine stopped at about 200 feet agl on final approach to land. The aircraft landed short of the runway in a mangrove swamp, which resulted in damage to the undercarriage. This accident highlights the need to ensure adequate altitude is maintained on approach in low-inertia aircraft, in case a loss of engine power occurs.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 02/1

ZK-FRR, Cessna 152, 4 Jan 02 at 10:50, Thames. 1 POB, injuries 1 minor, aircraft destroyed. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 43 yrs, flying hours 455 total, 22 on type, 20 in last 90 days.

The pilot was flying from Great Barrier Island to Thames aerodrome. Prior to departure he checked weather conditions, discussed the weather at his destination with a pilot in Thames, and received updated conditions in the Hauraki Gulf from some commercial operators. Close to Thames aerodrome he was forced to turn back due to a severe squall, which had markedly reduced forward visibility. The pilot then configured the aircraft into the poor visibility/bad weather configuration and was holding at low altitude in anticipation of an improvement in the weather. The aircraft stalled in the turn and impacted the sea off the Thames township. The pilot managed to extricate himself from the wreckage and swim ashore.

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

CAA Occurrence Ref 01/4236

ZK-DDW, NZ Aerospace FU24-950, 15 Jan 02 at 19:15, Waikaia. 1 POB, injuries nil, damage substantial. Nature of flight, agricultural. Pilot CAA licence CPL (Aeroplane), age 33 yrs, flying hours unknown.

During the takeoff roll, a tyre blew out slewing the aircraft off the airstrip. The righthand undercarriage leg folded resulting in damage to the righthand flap. A defect was found in the inner tube of the tyre, which had caused it to blow out.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 02/75

ZK-RCJ, Rotor Flight Dominator, 26 Jan 02 at 00:00, Dannevirke. 1 POB, injuries 1 serious, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours unknown.

The gyrocopter failed to recover from a manoeuvre at low altitude.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 02/235

ZK-MBM, Piper PA-44-180T, 29 Jan 02 at 17:50, Ardmore. 4 POB, injuries nil, damage substantial. Nature of flight, training dual. Pilot CAA licence CPL (Aeroplane), age 26 yrs, flying hours 1410 total, 315 on type, 75 in last 90 days.

After landing on runway 03, the aircraft's nosewheel collapsed, causing damage to the nose area and propellers.

Further investigation revealed that the nosegear downlock hook had failed in overload due to a fractured draglink attachment bolt, and general wear in the whole nosegear assembly.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 02/153

GA Defect Incidents

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

Cessna 152 – Discharge tube jams butterfly valve, P/N IO-5267-MFV

The pilot reported that the throttle jammed open at 2200 rpm.

The air filter was removed and the accelerator pump discharge tube was found in the carburetor heat box. The carburettor was removed and evidence was found that the discharge tube had jammed the butterfly.

This defect has occurred on a number of occasions before. Accelerator discharge tubes should be checked for tightness when carburettors are removed. Overhaul facilities should, when fitting discharge tubes, ensure that they are a good interference fit.

TSO 2357 hrs;TSI 52 hrs.

ATA 8500 CAA Occurrence Ref 00/3408

Cessna 172H – Continental cylinder cracks, P/N 641917

The aircraft was en route when it developed engine trouble. A successful forced landing was made in a field.

Investigation showed that the number-five cylinder had separated from the engine, cracking through the cooling fins approximately one inch from its base.

TTIS 1700 hours.

ATA 8500 CAA Occurrence Ref 00/2539

Cessna U206F – Incorrect cylinder shims fitted

Metal was found in the oil and filters during routine maintenance.

The incorrect rocker thrust washers had been fitted during a previous cylinder installation and had broken down and travelled through the oil pump and filter.The relevant areas were cleaned and the correct parts fitted and satisfactorily bench tested.

The most likely scenario is that the incorrect parts were transferred from an unserviceable cylinder assembly being kept in storage from a previous cylinder change.

TTIS 3124.3 hrs;TSO 1311.3 hrs.

ATA 8530 CAA Occurrence Ref 00/3163

Hughes 269C – Air filter intake cowl collects water

The pilot had just washed the helicopter's windscreen prior to making a flight.The helicopter was climbing through 300 feet agl when its engine suffered a power loss. A sucessful forced landing into a paddock was carried out.

An engineering check found water in the air filter. Some of this water had found its way into the engine's fuel control unit, causing the engine to fail.

The water ingress was due to the helicopter's windscreen being washed while it was sitting on a slope and water being allowed to pool in the air filter cowl. This was sucked up when the helicopter translated to forward flight.The engineer drilled a small hole in the cowl to allow water to drain away in the future.

ATA 7300 CAA Occurrence Ref 00/4051

Maule M-5-180C – Flap handle fractures

The flap handle broke completely through the base of its shaft ahead of the pivot-fixing bolt.The apparent stress fracture was probably as a result of a notch in the flap handle caused by contact with the push rod carry-through hole.The handle was welded back together with a strengthening doubler as reinforcing.

TTIS 950 hrs.

ATA 2750 CAA Occurrence Ref 00/3383

Piper PA-32-300 – Bendix ignition switch fails, P/N 10-357200-22

The aircraft was departing Christchurch when the pilot noticed smoke coming from under the instrument panel on his side. He turned off the electrics and diverted to Rangiora and carried out a precautionary landing. The passengers were evacuated due to the strong odour of burning plastics.

Further engineering investigation found that the ignition switch had failed and remained stuck in the START position. The switch and aircraft battery were replaced. A ground run and test flight successfully carried out.

ATA 2400 CAA Occurrence Ref 00/3293

Piper PA-32-300 – Alternator terminal breaks

The pilot reported that the aircraft had experienced a complete in-flight electrical failure.

Investigation revealed that the alternator lead had been installed with no allowance for flex.The alternator terminal was found to have broken off as a result.

A new terminal was fitted and the lead run with extra radius to allow flexing.

ATA 24 10 CAA Occurrence Ref 00/337

Robinson R22 Beta – Sprag clutch fails

The clutch assembly failed at 2566 hours TIS.

This component was being maintained 'on condition' as allowed for under the CAA Rules. The helicopter's Maintenance Manual recommends that the clutch assembly is overhauled and the sprag assembly replaced at 2200 hours TIS.

Failure of these components in flight could have catastrophic consequences.

ATA 6310 CAA Occurrence Ref 00/3069