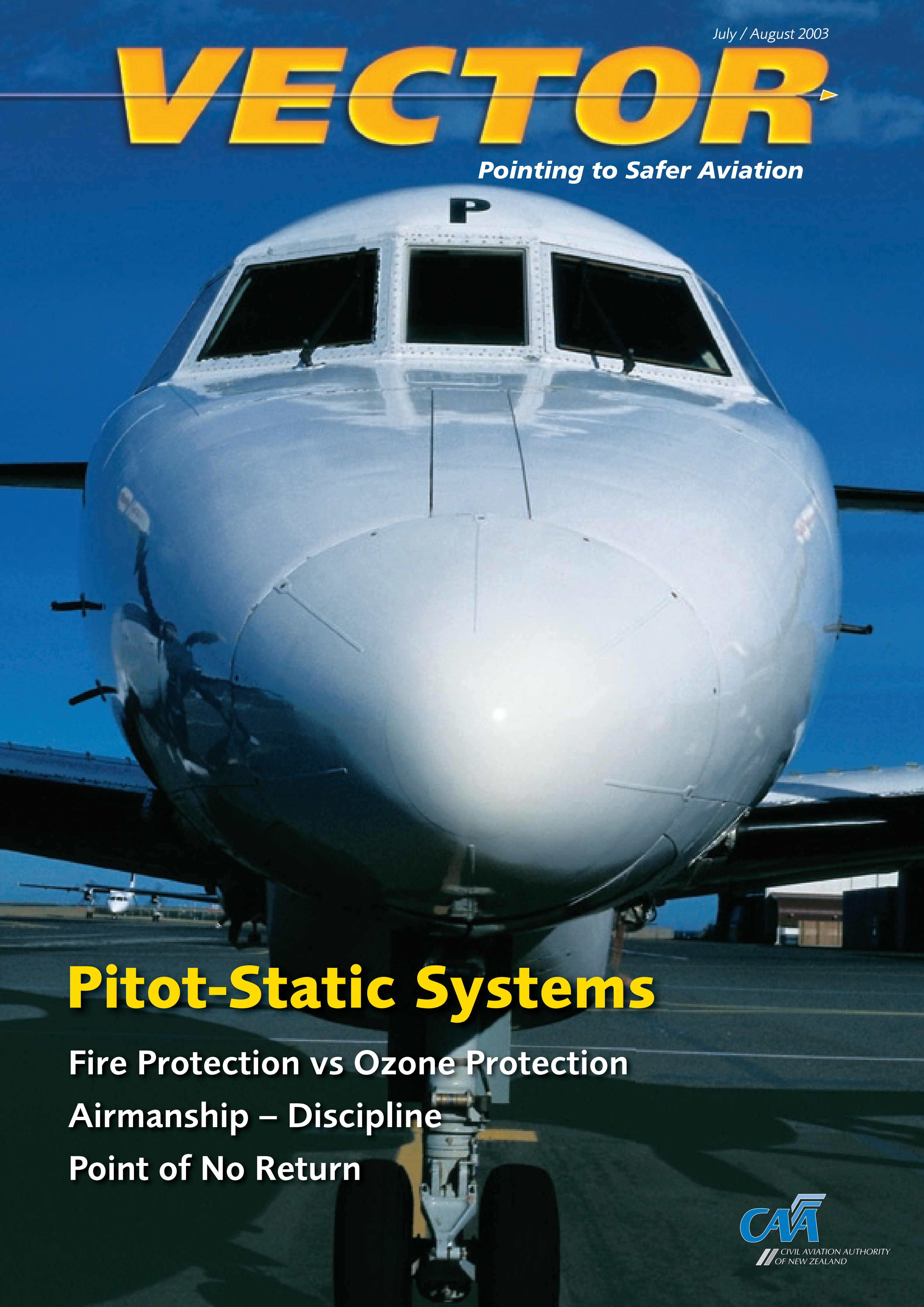
July / August 2003

VECTOR

Pointing to Safer Aviation



Pitot-Static Systems

Fire Protection vs Ozone Protection

Airmanship – Discipline

Point of No Return

CIVIL AVIATION AUTHORITY OF NEW ZEALAND

VECTOR

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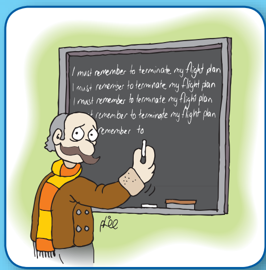

This article continues the series on airmanship and looks at the importance of discipline, ie, doing what you know you should do.

Replacement fire extinguishers with comparable characteristics to those of halon-type extinguishers are not readily available. Find out how this affects you.

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Cover Photo: A British Aerospace Jetstream Series 3200 operated by Air National Corporate Limited, on the western apron at Wellington International Airport.

Pitot-Static systems

Aircraft pitot-static systems are relatively simple and effective most of the time. They can, however, become blocked by foreign objects and provide erroneous pressure instrument readings, which could have disastrous consequences for the unwary pilot. This article looks at how the pitot-static system works, what can go wrong with it, how to interpret erroneous instrument readings and what corrective actions to take should a system blockage or malfunction occur.

It is possible that many more accidents and incidents are caused by pitot-static system blockages and malfunctions than is able to be determined through investigation. Some pilots appear to be unaware of the dangers associated with such blockages/malfunctions, and their effect on pressure instrument indications. This is of concern, as the winter months bring the highest likelihood of pitot-static blockages from ice. A lack of knowledge in this regard could have fatal consequences.

Many years ago, a Boeing 727 on a flight from New York to Buffalo entered a spin as it climbed through 24,800 feet. It crashed 83 seconds later, (the average descent rate was 17,000 fpm) killing everyone on board. The flight data recorder showed that the pilots were deceived by erroneous airspeed indications caused by an ice blockage in the pitot-static system. The airspeed had increased steadily during the climb, which encouraged them to raise the nose further to reduce the airspeed. This process continued until the aircraft's attitude was nearly 30º nose-up before it stalled and entered a spin.

This accident highlights some important factors: always follow appropriate checklists (the pilots of the Boeing failed to follow the pre-takeoff checklist and turned the pitot heat switch OFF); don't trust instruments that indicate performance beyond the capability of the aircraft (at one point the Boeing's instruments indicated a continuous 5000 fpm climb at an IAS of 340 knots); make sure you understand how the pressure instruments work; and be aware of the pitot-static blockage symptoms.

The following sections deal with understanding problems that can occur in the pitot-static system and the appropriate actions to be undertaken to avoid a malfunction developing into an in-flight safety issue.

Altimeter and Vertical Speed Indicator

Blocked Static Sources

If all static sources become completely blocked, the vertical speed indicator (VSI) will read zero regardless of whether the aircraft is climbing or descending. The altimeter will record the elevation that the blockage occurred at and will not change, regardless of changes in altitude. Totally blocked static sources can be extremely hazardous in instrument meteorological conditions, as the pilot may unwittingly descend below the minimum safe altitude for the route. If a blockage does occur the pilot has two options:

- Switch to the alternate static cabin-air source. If the aircraft is unpressurised, the ambient pressure inside the cabin will be similar to the pressure outside. There will be a degree of inaccuracy in altimeter and VSI readings as cabin pressure varies with airspeed, attitude and the positioning of the ventilation controls. When the vents are open, the air rushing in tends to pressurise the cabin. This increased pressure is sensed by the altimeter as a lower altitude. The altimeter will consequently under-read, but this is a safer alternative than having the vents closed and having the altimeter over-reading. It is, therefore, advisable to open the cabin vents when using the alternate static source during an instrument approach.
- If no alternate static source is available, the glass on the face of the VSI should be broken (unpressurised aircraft). This allows cabin air to flow slowly

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into the instrument and through the static lines to the altimeter and airspeed indicator (there will be a noticeable lag in the ASI and altimeter readings). When breaking the glass of the VSI, care should be taken not to damage the pointer. (Be aware that the VSI will now give reverse readings.)

Partially Blocked Static Sources

Static sources are also prone to partial blockages from bugs, dirt and blowing sand. Partial blockages can also occur if a pilot flies an aircraft after recent rain or after it has been washed. Water droplets and/or condensation in the static lines can freeze when climbing to altitudes above the freezing level.

Partial blockages are very dangerous because their symptoms vary according to the degree of blockage and can be difficult to interpret. If a partial blockage occurs with the aircraft in level flight, and it is then placed into a climb, the altimeter and VSI will lag (respond after the aircraft starts the climb) and indicate less than true values.

If the aircraft then flies straight and level, the instruments will slowly catch up and read correctly. If the aircraft descends, the altimeter will over-read and the VSI will indicate a slower rate of descent than actual. This could result in the pilot believing that the situation is safer than it really is. It is recommended that the alternate static source be activated at least once when on approach in instrument meteorological conditions. If the instrument pointers change significantly after its activation, a static problem exists and the alternate source should be used for the remainder of the approach. Consideration should then be given to initiating a missed approach and diverting to a suitable alternate aerodrome where a visual approach can be carried out.

Airspeed Indicator

Pitot Blockages and Leaks

The most common reason for the pitot head becoming blocked is ice. If this occurs on the ground in an aircraft with independently located static vents, the ASI will register zero on the takeoff roll. If the aircraft is then climbed, the unaffected static air pressure surrounding the diaphragm decreases, allowing the diaphragm to expand. This causes the indicated airspeed to increase progressively as altitude is gained, even though the true airspeed of the aircraft may remain constant. If the aircraft is then descended without pitot pressure, the static pressure increases and compresses the diaphragm resulting in a progressive decrease in indicated airspeed as altitude is lost.

If there is a leak in the pitot head line then the ASI will simply under-read in all situations.

To prevent icing, the pitot heat must be used at all times when flying in visible moisture. (Note that in a light piston-engine twin, the reduction in engine power caused by selecting pitot heat ON prior to takeoff could be critical to single-engine performance following an engine failure after takeoff.) The operation of the pitot heat should be checked before every flight as part of the preflight checks. Turn on the pitot heat and immediately check the pitot head by touching it to feel if it is warm. The pitot heat should not be left on for long periods of time when the aircraft is on the ground, as the heater relies on air moving past it to prevent overheating and burning out the element.

Blocked Static Sources

A complete blockage in the static system can affect the ASI even if the pitot head is clear. If the aircraft is in level flight there will be no indication of a malfunction and the ASI will read normally. If the static sources become blocked during the climb, the static pressure surrounding the diaphragm remains constant, stopping the expansion of the diaphragm as altitude is gained. The ASI will under-read as a consequence. During the descent, the static pressure will not increase and the diaphragm expands more than it should, resulting in the ASI over-reading. This is potentially very serious because the pilot will believe that the aircraft is going faster than it actually is. The aircraft will be closer to its stalling speed, the potential consequences of which need little elaboration.

Partially Blocked Static Sources

The symptoms of a partially blocked static source are slightly different to those of a complete blockage. If the blockage occurs in level flight the ASI will read normally.

If the blockage occurs during the climb, the system static pressure will reduce at a slower rate that normal, slowing the expansion of the diaphragm as altitude is gained. The ASI will therefore show a slight under-read. If the aircraft is then leveled from the climb, the ASI will continue to under-read until the static pressure slowly equalises, whereupon it will read normally.

During the descent, the static pressure will increase at a slower rate than normal and the diaphragm expand more than it should, resulting in the ASI over-reading slightly. If the aircraft is then leveled from

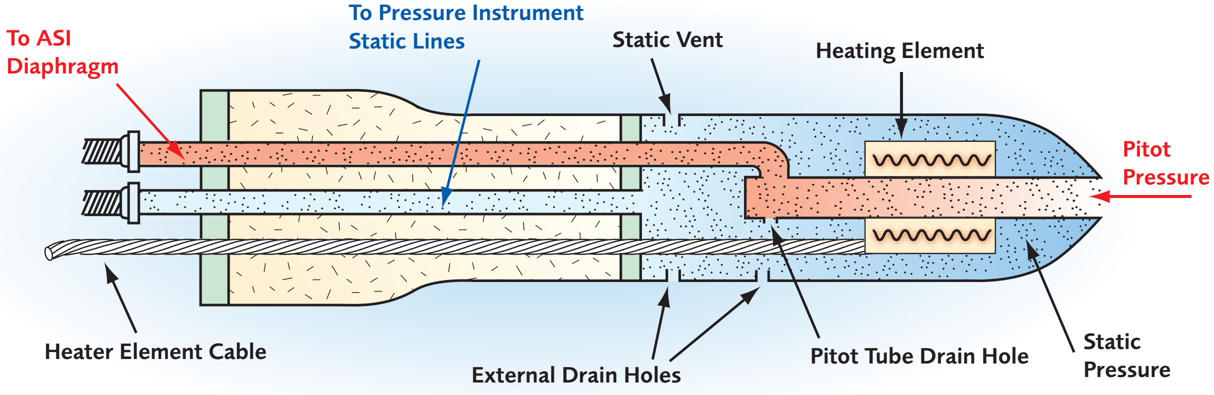

Figure 1. – Basic Pitot-Static Pressure Head

descent, the ASI will continue to over-read until the static pressure equalises, whereupon it will read normally.

Drain Holes

For the pitot-static system to work effectively there needs to be a method of eliminating water that enters the system. This is achieved through the provision of drain holes in the pitot head and drain valves in the system pipelines. Usually these drain holes are very small so they do not introduce any instrument error (see figure 1). If the main pitot head becomes blocked but the drain holes remain clear, then static pressure can still enter through the pitot tube drain holes, and this pressure will be exactly equal to the static pressure surrounding the diaphragm. This results in the ASI reading zero.

System Serviceability Checks

The serviceability of the pressure instruments and the associated pitot-static system should be confirmed during the preflight and monitored during flight. Before flight, ensure that the pitot and static sources are clear of contaminants, the pitot cover is removed, and the pitot head is securely attached and free of damage. The operation of the pitot heat (if fitted) should be checked, as indicated previously. The pressure instrument faceplates should be checked to ensure that the glass is secure and free of cracks. The ASI should read zero and the altimeter should be accurate to within plus 30 feet and minus 45 feet of the correct altitude. The VSI should read zero, but is considered serviceable if the needle shows no more than plus or minus 200 fpm.

In flight, the pilot should ensure that the ASI needle comes off the stop shortly after the start of the takeoff roll and, once airborne, that the VSI indicates a climb rate that approximates that stipulated in the Flight Manual for the given conditions. En route, the pitot heat should be used continuously if there is visible moisture present. If flying within radar coverage, a check of indicated altitude versus the altitude provided by ATC can be done. Periodically, the pilot (particularly if on an instrument approach) should activate the alternate static source to confirm that there is not a significant difference between the two pressure readings.

Continued over ...

Pitot-Static System – The Basics

The pitot-static system is a simple system of tubes used to transmit dynamic and static pressures from the points at which they are sensed on the aircraft to the pressure instruments.

Figure 2 is a simplified diagram of a pitot-static system typical of most general aviation aircraft. Static pressure (the pressure of the localised atmosphere) is transmitted to all three pressure instruments. This pressure is taken through static vents located on the side of the fuselage or a pitot-static head underneath the wing. The altimeter measures the change in the surrounding pressure like a barometer, except that the change in pressure is calibrated to be read as an altitude. For example, when the aircraft climbs, the static pressure reduces and this reduction is registered as an increase in altitude. The vertical speed indicator (VSI) measures the rate of climb or descent by sensing the rate of change in the static pressure as the aircraft climbs or descends.

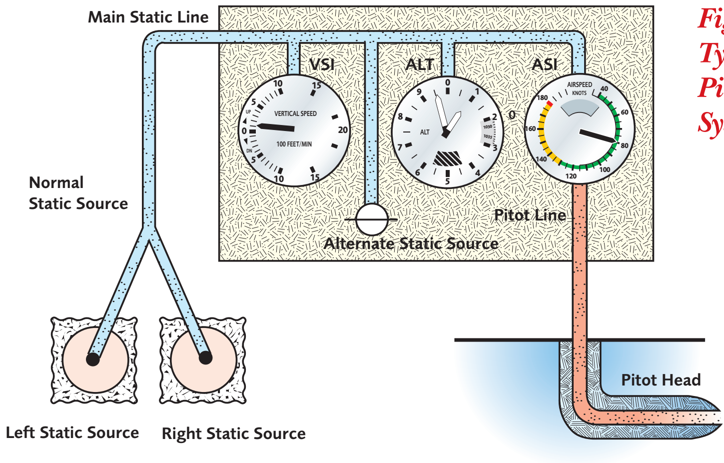

Figure 2. – Typical Pitot-Static System

Figure 3 is a simplified diagram of the airspeed indicator (ASI) system. The ASI measures the speed of an aircraft relative to the surrounding air, using the differential between the pressure of still air (static pressure) and that of moving air compressed by the aircraft's forward motion (ram pressure). Ram air plus static pressure entering the pitot head result in a pitot (total) pressure, which is transmitted through a pipeline to a sealed diaphragm inside the ASI. The static pressure component of pitot pressure in the diaphragm is balanced by the surrounding static pressure (taken from the static vents) inside the instrument casing. The amount of expansion or contraction of the diaphragm, and therefore the movement of the needle, is proportional to the change in dynamic pressure.

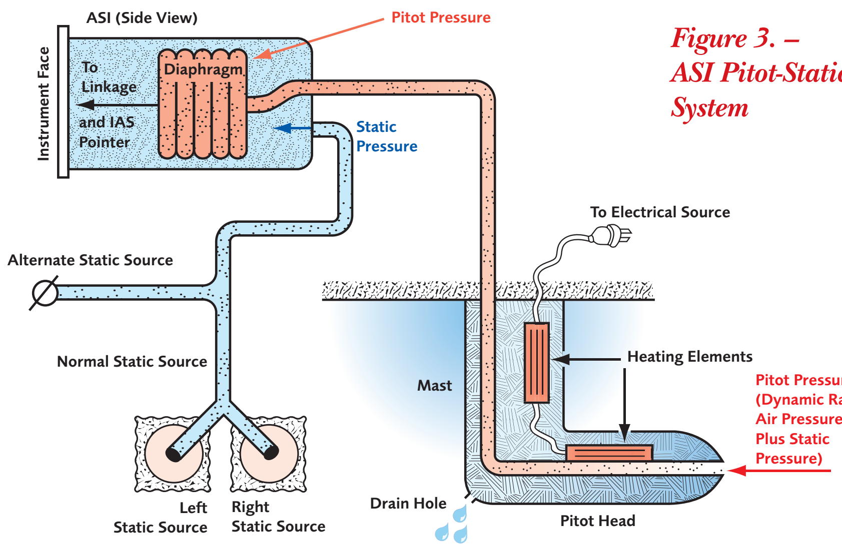

Figure 3. – ASI Pitot-Static System

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If any discrepancies occur then the pilot should continue to use the alternative static source.

A summary of pressure instrument errors associated with various types of pitot-static system blockages/malfunctions is provided in the accompanying tables as a quick reference.

Summary

It is recommended that all pilots, especially pilots of IFR aircraft, become and remain familiar with how their aircraft's pitot-static system works. Learning what can go wrong with it, how to check its serviceability, how to interpret erroneous instrument readings and what corrective actions to take should a system blockage or malfunction occur is important. This is definitely preferable to waiting until an in-flight pitot-static problem is experienced and possibly learning the hard way. ■

ASI

		Climb	Level Flight	Descent
Pitot Head	Leaking	Under-read	Under-read	Under-read
	Blocked	Increasing airspeed with increasing altitude	Reads the speed at which the blockage occurred	Decreasing airspeed with decreasing altitude
	Partial Blockage	Under-read	Under-read	Under-read
Static Source	Leaking	Over-read	Over-read	Over-read
	Blocked	Under-read	No change	Over-read
	Partial Blockage	Under-read	Lag then normal	Over-read

VSI

		Climb	Level Flight	Descent
Static Source	Leaking	No change	No change	No change
	Blocked	Zero	Zero	Zero
	Partial Blockage	Under-read	Lag then normal	Under-read

Altimeter

		Climb	Level Flight	Descent
Static Source	Leaking	Over-read	Over-read	Over-read
	Blocked	Reads the altitude of the blockage and will not change		
	Partial Blockage	Under-read	Lag then normal	Over-read

Faulty Seat Belt Inertia Reels

The recent failure of a seat belt inertia reel mechanism fitted to a Piper Arrow has highlighted an underlying design fault in some models of inertia reel that are commonly used in New Zealand aircraft.

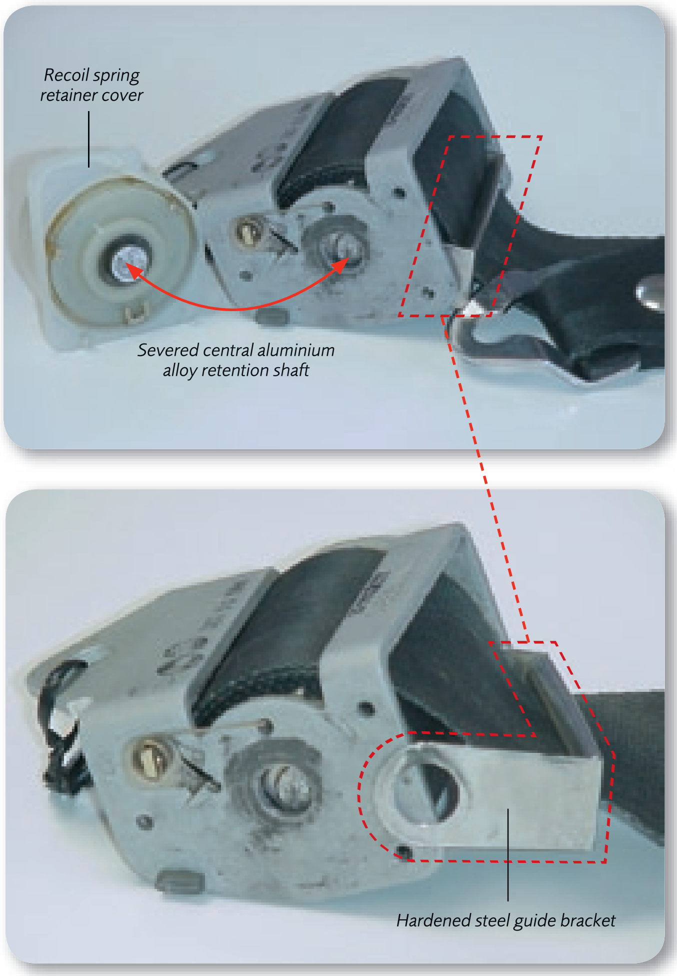
The fault relates to Pacific Scientific inertia reels manufactured before June 1992 whose part numbers fall within a range specified by the manufacturer. (The manufacturer issued a Service Bulletin, Pacific Scientific SB A 25-1124A in June 2000, to specifically address this issue.)

The problem is being caused by the hardened steel seat belt guide bracket wearing through the central aluminium alloy retention shaft (see photographs for details). In some cases the retention shaft has been completely severed, which normally causes the reel to jam, but could result in it pulling loose from its mounting. Reels manufactured after June 1992 contain a stainless steel retention shaft, which corrected the problem.

If you own or operate an aircraft that has Pacific Scientific inertia reels fitted, check that they do not fall into the specified range (refer to the above Service Bulletin for details). If they do, have your maintenance provider rectify the problem – preferably by replacing the reels. One reported indicator of the problem is a fine aluminium dust mark on the seat belt webbing near the reel, but this is not always visible. Unfortunately, the retention shaft is not visible without dis-mantling the reel.

We urge you to take the time to ascertain whether or not your aircraft falls into this category, and to take corrective follow-up action if it does. The alternative is perhaps having a faulty restraint system that fails when it is most needed, something that does not bear thinking about. ■

Pacific Scientific Inertia Reel



Seat Belt Standards

Vector has received a letter from an LAME employed with an airline. He enclosed a photograph of the seat belt in an aircraft in which his son, who is learning to fly, had been offered a flight.

"As you can see, the alloy buckle has a huge scab of corrosion and the steel tongue is badly rusted [see accompanying photograph]. If this was in a car, it would not get a warrant of fitness, so what's it doing in an aircraft?

"Seat belts in a crash are the last line of defence for the occupants – maybe they are taken too lightly by some people.

"I informed the pilot that I did not consider the seat belt safe and he assured me that he would have it rectified."

The poor condition of this seat belt is certainly cause for concern.

Civil Aviation Rules, Part 43 *General Maintenance Rules* outlines in Appendix C the procedures for Annual and 100-hour Inspections. In addition to some general inspection criteria listed, seats and safety belts are required to be inspected for "poor condition, apparent defects, and security of adjustment devices".

"Seat belts are the last line of defence – and we expect them to perform when it matters."

As with most maintenance, how well these criteria are judged and acted upon depends on the professional integrity, skill and knowledge of the licensed engineer carrying out the inspection.

The inspection would include such things as:

- Examining each strap for wear, damage, broken stitches, discolouration and deterioration.
- Examining attachments and fittings for security, wear and elongation of attachment holes.
- Checking the release mechanism and means of adjustment for freedom from slip.
- Checking the action of the release mechanism.
- Checking each inertia reel for correct function and freedom of operation.

There are extensive standards that must be met in the manufacture and continuing service of aircraft restraint systems (which is reflected in rule 91.A.4 *Restraints*) and any inspection is aimed at ensuring that the belts continue to meet those standards.

Aircraft owners have a key responsibility – an engineer may only see a private aircraft once a year. The ultimate responsibility for ensuring the aircraft is maintained in an airworthy condition lies with the owner.

Seat belts **are** the last line of defence – and we expect them to perform when it matters. It is a relatively small price to pay to ensure they are kept up to scratch – infinitely preferable to a hospital or funeral bill. ■

Nyloc Undercarriage Nuts

In the "GA Defect Incidents" section of the last issue of *Vector* we reported on a Piper PA-28-161 landing gear bolt shearing. The defect rectification action stated was: "New bolts and Nyloc nuts have since been fitted to the undercarriage assembly and the area closely monitored at each inspection".

Thank you to an eagle-eyed reader (Frank Higham) who noted that the reference to Nyloc nuts was incorrect. The PA-28-161 Parts Catalogue refers to the nut in question as Part Number MS20365-428C. However, reference to the parent Military Standard MS20365 shows that the suffix 'C' is for nuts fabricated **entirely from metal**.

Their application is usually associated with high-temperature environments, but best practice suggests that they will hold their torque more effectively than the Nyloc version no matter where they are used. This may be the reason why metal nuts are specified for PA-28-161 undercarriage bolts and may explain why the reported problem occurred in the first place. In any event, the correct replacement nut is **not** the Nyloc version.

It is also interesting to note that an Internet search on the subject unearthed two Service Bulletins warning of the use of Nyloc nuts where the metal version has been specified.

Airmanship – Discipline

Previous articles in this series have discussed a model of airmanship that can be described by using the catch-phrase 'Detect – Determine – Decide – Discipline – Do'. This article considers the fourth aspect of the model, Discipline.

Discipline

What do we mean by the term 'discipline'? In the opening article of this series it was described in terms of 'doing what you know you should do'. At first glance this seems like a ridiculous statement – doesn't everybody do what he or she knows they should? Unfortunately, no! The first article also asked the rhetorical question about how many readers had ever exceeded the speed limit while driving. Almost all of us will admit to having done so, and can come up with a host of reasons to excuse what we did. Deep down we know we shouldn't speed, but somehow we often end up doing so. In our model such behaviour would be characterised as a lack of discipline on our part.

There are many examples of similar sorts of behaviour in aviation; either things we do, or often, things we **don't** do that we know we should. The following is a list of some of the more common examples of poor discipline that experienced instructors often see:

- Failure to adequately prepare for flights, check NOTAMs, get up-to-date weather, etc.
- Poor or rushed preflight inspections.
- Carrying out-of-date publications and maps.
- Failure to adequately brief passengers about the flight.
- Inconsistent checks, or sometimes no checks at all!
- Inaccurate flying through laziness.
- Failure to keep accurate, tidy and complete logs for navigation flights.

Ever done any of these things? If you are like most pilots, and are honest, then the answer is likely to be yes. The next question is "Why?"

The Causes of Poor Discipline

The degree of discipline that an individual pilot applies to his or her flying is closely related to the attitudes they have towards flying and safety. This in turn can be strongly influenced by the culture that pervades the environment that they operate in. An organisation with a strong safety culture is likely to breed well-disciplined pilots. An organisation with a lax culture will unfortunately engender a lack of discipline in the individuals within it.

To take a non-aviation example, how many of you have had the experience of driving in some third world countries? If you have, then you are likely to be well aware that for most drivers in a lot of countries the road rules appear non-existent. The standard of driving is truly unbelievable to us, but because everyone does it, it is the accepted norm. Changing such attitudes takes time. It wasn't too long ago that drink-driving was socially acceptable in New Zealand. That culture is fortunately changing for the better. Aviation has its own problems with safety culture, though once again attitudes do seem to be changing, mostly for the better.

A pilot's level of discipline is therefore strongly influenced by the cultural environment, but the pilot's own attitudes have an equally important part to play. Researchers have determined that there are five 'hazardous attitudes' that are most commonly exhibited by pilots who display poor discipline.

The Hazardous Attitudes

- **Anti Authority –** Some people don't like being told what to do, and out of spite will often do the opposite. This can quickly lead to breaking rules, limits or exceeding whatever the pilot has been authorised to do.
- **Impulsiveness –** This means to act without thinking, considering or analysing the situation.
- **Invulnerability –** It can't happen to me. Sorry, it can!
- **Machismo –** Some people like to take unnecessary risks, maybe for the adrenaline rush, or perhaps out of a mistaken belief that they need to prove themselves or impress others.
- **Resignation –** The feeling that trying again or trying harder is not going to solve the problem, so not even bothering to do anything about it.

Have you ever recognised any of these symptoms in yourself? If so, the chances are that your level of flying discipline is not what it should be.

The Solution to Maintaining Discipline

There is a very simple strategy that you can use to improve your level of discipline – pretend that every flight you do is a check flight with an ASL examiner. It is pretty well guaranteed that you won't deliberately do anything stupid on such a flight. You will be on your best behaviour. You will be very unlikely to display any of the hazardous attitudes listed above.

If you can do it with an examiner on board, then you can do it on **all** your flights. ■


Photograph provided courtesy of Glenn Williams, 'Wormald'.

Fire Protection vs Ozone Protection

– What's Happening with Fire Extinguishers? –

The March/April 2002 edition of *CAA News* ran an article regarding the withdrawal of halons, or BCFs (bro mochlorofluoromethane), as fire extinguishing agents in accordance with the 1987 Montreal Protocol, which aimed to reduce damage to the ozone layer. The article proposed that dry powder was the safe alternative to halons. There are, however, some associated problems with the use of dry powder extinguishers and we will discuss these, and other alternatives, in this article.

The majority of fire extinguishers fitted to aircraft in the past have been of the halon type. They are light, small, and provide the best 'knockdown' effect on fires.

As the last of the halon stocks are being used up, it is timely to have a look at the alternatives. The problem is that replacement fire extinguishers with comparable characteristics to the halon types are not readily available.

The CAA Rules

Civil Aviation Rules, rule 91.523 *Emergency Equipment* requires that aircraft used for commercial operations, capable of carrying one or more passengers, have a readily-accessible portable fire extinguisher. The number of extinguishers required is in accordance with an accompanying table, eg, passenger numbers of one through thirty require one handheld fire extinguisher.

Civil Aviation Advisory Circular 43-6 *Emergency Equipment* requires that: "…each portable fire extinguisher should be weighed at intervals not exceeding 12 months. The weight shall not be less than that specified by the manufacturer for a fully charged extinguisher."

Maintenance Checks

Weighing Problems

It has been found that many extinguishers in light aircraft pass the weight test, but in fact have no propellant pressure remaining. The nitrogen propellant may leak out over time, due to the 'O' ring neck seal in the cylinders perishing, as they only have a design life of 18 to 20 years. Weighing is therefore of limited value, as it is only possible to ascertain the weight of the liquid halogen, or dry powder in the cylinder. Without the nitrogen charge the effective operation of the extinguisher cannot be assured in an emergency. Some imported extinguishers are fitted with pressure gauges and although scarce, these types are the preferred option.

Hydrostatic Check

A hydrostatic check of the cylinder is required every five years. This involves a pressure check, which measures the percentage of permanent expansion of the cylinder when it is subjected to a specific pressure loading.

When a cylinder is charged, the pressure causes expansion, or stretch, of the metal. When the pressure is released, the cylinder will contract back towards its original dimensions. When recharged, it will expand again. Over time, this expansion and contraction will weaken the cylinder. The purpose of the hydrostatic check is to ensure that the cylinder hasn't expanded beyond a certain specified point. If it has, it must be discarded.

The process requires that the extinguishing agent and the propellant first be removed from the cylinder.

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As it is now illegal to release halons to the atmosphere, most portable extinguishers containing halons are being treated as storage vessels, which have a 12-year life. They must then be disposed of in an approved manner. As Halon 1211 (most portable fire extinguishers contain this derivative of halon) has not been manufactured since 1987, extinguishers being classed as storage vessels have now exceeded this 12-year life.

Although there are still limited stocks of halon left in New Zealand, these are mainly supplied where expensive fixed systems are used, such as in engine compartment installations on larger commercial and military aircraft.

British Aerospace Jetsteam Series 3200 engine compartment fire protection system.

Approved Extinguishing Agents

Rule 91.523 currently approves the following extinguishing agents for fire extinguishers:

- Halon 1211.
- Halon 1301.
- Carbon dioxide.
- Dry Powder; or
- Another agent which provides an equivalent extinguishing action.

New Products

A new extinguishing agent has been developed in the United States that has similar properties to halon, but is more ozone-layer friendly. This product, called halotron, is probably not yet available in New Zealand as this would depend on someone making a substantial investment in a service facility, for a limited market demand. Halotron is expensive – a new extinguisher of this type costs around NZ $1000. Halotron units manufactured in the USA have an Ozone Depletion Potential (ODP) of 0.014 compared to halon units, which have an ODP of 1.0.

Carbon Dioxide Extinguishers

Significantly larger quantities of carbon dioxide extinguishing agent are required to put a fire out than is the case with halons.

At the moment the only practical alternative to halon is carbon dioxide. This can be used on Class A, B and C fires. Class A fires involve solid materials such as wood, cloth, paper, rubber and many plastics. Class B fires involve flammable liquids or grease, and Class C fires are electrical.

The 'knockdown' effect of carbon dioxide is not as good as halon or dry powder, mainly because it does not have the cooling properties of the other chemicals. It relies on a flooding factor, reducing the oxygen concentration to between 14 percent and 10 percent. Oxygen concentrations of less than 14.8 percent will not support flaming combustion in the majority of cases. Significantly larger quantities of the carbon dioxide extinguishing agent are required to put out a fire than is the case with halons.

The carbon dioxide extinguisher should be held one to two metres from the base of the fire and gradually moved forward and upward, the nozzle swinging in slow, even arcs.

Security of Extinguishers in the Cockpit

In order to be readily accessible and secure in flight, fire extinguishers should be fastened in the aircraft with an approved quick-release bracket. Installation is a job for a licensed aircraft maintenance engineer.

An unsecured fire extinguisher, which could weigh as much as three kilograms, would be a hazard flying around the cabin during turbulence, or rolling around the floor. Using a bracket to mount it makes its exact location certain in an emergency.

There have been instances where a fire extinguisher latch has been inadvertently released when pilots enter or exit the aircraft, presenting the hazards referred to in the above paragraph. There have been incidents where the extinguisher has been expelled through the rear cabin window of a Cessna 152 Aerobat. In order to prevent this from happening, particularly in aircraft with a confined cockpit, such as the Pitts Special, consideration should be given to having the latch secured. To this end, the military, and some civilian installations, use soft copper annealed wire to secure latches. This is easily broken when required in an emergency, while retaining security of latches from inadvertent unlatching.

It has been known for the extinguisher to be expelled through the rear cabin window during aerobatics or in turbulence.

Rapid motion, or advancing too quickly, can leave areas where the fire appears to be out, only to rekindle because of surrounding hot temperatures.

Dry Powder Extinguishers

Dry powder extinguishers have a good 'knockdown' capability, and are effective on Class A, B and C fires. They do, however, have some associated problems – the powder may cause respiratory and visibility problems in confined spaces. The Fire Service has stated, however, that if the dry powder extinguisher is utilised properly by a trained person, a very small discharge of extinguishing agent can be used in a confined space to better effect than a carbon dioxide extinguisher and with minimal risk of incapacitating a person. It is therefore considered that a small aircraft cockpit fire could be contained effectively using a dry powder fire extinguisher with minimal risk to the occupants provided it was used properly. Training in its proper use in confined spaces is therefore essential.

Training in the proper use of dry powder fire extinguishers in confined spaces is essential.

When operating a dry powder or a carbon dioxide fire extinguisher, it is important not to panic and release all of the contents in one go. In other words – don't blow it all at once!

With carbon dioxide, the fire might rekindle and you wouldn't have any extinguishing agent left to put it out.

If you release all of the charge in a dry powder extinguisher within the confines of the cockpit, you will likely have breathing and visibility problems. The powder released, which is finer than talcum powder, will persist in the atmosphere for some time before dissipating.

As yet, in New Zealand, there is no really good substitution available for halon (BCF) type portable fire extinguishers.

Corrosive Effects of Dry Powder

The chemicals used in dry powder extinguishers are corrosive to aluminium and other aircraft components. In a life-threatening situation, the extinguisher should always be used, as the detrimental effects of the fire would almost certainly be greater than the consequences of discharging the extinguisher. Nevertheless, after a dry powder fire extinguisher has been discharged, the corrosion issue needs to be addressed and appropriate remedial maintenance action taken.

The following account was received from the principal of an aircraft maintenance engineering facility:

> "We recently had an incident where a dry powder extinguisher was discharged onto an aircraft, and it has brought to light some issues regarding the types of extinguishers that are able to be used on aircraft.
>
> The extinguisher used was a dry powder type (mono-ammonium phosphate), and upon talking to a fire extinguisher service centre, we were informed that it was highly corrosive to aluminium and other metals and to wash it off as quickly as possible. This we did, and treated the whole engine bay with corrosion inhibitor. My concern is that had we not been informed of this, we would probably have blown as much of the powder out as possible with an air gun, and any residual would probably have been left to disperse in its own time, as it obviously doesn't pose a fire hazard. An operator who has an inadvertent activation inside the cabin would probably have done much less, perhaps only vacuuming up the residual powder, thereby posing a significant hazard to the aircraft, particularly since it could be up to 12 months until its next inspection."

Conclusion

Light aircraft and helicopters used for commercial and charter operations have a need for a suitable portable fire extinguisher replacement to the halon types that have been in use for many years.

From all of the above information it would appear that, as yet there is no really good substitute for halon (or BCF) type portable fire extinguishers available in New Zealand. However, here is a summary of the preferred options based on the information we have:

- Existing halon fire extinguishers that are fitted with a pressure gauge are still the preferred option, however, these may be hard to obtain.
- The next preferred option is carbon dioxide.
- Dry powder is next, provided training in its use has been given and that there is an awareness of its associated limitations and problems.

The optimum would be the new ozone-friendly product, halotron, which has been developed in the USA, but availability is uncertain and it is comparatively very expensive.

We recommend that operators arrange fire extinguisher training for their pilots and other operational staff. The companies involved with fire protection systems, or the Fire Service, may be able to assist with this – ask at your local Fire Station, or Airport Rescue Fire Unit. ■

Footnote The Australian Civil Aviation Authority (CASA) has approved Halon BCF units made as special batches by Chubbs in Australia. These could be made available, subject to an import licence here and an export licence in Australia. Any imports, however, would need the support of a service facility. Presently, Air New Zealand will only service units with a specific aircraft part number, and these Australian units would probably not have this. We are aware that the Chief Operating Officer of one fire protection system company is presently involved in discussions with the Ministry for the Environment and the Ministry for Economic Development, as well as the New Zealand Civil Aviation Authority, with a view to investigating the viability of importing some of these units into New Zealand.

Acknowledgments: We thank John Fraser, of 'Halon Recycling N.Z. Ltd,' for his assistance in providing valuable information during the preparation of this article.

Point of No Return

Some Fatal Mistakes

The aircraft was on a VFR flight from the West Coast of the South Island to Twizel in the Mackenzie Basin. The weather was fine on departure from the West Coast, but it appears that no pre-flight weather information was obtained by the two pilots or flight plan filed. On reaching the Mackenzie Basin they found themselves caught VFR on top of a low cloud layer, with insufficient fuel to return to the West Coast. They were apparently trying to reach Alexandra when the fuel ran out. The aircraft crashed onto mountainous terrain near the Lindis Pass and was probably in cloud at the time of impact. The accident was fatal.

It is sobering to consider what must have been going through the pilots' minds when they realised their predicament; caught in VMC on top over mountainous terrain and running out of fuel. It must have been even worse when the engine finally quit and they had nowhere to go but down into the cloud.

What Can We Learn?

We can learn a number of lessons from this accident, including the necessity of obtaining thorough pre-flight weather information and the importance of filing a flight plan. While filing a flight plan probably wouldn't have made much difference to the pilots' chances of survival in this instance, it certainly would have if they had survived the impact. The alarm would have been raised as soon as their SARTIME was exceeded and Search and Rescue personnel would have had some idea of where to start looking.

What is PNR?

The lesson this article addresses is the concept of point of no return (PNR). This is the point on a flight beyond which the aircraft has insufficient fuel to get back to the departure point. A cardinal rule of aviation is that pilots should never go past PNR unless they can be assured that weather conditions at their destination (or a safe alternate aerodrome) will allow for a safe arrival.

You may think the PNR is something that applies only to bigger aircraft on long flights, particularly oceanic crossings, and indeed it is an extremely important flight-planning factor for such flights. (The author of this article spent many years flying Hercules to Antarctica. On these flights, the PNR back to New Zealand was normally at around 65 degrees south. This was about the start of the ice pack with some 1000 NM, or three hours flight time, still to go to McMurdo. If the weather changed for the worse during those three hours life could get very interesting.)

But, PNR also applies to VFR flights around New Zealand. There are significant areas of the country where aerodromes or suitable landing areas are few and far between, particularly on the West Coast, in Fiordland and the mountains of the

PNR Calculation

PNR can be calculated before flight using the following formula:

X = POH / O+H, where

X is the distance from origin to PNR,

P is the safe endurance (fuel burn at cruise power with a specified reserve),

O is the planned groundspeed out from the origin to destination, and

H is the planned groundspeed you would have for the return trip.

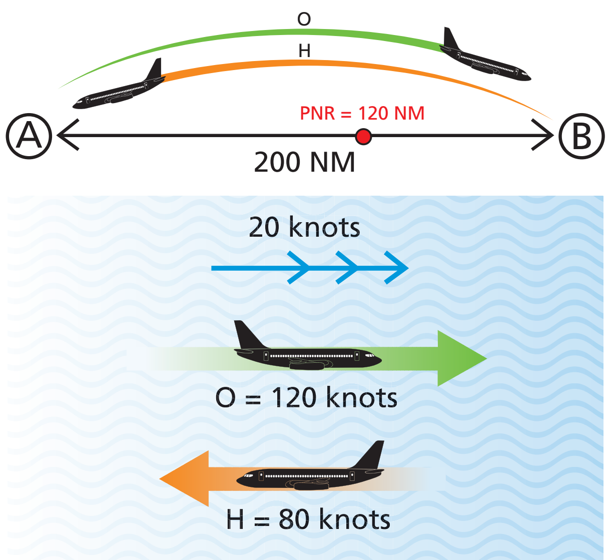
Consider a flight from **A** to **B** 200 NM apart. Your aircraft cruises at 100 knots. For the trip out there a tailwind of 20 knots is planned for, so **O** = 120 and **H** = 80. You have a safe endurance of 2.5 hours (plus a reserve). Therefore:

X = 2.5 x 120 x 80 / 120 + 80 which equals 120 NM.

If you fly past this point, you won't have sufficient fuel to get back without eating into your reserve.

Try putting some other numbers into this equation, or calculate PNR for flights you might undertake. Some points to note are:

- To keep units consistent, if you calculate speed in knots, and distances in nautical miles, then your endurance must be expressed in decimal time as in the above example.
- PNR is always earlier if there is any wind – either headwind or tailwind on either leg. In the above example, the nil-wind PNR is at 125 NM. Conversely if the wind increases to 50 knots, PNR decreases to 93.75 NM.
- This formula only works for straight out-and-back flights, where the wind stays the same and your cruise airspeed and fuel consumption are the same on both the outbound and homeward legs.



South Island. Even the North Island ranges, especially inland of Gisborne, can pose just as much of a problem. Rapid changes in weather conditions, especially when crossing mountain ranges, can also leave pilots in similar situations to the one faced by the pilots in this accident.

How is PNR Applied?

The accompanying sidebar shows you how you can calculate the PNR before a flight. When in flight you must be assured of the weather at your destination before you proceed beyond this point. You also need to monitor your fuel consumption, and any changes to wind en route, that could change the PNR. In a number of circumstances, particularly when you have other suitable alternate aerodromes to divert to, an out-and-back PNR may not be the best way of approaching the problem. Instead, you must have calculated the amount of fuel you need to reach the designated alternate. At any time in flight you must always have an aerodrome, or other safe landing area, that you know you can reach with the fuel remaining, plus a reserve.

Whichever method you use to calculate it, never go past the PNR unless you know you can safely land, otherwise there may well be no returning from the flight. ■

Flight Plan Overdues Update

In the last issue of *Vector* we promised we would provide regular feedback on how the VFR flight plan overdue statistics are trending. We also mentioned that there were some terminate-your-flight-plan reminder tools in the pipe-line.

National Briefing Office statistics just to hand, show that there has been a two-percent drop in the number of overdue VFR flight plans compared with those published for March – a step in the right direction. Well done to those of you who remembered to amend or terminate your flight plans. There is still plenty of room for improvement though!

A breakdown of the number of overdues by industry sector, the reason for the overdue and the number of flight plans filed each month is detailed in the accompanying graphs.

The CAA, in conjunction with Airways New Zealand, has just released an A2 poster and two types of stickers designed to help you remember to amend or terminate your flight plan. Entitled 'Amend SARTIME or Terminate Flight Plan' they are based around a jigsaw puzzle and its missing piece; the concept being that 'no flight is complete until the flight plan has been terminated'.

The poster (see page 21 for a sample) is designed to raise awareness of the importance of amending or terminating your flight plan. It should be displayed in a prominent place within your organisation.

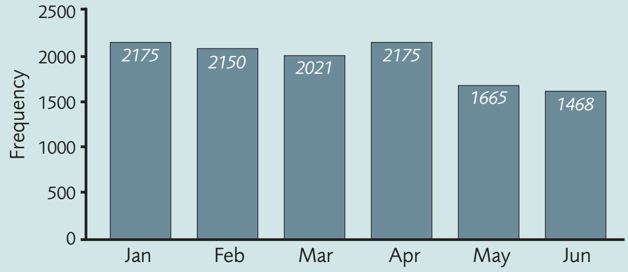
The A6 sticker (depicts the missing jigsaw piece) is intended as a memory jogger only and should placed in locations that pilots are likely to frequent after a flight eg, the toilet, kitchen, reception area or hangar.

The smaller A8 sticker contains the same information as the larger one, but should be placed on items like the VFG, flight log clip board, aircraft dashboard or door. Both stickers are of the non-permanent variety so will not damage the surface underneath when removed.

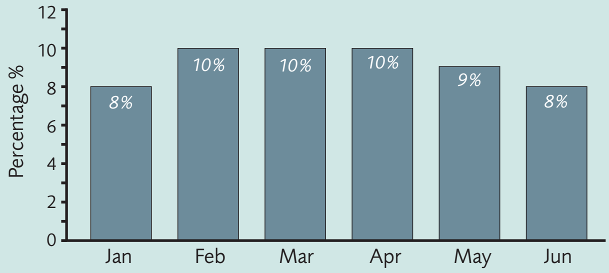
All of these products are available from your local CAA Field Safety Adviser or flight training organisation. We hope that you will use them.

Let's keep working together to improve aviation safety and to reduce National Briefing Office and Search and Rescue costs, by minimising the number of overdues!

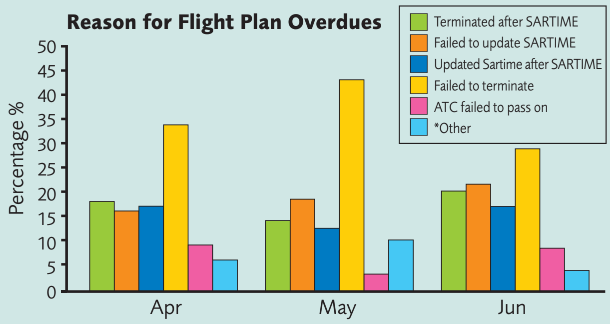
Number of VFR Flight Plans Filed 2003



Percentage VFR Flight Plan Overdues 2003

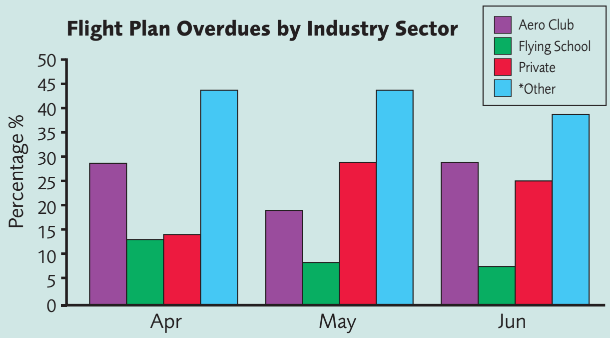


Reason for Flight Plan Overdues



* (Note that 'Other' includes IFR proceeding VFR failed to terminate, failure to request termination at an attended aerodrome, and not specified.)

Flight Plan Overdues by Industry Sector



* (Note that 'Other' includes commercial operators, RNZAF and Airways New Zealand.)

Avgas – Specific Gravity Values

While researching the *Fuel Management* GAP, Safety Education & Publishing Unit staff discovered that the specific gravity of New Zealand avgas was lower than the value of 0.72 that was being used by most pilots for weight and balance calculations.

The best information available at the time of writing the GAP indicated that the average specific gravity of fuel batches being imported into New Zealand was 0.695. This value provides a slight increase in useful payload when used in weight and balance calculations. It was decided to bring this information to pilots' attention in the form of an avgas quantity/weight conversion flow diagram on page 10 of the *Fuel Management* GAP. (This also meant amending all of the pre-determined weight conversion factors in the diagram.)

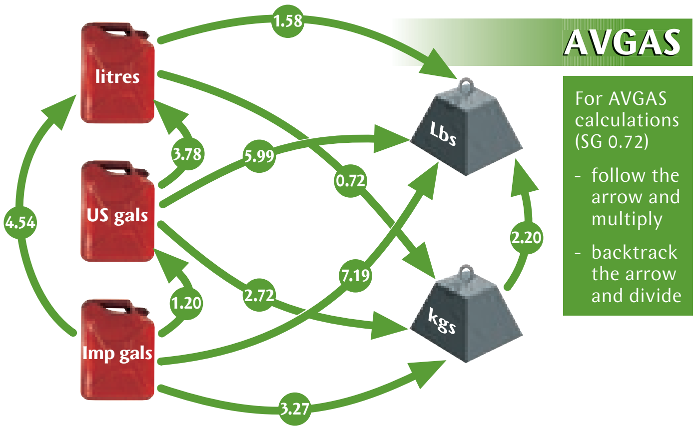
However, recent information obtained from fuel companies indicates that a small amount of avgas with a specific gravity of 0.715 is currently being imported into New Zealand. This has effectively made the fuel conversion diagram in the GAP inaccurate in some situations.

In the interests of safety, we advise avgas users that the original value of 0.72 should be used for all weight and balance calculations. This way, the possibility of exceeding the aircraft MAUW is avoided should the heavier fuel be uplifted.

The CAA apologises for this state of affairs, and we propose to rectify the situation as follows:

A corrected avgas conversion flow diagram sticker (illustrated here) using the original specific gravity value of 0.72 has been produced to enable pilots to correct the GAP – or to stick in a prominent location for use as a quick fuel conversion reference. Stocks of these will be circulated to all organisations that hold copies of the booklet via CAA Field Safety Advisers. All booklets currently held in stock by the Safety Education & Publishing Unit will be corrected before distribution.

Note, we have been advised by the manufacturer that Aero Scale navigation rulers sold since March 2003 (depicting the new VNC scale) also use 0.70 for avgas conversion values printed on the ruler's back face. The manufacturer advises that customised correction stickers will be made available to pilots who have purchased one of these rulers through their local flight training organisation. Existing stocks will be corrected. ■



AV KIWI

Safety Seminars

– Weather Wisdom –

Last year's Av-Kiwi Seminar series *Weather Wisdom* was so successful that the topic will be offered again this year at different venues. The focus will be on understanding our weather from an aviation perspective.

Come along and listen to key presenter Erick Brenstrum from MetService speak on this topic. He will be supported by a local aviator (who will provide comment on local weather scenarios) and CAA staff.

Erick Brenstrum is the author of the highly acclaimed *New Zealand Weather Book*. In this very readable book, he clearly explains the weather, covering such things as how to interpret a weather map, and the wide range of weather patterns and processes that affect New Zealand.

The seminars will involve a mixture of presentations and practical work. The CAA will provide afternoon tea at each venue, and will also be providing all attendees with a **free** copy of an interactive CD-ROM *Weather Wise 2*. This CD-Rom is about assessing flying weather, so you will be able to further expand your knowledge and skills, using your home computer. A copy of the *New Zealand Weather Book* will also be awarded, as a spot prize, to one lucky person at each seminar.

Don't miss this opportunity to learn more about one of the most influential factors affecting our flying environment. Dates and venues have now been set for 2003 as detailed below.

Be there!

Seminar Venues

To be held on the following Sundays from

12:30 pm – 4:00 pm:

Hamilton Sun 17 August

Waikato Aero Club, Steele Road, RD 2 Hamilton

Dunedin Sun 24 August

Otago Aero Club, Taieri Aerodrome, Mosgiel

Palmerston North Sun 31 August

Manawatu Districts Aero Club, Palmerston North Aerodrome

Lifting the Game

At some recent CAA-sponsored safety seminars there was a fair bit of talk about 'lifting the game' within the general aviation community. Discussions have mostly centred on improving basic airmanship practices thereby lifting safety standards. A lot of heads have nodded in agreement to this at these gatherings. But, as with most things in life, the real change in behaviour needs to be at the coal face. It is not just about agreeing or committing in some notional way to do things better at a meeting, it is about doing things right, each and every day we contemplate a flight. Yes, it is about a change in attitude, and it is about being disciplined enough to translate that attitude into behaviour.

"…there were a number of pilots who blundered their way into Matamata CTR oblivious to its presence…"

Recently, a CAA staff member attended the Walsh Memorial Flying School at Matamata and was concerned by the lack of basic airmanship displayed by some of the pilots visiting Matamata during the event. It seemed that they had not checked the *AIP Supplement* and NOTAMs before commencing their flight to Matamata. The reasons for his concern were valid as there was, and has been for many years, an ATC presence at the airfield in the form of a control zone (Matamata CTR/D) for the two-week duration of the school.

A Supplement detailing the control zone's parameters, arrival and departure procedures, and associated radio frequencies is always issued several months prior to the event to provide pilots with as much notice as possible. Furthermore, on-going trigger NOTAMs referring to the Supplement are issued daily once the airspace is activated.

As you can probably guess, this year, as in past years, there were a number of pilots who blundered their way into Matamata CTR oblivious to its presence only to find themselves in the middle of a lot of other aircraft activity.

Obviously, the aircraft involved were itinerant aircraft making only a short stopover at Matamata, which presumably means they were on a cross-country flight of some distance. It is both a CAA rule requirement and basic airmanship to plan such flights, which means having studied the relevant documents thoroughly. Reading the Supplements and NOTAMs applicable to the intended route is definitely an important part of this process.

One of the aircraft involved in these recent airspace incursions came from the lower North Island and it was pretty evident that neither the Supplement and NOTAMs, nor the weather forecast had been consulted. Others came from closer at hand, but still without a clue that Matamata aerodrome was very different and very busy at this time. Fortunately, Airways New Zealand staff members are good at handling these situations and managed to keep the traffic flowing safely.

Usually, the offending pilots end up talking away on the aerodrome's secondary frequency as they attempt to join the aerodrome circuit. It isn't good to see licensed pilots making right fools of themselves in front of a large community of budding aviators – all for the lack of a bit of preparation and planning.

The observers to these unprofessional incidents are the sixty or so students attending the school, and around forty experienced instructors, aviators and air traffic controllers. Typically, there are about 20 aircraft based at the school. Parallel runway operations take place in conjunction with four training areas in the vicinity. At any one time there can be eight to ten aircraft airborne and others preparing to leave. Weather permitting, flying takes place pretty much continuously and sometimes at

Continued over …

Photographs courtesy David Jupp, Walsh Memorial Scout Flying School

... continued from previous page

night as well. It is very busy! It is very professional!

As with previous years, these errant pilots 'fess-up' when on the ground (they really don't have much option). Maybe they have since learnt the importance of checking the Supplements and NOTAMs before commencing a flight. We hope that they have, as it isn't a hard task.

If you are hiring an aircraft from an organisation, they should have a copy of the latest Supplement for you to check when flight planning, although it is preferable to have your own publications to assist with pre-flight planning at home. AIP *Supplements* are part of the VFG subscription, along with VFG *Change Notices* and AICs. Can we assume that pilots not receiving (or is it just not reading?) Supplements do not have a current VFG either? A VFG subscription (with its accompanying publications) is available from Aviation Publishing (Tel: 0800 500 045) for less than the cost of one hour's flying per annum (give or take a bit) – not a lot of money when you consider the safety and security they provide. Carrying appropriate and current publications and charts is part of a pilot's responsibility. Supplements are also available free of charge on the Airways New Zealand IFIS web site (www.ifis.airways.co.nz) under **Publications/Documents On-line**.

Daily NOTAMs are available free of charge from the National Briefing Office via their IFIS web site (www.ifis.airways.co.nz) or by fax-on-demand*. Checking the NOTAMs (and the weather briefing) should be as routine as checking the aircraft fuel status – always done. Not only will they provide you with all the safety-critical information applicable to the intended route, but the trigger NOTAMs will alert you any relevant Supplements.

Now, none of this is rocket science – it's just good safe planning sense. It is all part of airmanship and lifting the aviation safety game. Please help us lift the game by setting a good example and encouraging others in our fraternity to do likewise. ■

* If you don't have a fax-on-demand card, and would like one, contact Michelle Frood
email: michelle.frood@airways.co.nz
or Tel: 0–3–358–1564.

Field Safety Advisers' Cellphone Numbers Change

Please note that all CAA Field Safety Advisers have changed to Telecom's (027) cellphone network. The new numbers are published below.

Don Waters
(North Island, north of line, and including, New Plymouth-Taupo-East Cape)
Tel: 0–7–823 7471
Fax: 0–7–823 7481
Mobile: 027–485 2096
e-mail: watersd@caa.govt.nz

Ross St George
(North Island, south of line
New Plymouth–Taupo–East Cape)
Tel: 0–6–353 7443
Fax: 0–6–353 3374
Mobile: 027–485 2097
e-mail: stgeorger@caa.govt.nz

Murray Fowler
(South Island)
Tel: 0–3–349 8687
Fax: 0–3–349 5851
Mobile: 027–485 2098
e-mail: fowlerm@caa.govt.nz

Owen Walker
(Maintenance, North Island)
Tel: 0–7–866–0236
Fax: 0–7–866–0235
Mobile: 027–244 1425
e-mail: walkero@caa.govt.nz

Bob Jelley
(Maintenance, South Island)
Tel: 0–3–322 6388
Fax: 0–3–322 6379
Mobile: 027–285 2022
e-mail: jelleyb@caa.govt.nz

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* 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
03/10	31 Jul 03	7 Aug 03	2 Oct 03
03/11	29 Aug 03	4 Sep 03	30 Oct 03
03/12	25 Sep 03	2 Oct 03	27 Nov 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. Full TAIC accident reports are available on the TAIC web site **www.taic.org.nz**.

ZK-NPR, Piper PA-31, 24 Jun 02 at 07:34, Napier Ad. 1 POB, injuries nil, damage substantial. Nature of flight, frieght only. Pilot CAA licence CPL (Aeroplane), age 55 yrs, flying hours 4146 total, 240 on type, 53 in last 90 days.

On Monday 24 June 2002, at about 0730, Air Napier PA31-310 Navajo ZK-NPR was on a freight flight from Palmerston North when the pilot had to make an emergency landing at Napier because the righthand undercarriage was unable to be extended. The landing was successful, with moderate damage to the aircraft and no injury to the pilot.

The righthand undercarriage had failed to extend because the uplock hook could not release the undercarriage leg. This resulted from a flat oleo strut becoming compressed, and was a previously-unknown design deficiency.

A safety issue identified was the need for wide publicity, including foreign countries operating the PA31 type, about this deficiency.

A copy of the full report is available on the TAIC web site.

Main sources of information: Abstract from TAIC report 02-008

CAA Occurrence Ref 02/1919

ZK-HRC, Bell 206B, 2 Oct 02 at 12:15, Huka Falls Rd. 2 POB, injuries 1 minor, damage substantial. Nature of flight, ferry/positioning. Pilot CAA licence PPL (Helicopter), age 67 yrs, flying hours 1525 total, 1290 on type, 55 in last 90 days.

On Wednesday 2 October 2002 at 1215, ZK- HRC, a Bell 206B JetRanger III helicopter, was positioning to uplift passengers for a local scenic flight. Approaching to land at the Huka Falls landing pad, the pilot reported a loss of engine power. The pilot managed to fly the helicopter onto the landing pad, where it slid across the pad and over the edge, rolling onto its side. The two occupants received minor scratches and bruising. The helicopter was extensively damaged.

The cause of the power loss was not determined. No new safety issues were identified.

A copy of the full report is available on the TAIC web site.

Main sources of information: Abstract from TAIC report 02/011

CAA Occurrence Ref 02/2891

ZK-JMB, Cessna 172N, 9 Nov 02 at 14:00, Waitangi Golf Course. 4 POB, injuries 1 minor, damage substantial. Nature of flight, transport passenger A to A. Pilot CAA licence CPL (Aeroplane), age 19 yrs, flying hours 541 total, 250 on type, 104 in last 90 days.

The aircraft was on a scenic flight from Paihia to Cape Reinga, when the engine started to misfire and lose power. The pilot was unable to rectify the situation so elected to make a forced landing onto the Waitangi Golf Course. Touchdown was achieved into wind on a fairway, but with insufficient distance remaining to stop. The pilot steered the aircraft between trees, which resulted in substantial damage.

The newly-overhauled engine had run 6.3 hours since installation two days prior. On the previous day, the pilot had reported that the engine missed momentarily on two occasions, but ran normally thereafter. This had been attributed to some water contamination he had found in the fuel.

Investigation of the aircraft fuel system subsequent to the accident found that there was a sufficient quantity of uncontaminated fuel on board to complete the flight. The engine and its accessories were in good condition and performed normally during a ground run.

Examination of the pilot's engine-handling techniques disclosed no likely cause for the power loss.

Main sources of information: Synopsis generated from TAIC report 02-012.

CAA Occurrence Ref 02/3204

ZK-JAE, Micro Aviation B22 Bantam, 1 Dec 02 at 11:58, New Plymouth. 2 POB, injuries nil, damage minor. Nature of flight, training dual. Pilot CAA licence CPL (Aeroplane), age 44 yrs, flying hours 7000 total, 15 on type, 45 in last 90 days.

During a practice glide approach the aircraft landed heavily fracturing its undercarriage. The pilot decided to remain airborne until emergency services arrived, after which a successful landing was made.

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

CAA Occurrence Ref 02/3496

ZK-EMO, NZ Aerospace FU24A-954, 1 Dec 02 at 14:00, Lindis Valley. 1 POB, injuries 1 serious, damage substantial. Nature of flight, agricultural. Pilot CAA licence CPL (Aeroplane), age 38 yrs, flying hours unknown.

The aircraft was observed by the loader driver to carry out a steep lefthand turn – possibly after having conducted a go-around from an approach to land. It subsequently collided with rocky high ground, rolled inverted and slid down the hill.

The pilot has no recollection of the events leading up to the accident and cannot explain why he was attempting to land with a full hopper.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 02/3469

N30DM, RV-4, 28 Dec 02 at 16:50, Glendhu Bay, Wanaka. 2 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 33 yrs, flying hours 750 total, 140 on type, 30 in last 90 days.

The aircraft suffered an engine failure while in the cruise, but the pilot was able to carry out a forced landing onto a disused airfield. However, during the landing roll the aircraft ran through some soft ground and overturned.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 02/3748

ZK-HWE, KHI Kawasaki-Hughes 369D, 3 Jan 03 at 18:30, Haast. 1 POB, injuries nil, damage minor. Nature of flight, training solo. Pilot CAA licence CPL (Helicopter), age 25 yrs, flying hours 3500 total, 3000 on type, 90 in last 90 days.

The pilot was practising engine-off landings from the hover, by rolling off throttle and cushioning the helicopter on to the ground by applying collective pitch. On one landing, a wind gust caused blade sailing while the rotor rpm was still low, and one blade clipped the top of the tail boom, leaving a minor dent.

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

CAA Occurrence Ref 03/69

ZK-DMO, NZ Aerospace FU24-950, 7 Jan 03 at 15:15, Waitahuna. 1 POB, injuries nil, damage substantial. Nature of flight, agricultural. Pilot CAA licence CPL (Aeroplane), age 29 yrs, flying hours 1860 total, 110 on type, 212 in last 90 days.

The pilot lined up on the sloping airstrip, but picked the wrong reference point on terrain visible beyond the crest. On the takeoff roll, he found that as he came over the crest, he was about 25 degrees off the centreline of the airstrip. He began jettisoning the load, but he was unable to clear the head of a small gut adjacent to the strip.

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

CAA Occurrence Ref 03/15

ZK-HDY, Robinson R22 Beta, 18 Jan 03 at 10:15, Haast Pass. 2 POB, injuries nil, damage substantial. Nature of flight, hunting. Pilot CAA licence CPL (Helicopter), age 70 yrs, flying hours 3611 total, 384 on type, 92 in last 90 days.

The pilot was hovering over tussock-covered sloping ground at 3500 feet amsl while a passenger boarded. As the passenger became seated the helicopter sank, and the main rotor contacted the waist-high tussock. The helicopter immediately began to yaw to the right and contact the ground. It rolled down the slope for 20 metres before coming to rest.

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

CAA Occurrence Ref 03/131

ZK-HSN, Bell 206B, 25 Mar 03 at 14:50, Ruatiti. 1 POB, injuries 1 minor, damage substantial. Nature of flight, other aerial work. Pilot CAA licence CPL (Helicopter), age 61 yrs, flying hours 16180 total, 1000 on type, 160 in last 90 days.

The helicopter was dipping its monsoon bucket into a local farmer's dam while on a scrub fire fighting operation when one of three wires supporting the bucket became caught around the helicopter's right-rear landing skid causing a dynamic rollover. The helicopter sank into the shallow dam. The pilot escaped uninjured and swam ashore.

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

CAA Occurrence Ref 03/850

ZK-HJR, Bell 206B, 1 May 03 at 18:00, Ongaonga. 1 POB, injuries 1 minor, damage substantial. Nature of flight, agricultural. Pilot CAA licence CPL (Helicopter), age 38 yrs, flying hours 1640 total, 750 on type, 50 in last 90 days.

Faced with flying in hilly terrain and fading light while on a positioning flight back to a ground vehicle after agricultural operations, the pilot elected to return to the original take-off site. Depth perception was lost while on approach to the site and the helicopter contacted the ground heavily and bounced back into the air with a high nose attitude and a large aft cyclic input, which caused the main rotor to contact the tailboom.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 03/1281

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	**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

AS350B2

Tailrotor control cable seizes, P/N 704A34-130-058

The helicopter was engaged in agricultural operations when the tailrotor control pedals jammed. The pilot maintained control and flew the helicopter to its home airfield where a successful run-on landing was made.

Engineering investigation revealed that the tailrotor control cable had seized. Eurocopter recommendations to upgrade to a later style cable are detailed in Service Letters 1453-67-00 and 1327-67-97 and also on Work Card 05.29.00.601

ATA 6720 CAA Occurrence Ref 02/1302

Bell 206B

Hydraulic hose chafes through

The pilot noticed a hot oil smell and was about to land at the loading site when the hydraulics failed, causing him difficulty in controlling the helicopter. Hydraulic pressure was momentarily regained enabling the pilot to level out and perform a safe landing.

Engineering investigation revealed a chafed braided hydraulic pressure hose from the pump to the filter housing. An incorrectly sized pipe clamp had been fitted allowing movement and chafing of the pressure hose.

ATA 2910 CAA Occurrence Ref 03/1185

BK117 A4

Tailrotor transmission found loose, P/N 4639-003-007

The tailrotor transmission was found to be loose in its mounts – the only visual clue to this being an oil leak.

Further engineering investigation revealed that two attaching studs were loose in the transmission. Service Bulletin KSB 117-052 details inspections to be carried out in this area in conjunction with the pilot's preflight check.

ATA 6520 CAA Occurrence Ref 02/2363

Cessna 206G

Tailplane spar doubler found cracked

During a strip-down inspection the tailplane rear-spar attachment doubler on both the lefthand and righthand sides were found to be cracked at the 1/4 inch attaching bolt location.

ATA 5500 CAA Occurrence Ref 02/3282

PAC 08-600 Cresco

Undercarriage mount bolt fails, P/N NAS 1306-78

While stopping to refuel, it was noticed that the righthand main undercarriage leg was on an angle. On inspection it was found the lower front leg mount bolt had failed, which may have been caused by a heavy landing or operating off rough airstrips. The bolt was replaced.

ATA 3210 CAA Occurrence Ref 03/779

Robinson R22

TCM magneto fails, P/N S4LN-200

The lefthand magneto was found to be defective during a 500-hour inspection. The front bearing inner race was found to be loose on the shaft and had caused the rotor magnets to strike the housing. This in turn had caused cracks to develop in the rotor at the magnet inserts. The loose bearing was probably caused by fretting and wear between the bearing and the shaft due to inadequate bearing nip on the shaft at overhaul.

ATA 7400 CAA Occurrence Ref 02/2157

Robinson R22 Beta

Battery lead fails

The pilot reported that all of the helicopter's electrically driven instruments failed during flight. A precautionary landing was made whereupon it was discovered that the lead between the solenoid and the battery had failed at the terminal. The failure appeared to have been caused by corrosion and fatigue.

Further investigation revealed that the failure was not an isolated event. It is therefore suggested that extra scrutiny be given to verifying the condition of battery leads and terminals during scheduled maintenance. Battery leads are required by the manufacturer to be replaced at each overhaul with an improved longer battery lead that is positioned in such a way as to reduce the chance of failure due to fatigue.

ATA 2400 CAA Occurrence Ref 03/1114

Robin R2120 U

Wing fairing panel detaches

A loud banging noise was heard on the side of the fuselage as the aircraft climbed through 200 feet after takeoff. The pilot elected to make a precautionary landing, which was carried out uneventfully.

A post-flight inspection revealed that the left wing root lower fairing had departed the aircraft. The aircraft had recently been on maintenance, and the engineer realised that he had probably become distracted and may have not tightened all of the fairing attachment screws. This error was compounded by the panel sitting down on the screw heads, giving the appearance that all of the screws were in fact flush with the panel.

ATA 5350 CAA Occurrence Ref 02/3589

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.

United Kingdom

Occurrences

The following occurrences come from the March 1999 edition of *Flight Safety, Fixed Wing* and *Rotary Wing Occurrence Lists*, published by the Safety Data Department, United Kingdom CAA.

Pegasus Q

Pilot becomes distracted

The pilot was distracted by another aircraft landing as he approached final. He allowed his aircraft to get too high and considered going around, but decided to steepen his approach to land. A gust caused a drift off the runway where a wingtip caught a bush and the aircraft tipped over. The pilot suffered minor injury.

PPL with 148 hrs P1 and 68 hrs on type.

Typhoon/Tripacer

Aircraft fails to get airborne

The pilot was invited by the owner, who was unlicensed, to fly the recently revalidated aircraft. The grass on the strip was long and acceleration during takeoff was poor. The aircraft sank back onto the ground beyond the end of the strip and nosed over in a corn crop causing severe damage to the aircraft. The pilot speculated that high humidity and sink caused the accident. The pilot suffered minor injury.

PPL with 420 hrs P1 and 45 hrs on type.

ASK21

Student checks forward during roundout

This was the third of a series of flights over which the student showed a steady improvement. After a good circuit and approach P2 rounded out a little quickly and levelled out too high. As he started to close the brakes P1 advised they should be left open. However, P2 pushed the stick forward and the glider hit the ground before P1 could react.

P1 aged 62 with 1200 hrs P1. P2 aged 47 with zero hrs P1.

Harvard T-6G

Aircraft ground-looped during taxi

The surface wind was 280/20–30 kts varying between 280 and 320 degrees. Runway 32 was in use and the pilot was back-tracking along Runway 14 prior to takeoff. He was taxiing faster than normal when a tailwheel shimmy developed. The pilot eased the stick forward to reduce the load on the tailwheel and the stick was just beyond neutral when the tailwheel unlocked, leaving it free to castor. The aircraft immediately groundlooped to the right through 270 degrees causing damage to the starboard wingtip.

The Flight Manual advises that the stick be held forward during downwind taxiing to prevent the tail being lifted, but warns that if the stick is held fully forward the tail wheel will unlock and free-swivel.

The pilot considered that he moved the stick too far forward and was taxiing too fast for the conditions.

ATPL with 4500 hrs total, 150 hrs on type with 150 hrs in the last 90 days and 70 hrs in the last 28 days.

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.

Cessna U206G

Broken mixture cable causes engine failure

The aircraft was on a flight from Weipa to Aurukun (a distance of 44 NM) with the pilot and three passengers on board when the pilot transmitted a Mayday call. He stated that the aircraft was 10 NM north-west of Aurukun, that it had experienced an engine failure, and that he would be conducting a forced landing into trees. No further transmission was heard from the aircraft. Some five hours later a search aircraft sighted the burnt-out wreckage in a densely treed, inhospitable area 24 NM north of Aurukun.

The investigation determined that the engine fuel mixture control cable end had become detached from the mixture control arm on the fuel control unit. This allowed the control arm to move to the 'idle cut-off' position, causing the engine to fail because of fuel starvation.

Saab SF-340A

Propeller hub failure causes lose of directional control

The aircraft was engaged on a scheduled passenger service from Melbourne to Devonport in Tasmania. During the flight, the crew experienced difficulty in controlling the right propeller rpm. When it landed at Devonport, directional control was lost. The aircraft departed the runway and ran through a ditch in soft, muddy ground. The aircraft sustained substantial damage but there were no injuries to passengers or crew.

The investigation revealed that a severe asymmetric thrust condition developed after landing when reverse thrust was selected, but the right propeller remained at a positive blade angle.

The report concludes that the right propeller control unit was defective, due to internal oil leakage across the feathering solenoid valve. As a result, the propeller failed to respond normally to pilot control input.

Cessna 210

Broken con rod bolt causes engine failure

During a search for a missing aircraft, the Cessna 210 aircraft crashed in inhospitable terrain following a complete loss of engine power. The aircraft was destroyed by impact forces; the pilot, co-pilot, and two observers received fatal injuries and two other observers suffered serious injury.

The Bureau determined that a failure of a connecting rod bolt resulted in the loss of engine power. The connecting rod penetrated the crankcase, allowing engine oil to escape. The oil was blown back onto the windscreen, probably obscuring the pilots' vision during the forced landing approach.

RTF: Christchurch Info (or ATS Units)

Tel NBO: 0800 626 756

Web: www.ifis.airways.co.nz

For further information refer to the AIP or phone the NBO

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