1999, Issue 2

VECTOR

Pointing to Safer Aviation

Pushing the Limits

Three people were killed recently when a light aircraft slammed into the Canterbury foothills in poor weather. The investigations into the accident are not complete, but weather was definitely a factor.

While CAA accident investigators were disturbed by the nature of this tragedy, they were also disappointed to hear of other VFR pilots who were operating on the same day in conditions below VFR meteorological minima and flying below 500 feet agl. In short, they were probably breaking the law — and risking their lives. Was it by good luck rather than good management that similar accidents were avoided?

Pressing on in marginal weather is frequently a factor in fatal accidents.

We would like to remind pilots that the decision to turn back, divert, or make a precautionary landing must be made as early as possible when things start to look doubtful — that is before you are forced below 500 feet agl or forced to operate with less than five kilometres (just under three nautical miles) visibility. To continue below these limits when safer options are available means that you will not only be breaking the law, but also will be taking considerable risks. By pressing on, you are further reducing the options and manoeuvring space available to safely end the flight. Don't think you can outwit the physics of turning when a hill looms in front of you!

"By pressing on, you are further reducing the options and manoeuvring space available to safely end the flight."

A decision to divert or carry out a precautionary landing should be based on the weather conditions that are being encountered at that point and time — not on the hope that conditions ahead are forecast to improve or on a report that the weather at your destination is okay. During a flight you should

frequently assess whether the conditions ahead are remaining above the legal minima (or your own personal minima if these are higher). If things are worsening, this assessment will need to be made more frequently and include the area around and behind the aircraft in case a turn-back or diversion is called for. As cloud base and visibility decrease, navigation and terrain clearance will require more of your attention, leaving less 'brain power' for making an unhurried and sensible decision. Don't leave the decision too late. Give yourself more time and the aircraft greater manoeuvrability by slowing down and configuring for bad weather.

The pressure to get to a destination can be great — as can be the pressures exerted by passengers. It is essential that these pressures are resisted and that the decision on whether or not to continue is based solely on safety — the inconvenience and extra cost involved in turning back should not cloud this decision. Avoid the ego trap of thinking that you have sufficient flying experience and local knowledge to warrant 'pushing on that little bit further to see what conditions ahead are like' — it is not worth the risk.

If things are really turning to 'custard' don't hesitate to use the precautionary landing option — it is much better to

Continued over...

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VECTOR

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Next Issue

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contact the ground in a controlled manner at landing speed (with maybe minor damage and injuries, or possibly just embarrassment and inconvenience) than at a higher speed when you have lost control of the situation (this is almost invariably fatal).

Points to Consider

- Get route and destination weather before every flight. During your pre-flight preparation consider the possibility of diverting.
- Submitting a flight plan is strongly recommended. (Note that SARWATCH is an alerting service only, and does not include weather information). Remember that weather information is always available from Flight Information.
- Continually assess the actual (and any reported) weather ahead.
- Respect the VFR met minima and minimum height limitations, and make a positive decision to not fly below them.
- If you really are caught out, slow down and configure for bad-weather flying. This should be a strong clue that you ought to be looking for a suitable place to land, maybe a paddock, beach, or quiet road.
- If the weather necessitates that you fly through features such as gorges and saddles at low level, where traffic is 'funnelled', then have passengers keep an eye out for power lines and other aircraft to minimise the risk of a collision.
- If you have not practised the bad-weather configuration for a while, or think a refresher on precautionary landings would be a good idea, then arrange for it now. Instructors — are you sure that your students are really competent in these areas, and have they been given guidance on decision-making in flight? If not, sort it out.

Adhering to the advice given above will reduce the chances of finding yourself in a situation with no way out. Remember, be alert to any changes in the weather, and if in doubt turn back early, divert, or land. ■

Always have an 'out'.

Aviation Safety Coordinator Courses

Reminder!

Don't forget the Aviation Safety Coordinator training courses that are to be held in Christchurch 18 to 19 March and in Auckland 25 to 26 March.

An Aviation Safety Coordinator runs the safety programme in an organisation. Does your organisation have a properly administered and active safety programme? (See the last issue of *Vector* for further details on the 'what and why' of an aviation safety programme.)

If you are involved in commuter services, general aviation scenic operations, flight training or sport aviation, this course is relevant for your organisation.

Apply now for an enrolment form!

For further information and enrolment forms contact:

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Engines On Condition

A recent CAA report into maintenance standards for aircraft of 5700 kg and below found that there was some confusion as to when an aircraft engine can be operated 'on condition.'

What is *On-Condition* Maintenance?

On-condition maintenance is a preventative process in which an item, such as an engine or propeller, is monitored either continuously or at specified periods. The item's performance (in this case the aircraft's engine) is regularly compared to the applicable standard in order to determine whether it can continue to remain in service. Such assessments normally include on-going monitoring of engine performance by the pilot and the inspection of specific components in situ by a LAME (licensed aircraft maintenance engineer) as scheduled maintenance allows. Other types of monitoring may involve the installation of engine-metal chip-detectors and the examination of the engine's lubrication system for metal fragments during a routine oil change, for example.

If an engine is not meeting the required standard and reconditioning is not an option, then it will be replaced — the fundamental philosophy behind this being 'replace it before it fails'. It should be stressed that the *on-condition* concept is not intended to provide an operator with the freedom to run an engine until it fails, but rather to maximise an engine's life within very specific parameters.

Operating *On Condition*

The criteria for operating an engine *on condition* are strict and depend on the aircraft type and the nature of the operation that it is involved in. An engine can generally **not** be operated *on condition* if the aircraft that it is installed in falls into any of the following categories:

- The aircraft is involved in air transport operations.
- The aircraft has a MCTOW of more than 5700 kg.
- The aircraft is a turbine-powered multi-engine aeroplane or a turbine-powered helicopter.

(Note that some manufacturers' maintenance programmes, or other approved maintenance programmes, may in fact allow an engine to be operated *on condition*.)

Aircraft operators and maintenance organisations that require additional information on this topic should refer to CAR, Part 91 Subpart G *Operator Maintenance Requirements*, Advisory Circular AC43-4 *On-condition maintenance*, and AC43-5 *Engine testing and propeller overhaul and testing*. ■

Providing Services in Emergencies

A number of operators are listed with the National Rescue Coordination Centre and may be called upon by the National Rescue Coordination Centre or the Police to assist with Search and Rescue (SAR) operations.

In most cases these are conducted as normal operations. If an emergency situation exists "where an emergency … necessitates the urgent transportation of persons or medical or other supplies for the protection of life or property" (Civil Aviation Act, Section 13A para 3), this section has provisions for breaches of the Act or rules within certain strict guidelines. For example, the emergency must involve danger to life or persons, any breach must only go as far as necessary to deal with the emergency, there must be no other reasonable means of dealing with the emergency, and breaking the rules to assist must be less dangerous than the degree of risk resulting from not assisting. (RCC do not want another emergency on their hands!)

In addition, aircraft airworthiness requirements or requirements relating to licence, rating or currency may not be breached.

Last Resort

It must be stressed that this emergency situation clause and the breaches which it allows are to be used only as a last resort. It is not intended as a carte blanche to do what you like in an 'emergency'. Operators and pilots who are regularly involved in giving assistance in various emergency or SAR situations are aware that in many cases this is possible without needing to breach rules and take risks. It is important that any risks are assessed very carefully and a safe judgement made as to what is justified. The agency making the callout will not knowingly set a task that places SAR resources at risk. If weather conditions change, however, the decision to continue the search will ultimately rest with the pilot-in-command. Pilots must always make this judgement, leaving acceptable safety margins for themselves.

After the Emergency

If you have been involved in an emergency situation where a breach of the Act or rules has been necessary, the pilot-in-command or the operator must:

- immediately notify the relevant air traffic control service of the action, and
- as soon as practicable, notify the Director of the action and the circumstances that necessitated it.

It appears that this is not always happening, possibly because some pilots and operators are not aware of the notification requirement. So if you ever are the pilot-in-command of an aircraft that is involved in an emergency flight that necessitates breaching the Act, then make sure that the details of the flight are reported. ■

Slinging Empty

Helicopter sling-loading operations demand a high level of pilot skill and may involve a certain amount of risk. We generally tend to think of this risk as being associated with the loading, unloading, and transportation of a load. However, a recent helicopter sling-loading accident has highlighted the fact that transiting to and from the job site with an empty sling has its dangers too.

The helicopter involved (a Hughes 269C) had been transporting a number of sling loads in bush country. During the transit between loads, the lifting strop was projected into the main rotor blades, inflicting substantial damage. Both occupants were killed in the ensuing ground impact.

This photograph shows the extent of the damage to the Hughes 269C rotor blades caused by the sling line being catapulted through them. Note the chain-link impressions left on the leading edge of the rotor blade in the foreground of the photograph.

The CAA investigation into the accident found that the most likely explanation for the chain striking the main rotor was due to "Öthe momentary snagging of the chain in a tree or some other obstruction, allowing the chain to spring up suddenly when released."

There are plenty of overseas examples of similar sling-loading accidents. One fatal accident in Western Australia in the late 1980s involved a Hiller UH12E lifting an aerodrome beacon onto a control tower. As the helicopter moved away from the tower after having placed the beacon, the sling line snagged on the tower's guard railing, causing the machine to pitch nose-down and roll to the right. With the sling line under tension from the pull of the helicopter, the sling hook released itself, causing the sling to suddenly spring up and become entangled in both the main and tail rotor blades. The main rotor then severed the tail boom, and the helicopter fell to the ground and caught fire.*

Some of the things that can go wrong are: forgetting that a sling line is attached, being in transit after delivering a load only to find that the sling has become snagged, or not having the sling line set up properly aerodynamically. Sling loading requires a pilot to be aware of the proximity of the sling to obstacles and the helicopter at all times until the sling — not just the load — has been removed. This is a task that calls for strict mental alertness.

These accidents provide us with a reminder to revise sling-loading procedures. We contacted several helicopter operators experienced in external-load operations to find out what safety systems their pilots used when sling loading. They emphasised a number of points.

Important Points

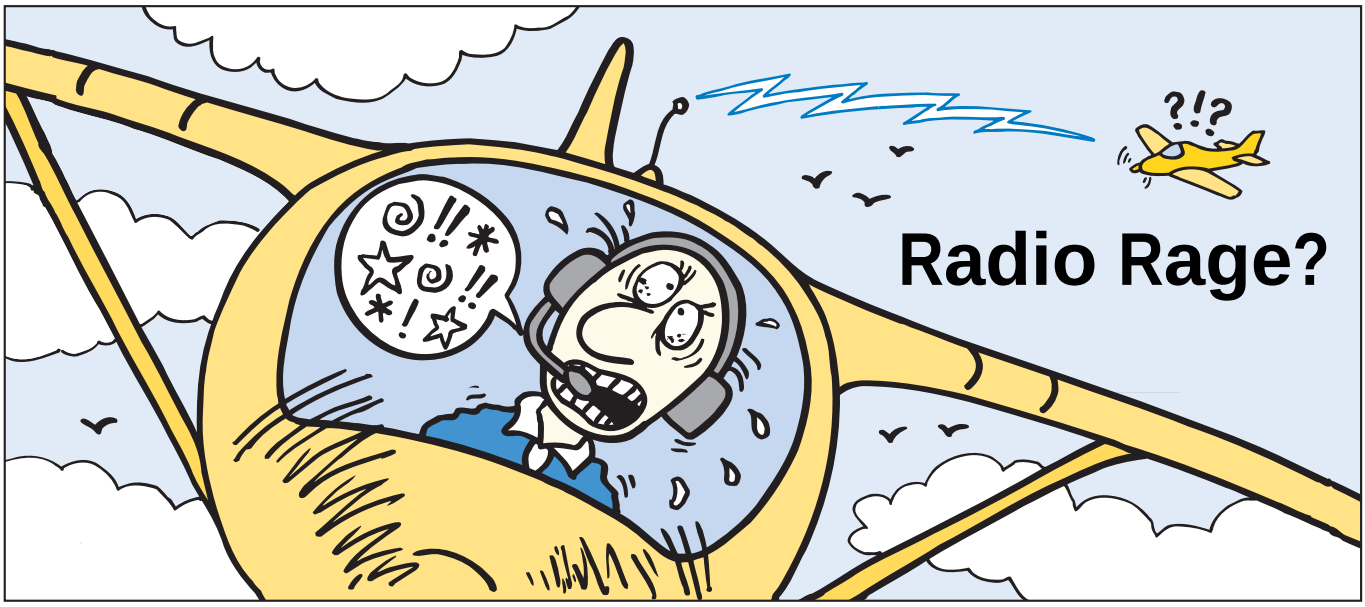
- Sling lines should be either, shorter than the distance from the cargo hook to the tail rotor (this precludes inadvertent tail rotor contact with the end of the sling or strop), or not less than three times the length of the helicopter (don't forget to include the length of the strop in this measurement as well). Sling lines should also be suitably weighted (usually not less than five kilograms). A correctly proportioned sling line will give the best aerodynamic characteristics and will avoid the possibility of the sling curving up into the tail or main rotor blades.
- The function of the helicopter release hook, and the release hook on the bottom of the sling, should always be checked both manually and electrically during the pre-flight walk-around to ensure that they will release when and as required. Note that all pre-flight walk-arounds should include checking whether or not a sling line is attached to the helicopter. This is particularly important if the pilot has finished sling operations and is transitioning to another type of work, or a new day's work is beginning. There are numerous instances, both in New Zealand and overseas, where pilots have forgotten that the sling was attached, resulting in it catching on objects during takeoff. A large percentage of these accidents have been fatal.
- A system should be in place to ensure that the pilot has a cue to remind them that a sling line is attached — especially if they are involved in sling-loading operations only on a casual basis. A sliding panel entitled 'LINE ON' positioned on the canopy bubble within the pilot's natural field of vision, or in a prominent place on the instrument panel, is an effective way to minimise this risk. Note that this panel must not be positioned in such a way that it interferes with the pilot's lookout.
- Sling-loading operations should be conducted, where possible, with the helicopter's pilot-side door removed to permit an unrestricted view of loading and unloading. A correctly adjusted mirror that allows the pilot to see the hook and sling load can also be a big help.

"As the helicopter moved away from the tower… the sling line snagged on the tower's guard railing causing the machine to pitch nose-down…"

- Prior to transitioning to forward flight after delivering a load, the pilot must make sure that the load is free of the helicopter and that the sling has not snagged on any objects after it has been released. Ensuring that a slow transition to forward flight is made after releasing a load is important too. A slow transition allows the control inputs to be gradually gauged by the pilot and provides confirmation that the sling line has not snagged.
- A sling line should always be treated as part of the helicopter, and all manoeuvres should be carried out smoothly, ie, no tight turns or rapid descents.

Sling loading requires a high level of pilot concentration. It is important that concentration levels are maintained throughout all phases of a sling-loading operation. Remember, Murphy's Law: "If it can go wrong it will" and that "The job is never done until the last lift has been completed and the helicopter is in the shed."

*Accident details courtesy of the Australian Bureau of Air Safety Investigation. ■



Vector has received a number of reports from pilots who have heard some discourteous, inconsiderate, and unprofessional radio exchanges. These have occasionally been with ATC, but more commonly it occurred on unattended aerodrome frequencies. The worst transmissions have included swearing and shouting abuse.

We would like to remind pilots that it is a privilege to hold an FRTO rating, and that radio transmissions should always be carried out in a proper and professional manner, no matter what the circumstances. No one really wants to hear aggressive language over the radio. Such acts diminish what are generally high FRTO standards in New Zealand, and they add nothing to the accuracy of radio communications from either an operational or safety perspective.

If you have a gripe with ATC, then visit the ATC centre concerned and rationally discuss the matter with them — do not resort to a debate over the radio. If you have a gripe with another aircraft at an unattended airfield, then rationally discuss the matter with them on the ground. If necessary, it is not difficult to trace an aircraft later via its registration. Consider whether CAR, Part 12 *Accidents, Incidents, and Statistics* requires the incident be reported to the CAA via the Occurrence and Investigation Reporting System (CAA Form 005). If a CAA Form 005 is not required, then it may be useful to report it to ICARUS. Provocative radio transmissions will generally only increase stress levels and diminish safety — we can all do without that.

While on the subject of radio procedures, we would like to remind pilots that unnecessary chat over the radio should be avoided. This is important when operating on standard unattended aerodrome frequencies such as 119.1 MHz. It easy to forget that pilots of other aircraft operating considerable distances away on the same frequency can hear your transmissions. Chatting on this frequency could prevent them from making the radio calls that they need to.

Unnecessary chatter can be frustrating to pilots who are trying to make standard position reports while conducting an IFR approach to an unattended aerodrome. Not being able to relay to local traffic all the necessary information on their position and type of instrument approach could quickly become dangerous.

So, even though your radio is silent for a lengthy period, it does not mean that it is okay to have a chat about your social life with another pilot. Doing so might cause considerable frustration to other pilots on the frequency, and it could be creating a circuit traffic hazard at the same time.

Keep aviation friendly — communicate with consideration. ■

Safety Around Helicopters

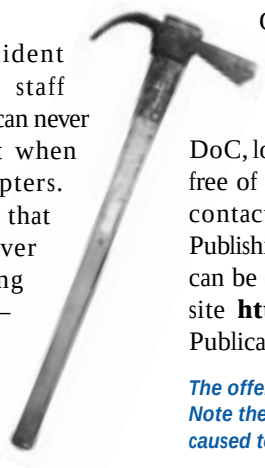
Recently, a hand grubber hit the tip of a rotor blade while a McDonnell Douglas 530F helicopter was being unloaded in a river bed.

Instead of being passed, the hand tool was "thrown" a short distance to the next person in the work party by an experienced Department of Conservation (DoC) manager.

All the DoC staff concerned had been briefed on helicopter safety before the incident, and the pilot was supervising the unloading operation. All the personnel involved were experienced in working around helicopters and were following standard DoC helicopter unloading procedures.

The fact that this incident involved experienced staff highlights the fact that you can never afford to be complacent when working around helicopters. We would like to stress that equipment should never be thrown when loading or unloading a helicopter — no matter how much time it saves. Also, anyone who is not familiar with helicopter operations must be thoroughly briefed beforehand.

Copies of the posters "Think Helicopter Safety" (aimed at passengers) and "Safety Around Helicopters" (aimed at users, eg, DoC, local government, etc) are available free of charge to helicopter operators by contacting the Safety Education and Publishing Unit. Alternatively, either poster can be downloaded from the CAA's web site **http://www.caa.govt.nz** under Publications — Pictures and Posters. ■



The offending grubber is pictured on the left. Note the damage that the rotor blade has caused to its head and shaft.

Photograph courtesy of the Department of Conservation.

Gone Off Watch?

The following has been contributed by CAA Field Safety Adviser Ross St. George. Ross makes some interesting observations about the importance of having an accurate means of determining the time when you are flying.

As I remember, two of the most critical instruments in navigation are a compass and some reasonably accurate means of keeping time. Keeping a note of the time is just as important for fuel management reasons, even if you are not intending to fly very far — staying in the local aerodrome circuit for instance.

It was therefore with some surprise that, while out flying, I heard a pilot call his flight training organisation to find out what the time was — he did not have a watch. While this pilot did the right thing by confirming the time, it was somewhat surprising that he had no other means of actually determining what it was.

So why is it important to know the time while you are aviating? I can think of a number of reasons.

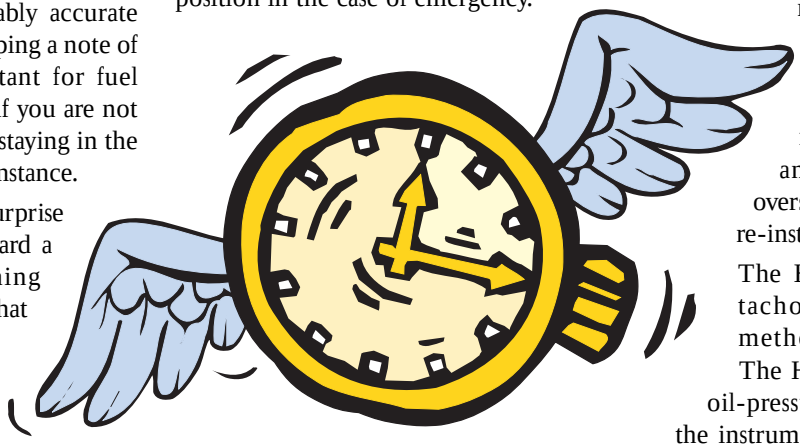
Fuel Management

Regardless of whether your aircraft has separate fuel tanks, or a cross-feed system, time is vital to fuel management. You should always know how much fuel you have on board, what your estimated rate of fuel burn is, what your safe endurance is, and what reserves you have. The start time and elapsed time are key elements here. To not have this information available even on a local flight is setting you up for poor aviation practice on longer flights, where wind components and diversions because of weather can make the difference between life, death, and an embarrassing incident.

Writing down your engine start time on your pilot flight log, keeping a running total of the fuel burned from each tank, and knowing when the next tank change is due, all make fuel management far easier. There are just too many examples of aircraft accidents caused by too much air and not enough fuel in the tanks.

Navigation

Time is integral to navigation. Knowing the time between points enables the calculation of groundspeed, from which other in-flight decisions will flow. The dynamics of weather can often dictate an unexpected enroute change to the proposed flight plan — especially if you are conducting a VFR flight. Time is also related to position reporting, and to providing an accurate ETA for your destination aerodrome — and could be crucial when reporting your last known position in the case of emergency.



"It is always important to make a note of the engine start time, and the takeoff time, from your watch."

Cost

Closer to a pilot's bottom is his or her wallet and, when flying, time is money. Accurate timekeeping is certainly important to both the aircraft owner and the pilot for determining the total cost of the flight.

The Rules

Civil Aviation rule 91.221 (a) *Flying equipment and operating information* requires the pilot-in-command to have a means of keeping time for navigational and fuel management purposes.

Rule 91.509 (a) *Minimum instruments and equipment* also requires that most aircraft have a means of recording flight time for the purposes of determining airframe hours. This rule is the reason why many aircraft have a Hobbs meter or engine tachometer.

Recording Time

Since the Civil Aviation Rules oblige us to have a means of recording flight time, it makes sense that we have a watch, or at least a fully functioning aircraft clock, and that we utilise them for navigation and fuel management purposes as mentioned.

Many light aircraft do have a clock, but from my observations few of them work — which is all the more reason for always carrying a watch. Most aircraft clocks are mechanical so as not to draw off the battery during stationary periods. Many have been over-wound, and few are ever repaired — even though it is only a modest cost through a watchmaker. You might like to consider getting your aircraft's clock repaired (remember that an LAME is required to oversee its removal, repair, and re-installation).

The Hobbs meter and engine tachometer are two other methods of recording time. The Hobbs meter works off an oil-pressure sensor that activates the instrument to record actual time from engine start-up to shutdown. It is reasonably accurate as, once the engine is started, the oil pressure should remain fairly constant. The engine tachometer, on the other hand, is a mechanically driven device that runs off engine rpm. An aero engineer specialist tells me that on most standard four-cylinder horizontally opposed engines, the tacho is comparable to actual clock time when cruise power (normally around 2300 rpm) is set.

It is always important to make a note of the engine start time, and the takeoff time, from your watch. If you also note the Hobbs or tacho time before start-up, you will then have a very good back-up estimate if your watch fails (assuming your aircraft's clock died long ago) which would allow you to continue your flight safely and without too much drama. Often you may have to record tacho or Hobbs readings anyway, as hire charging may be based on either of these.

Summary

Have a way of knowing the time. Make wearing a watch part of your personal minimum equipment list the next time you go flying — even if your aircraft does have a clock, Hobbs meter or tachometer. Instructors and aircraft operators should insist that you do carry a watch on all flights.

When flying, time on your hands is where you want it — make sure it is there. ■

Fuel Tank Caps

The following extract (originally from the Australian Accident Bulletin) has been taken from a 1996 issue of the British CAA safety publication, GASIL, and it illustrates how an incorrectly fitted fuel tank cap can lead to disaster.

Any interruption or distraction during refuelling, or during pre-flight checks, could result in a fuel cap not being replaced and mean the loss of a substantial amount of fuel in flight. This applies especially to high-wing aircraft, where fuel caps may not be visible to the pilot when standing on the ground.

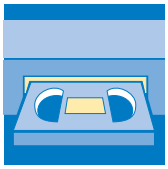
The light twin-engine aircraft was on a night freight flight from Sydney to Melbourne. The 23-year old pilot had accumulated 660 hours total flying time and was the only person on board the aircraft. On descent, about 20 miles north of Melbourne, the pilot made a MAYDAY call advising that he had a double engine failure. Air Traffic Services provided the pilot with radar headings towards a nearby airfield.

Two minutes into the emergency the pilot reported that his altitude was now 1000 feet, and when told that the airfield was five miles away he said that he was not going to make it. Radar contact with the aircraft was lost shortly afterwards. The aircraft subsequently impacted the face of a road cutting.

It was determined that both engines had run out of fuel. A fuel stain on the left wing was consistent with an in-flight loss of fuel from the left main fuel tank cap. The accident investigation revealed that, although apparently fastened correctly, the fuel tank cap had been prevented from sealing due to interference from a wire clip attached to the fuel cap securing chain. As a result, fuel was sucked past the cap during flight. At the same time, the floor of the bladder type fuel tank was lifted, resulting in false gauge indications. The investigation concluded that the clip had probably lodged under the left main fuel cap during the pre-flight inspection of the tank contents.

Vector Comment

A number of aircraft in New Zealand have a chain and clip arrangement such as described above. Similar fuel exhaustion accidents could result from fuel caps being incorrectly replaced after refuelling or fuel-tank dipping. It is always important to check that each fuel cap has seated correctly, and has been firmly tightened, during the pre-flight walk-around. ■



New Video

The Safety Education and Publishing Unit has just released a new Aviation Safety Video called *We're Only Human*. This 21-minute video looks at the compromises between our physiology, the environmental demands of flight and the design limitations of our aircraft — and how these can affect our performance as pilots.

The 'human factor' is a critical part of aviation safety, and with a better understanding we can become more attuned to the potential dangers of the flight environment. The video takes a close look at the effects of flight on our physiological and sensory systems and investigates the influence of cockpit ergonomics.

We're Only Human complements our previous release *The Final Filter*, which deals with decision-making aspects of the 'human factor'. Other titles relevant to our minds and bodies are *Mark I Eyeball*, *Fit To Fly?*, *Drugs and Flying*, and *Decisions, Decisions*.

All videos can be borrowed from the CAA Library or purchased from DoveVideo. Details on how to borrow or buy can be found in the previous issue of *Vector*.

Flying is a discipline... safety is an attitude.

Field Safety Advisers

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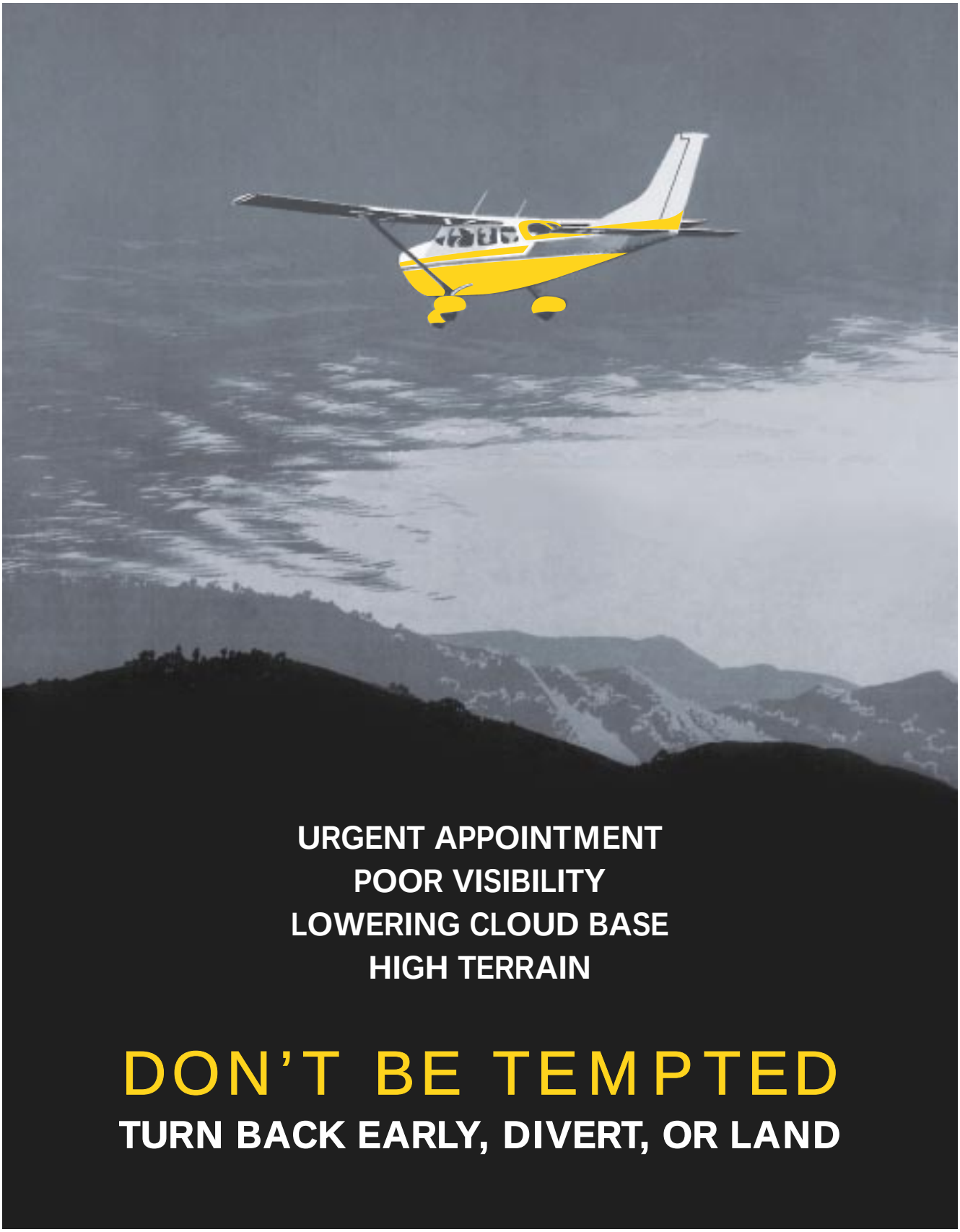

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CAA Web Site, http://www.caa.govt.nz *for CA Rules, ACs and Airworthiness Directives.*

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Accident Notification

24-hour 7-day toll-free telephone

0508 ACCIDENT

(0508 222 433)

CAA Act requires notification "as soon as practicable".