Aviation Safety Digest

BUREAU OF AIR SAFETY INVESTIGATION

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Contents

Covers
SA330J Puma helicopters operated by Mayne-Bristow Helicopters Pty Ltd from Broome and Karatha, W.A., in support of offshore oil and gas drilling operations.

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Helicopter wake turbulence

Most pilots are aware that the wingtip vortices generated by large fixed-wing aircraft can present a hazard to other aircraft which encounter them, particularly during takeoff and landing. The force of this wake turbulence can be gauged by the fact that some years ago overseas a DC-9 — a large aircraft itself — crashed while making an approach to land behind a DC-10, killing all on board. The investigation concluded that the probable cause of this accident was an encounter with the trailing vortex of the DC-10, resulting in an involuntary loss of control.

For those who have become a little hazy on wake turbulence, the key points to remember, in general terms, are as follows:

- Wake turbulence is usually worst behind a large, slow aircraft which is in a clean configuration.
- The turbulence descends at about 500 feet per minute to about 900 feet below and behind the generating aircraft.
- It is most persistent over an airfield where there is a 5 knot crosswind.
- The greatest loss of control will occur when an aircraft climbs on the same heading through the wake of the generating aircraft.
- While wake turbulence is most dangerous to aircraft which are taking off or landing, aircraft encountering it at cruise altitudes may still experience loss of control, airframe overstress and, in the case of jets, engine compressor stall.

It is also important to remember that the lifespan and size of vortices are significantly affected by ambient conditions. As a guide, experiments have shown that vortices close to the ground will typically last from 1 to approximately 2 minutes, while at higher altitudes the vortex life may be as long as 5 minutes. Depending on the generating aircraft's speed, vortex trails may vary in length from less than 2 nm to up to 5 nm.

Helicopters

The hazards presented by the downwash of a stationary helicopter are generally well known. Some pilots, however, seem to be unaware of the fact that moving helicopters can also generate severe wake turbulence similar to the wingtip vortices of fixed-wing aircraft.

There have been several instances of helicopter wake turbulence causing accidents. The following report illustrates this:

A light twin-engine aircraft was making an approach to land behind a reasonably large (4700 kg AUW) helicopter. The helicopter had completed its approach and was air taxiing to the left of the active runway. When the light aircraft was on short final approach, over the threshold and about 300 metres behind the helicopter, its starboard wing dropped suddenly; before the pilot was able to take full corrective action the aircraft impacted the runway heavily, nose first. Damage was substantial. Wind velocity at the time was 30 degrees off runway heading from the left at 5 knots.

From an assessment of the evidence the possibility exists that the light twin may have encountered wake turbulence generated by the helicopter.

Pilots must appreciate that the wake turbulence from a heavy helicopter can be significantly more severe than that from a fixed-wing aircraft of the same weight. As a rough guide, a 9000 kg helicopter on approach at 40 knots generates about the same vorticity as a 27 000 kg fixed-wing aircraft on approach at 120 knots.

Pilots should observe the same avoidance techniques for helicopter turbulence as they do for that produced by fixed-wing types:

- land beyond the helicopter's touchdown point;
- take off before the helicopter's takeoff point; and
- remember that the vortices will drift downwards and behind the helicopter at all times when it is airborne.

The main point to appreciate is that a large helicopter can be a formidable vortex generator, and should be given a wide berth.

Comment

Clear guidance on a pilot's responsibility for avoiding wake turbulence is given in the VFG and AIP. To quote the VFG:

> When the tower controller thinks that the turbulence from the wake of a preceding aircraft would be a hazard, he will advise you:
>
> 'CAUTION — WAKE TURBULENCE'.
>
> He cannot, however, assume responsibility for issuing this advice at all times as he cannot predict accurately the occurrence of wake turbulence. You should, therefore, be on the alert for this hazard, especially when taking off from an aerodrome where heavy traffic (not necessarily turbo-jet aircraft) is operating ●

A Lockheed Hercules flew through smoke from a smoke generator fixed to a mast to produce this visible wingtip vortex. The intensity of the vortex is obvious.

Wake turbulence quiz

Listed below are 10 multiple-choice questions originally published in Lockheed's *Flight Operations Digest* and reported in UK *Flight Safety Focus* and NZ *Flight Safety*.

Check your answers against those on page 9. Each correct answer is worth 10 points. If you achieve a maximum score of 100 points you have a good wake turbulence knowledge.

1. When departing behind a large cargo aircraft, which of the following winds would result in the most persistent runway turbulence?
   (a) calm winds
   (b) direct headwinds
   (c) 5-knot crosswind component
   (d) 10-knot crosswind component

2. A jet aircraft departs on runway 36L in calm conditions. How long would it take wingtip vortices to reach runway 36R if the distance between the two runways is 305 metres (1000ft)?
   (a) ½ minute
   (b) 1 minute
   (c) 1½ minutes
   (d) 2 minutes

3. When does a departing aircraft start producing wingtip vortices?
   (a) at the start of the takeoff roll
   (b) at a speed of approximately 60 knots
   (c) at point of rotation
   (d) when the landing gear and flaps are raised

4. Which of the following combinations of speed, weight and aircraft configuration generates the greatest amount of wake turbulence?

	Airspeed	Weight	Configuration
(a)	*slow*	*heavy*	*flaps down*
(b)	*slow*	*heavy*	*clean*
(c)	*fast*	*heavy*	*flaps down*
(d)	*fast*	*heavy*	*clean*

5. What is the sink rate of trailing vortices from a large aircraft at altitude and at what height below the generating aircraft do they stabilise?
   (a) 500 fpm to 900ft below
   (b) 500 fpm to 500ft below
   (c) 1000 fpm to 2000ft below
   (d) 1000 fpm to ground level

6. When taking off behind a departing jet or turbo-prop aircraft, the recommended technique is to:
   (a) Delay liftoff as long as possible to gain excessive airspeed for penetration of the vortices.
   (b) Plan to lift off before the rotation point of the departing aircraft and continue climb above or away from its flight path.
   (c) Climb to 500ft, level off and turn so as to cross the vortex path at a 90 degree angle.
   (d) Adjust the flight path so as to penetrate the vortex core 500ft below the departing aircraft.

7. Vortex cores can range up to 9 metres in diameter with tangential velocities of up to 85 metres/sec, depending on the size, speed and configuration of the generating aircraft. How would you describe the subsequent behaviour of the vortices?
   (a) The cores rapidly expand until they overlap and dissipate.
   (b) They stay very close together with little expansion until they break up at distinct intervals.
   (c) They gradually reduce in size until dissipation.
   (d) Depending on the atmospheric conditions, they sometimes increase or decrease in size.

8. Under what wind conditions will the movement of vortices in ground effect cause the greatest hazard to following aircraft in the touchdown zone?
   (a) light and variable conditions
   (b) 5-10-kt quartering headwind
   (c) light quartering tailwind
   (d) strong headwind

9. Which of the following encounters with wake turbulence would probably result in the greatest loss of control of the penetrating aircraft?
   (a) crossing the wake at a 90 degree angle
   (b) climbing through the wake at a 90 degree angle
   (c) climbing through the wake on the same heading as the generating aircraft
   (d) flights 1000ft below the generating aircraft

10. When departing or landing behind a large turbo-jet aircraft that has executed a missed approach or touch-and-go landing, how long should you wait before commencing takeoff or approaching to land?
   (a) 30 seconds
   (b) 1 minute
   (c) 3-4 minutes
   (d) 5-6 minutes ●

Answers on page 9

The experience factor

Experience is rightly recognised as being one of the major factors contributing to a pilot's competence. Yet it is not an end in itself, for as the following accident review shows, highly qualified and experienced pilots can still fall prey to the most basic errors if they fail to observe the fundamentals of safe operations.

A pilot was involved in spreading superphosphate in an Airtruk. While his agricultural experience was limited, amounting to 350 hours total and 40 hours on type, his overall experience level was substantial, consisting of 2700 hours and a Grade One instructor rating.

A second Airtruk was working on the same property: it was being flown by a pilot with about 10 000 hours agricultural flying time. Both aircraft were operating from the same airstrip, and work progressed uneventfully during the morning, with breaks being taken for morning tea and lunch. The aircraft were refuelled during lunch and operations recommenced.

On the third flight of the afternoon the pilot who held the instructor grading was turning on to his initial spreading run at an altitude of about 150 feet AGL when he felt his aircraft start to 'shudder'. He began a turn to the right towards lower ground and at the same time applied full power and dumped the load of superphosphate. However, the aircraft descended rapidly. Realising that ground impact was unavoidable the pilot tried to control the crash, but with little success. The aircraft hit the ground nose first; the propeller and nosewheel were torn off before the aircraft cartwheeled for 30 metres. It came to rest right way up with the cockpit virtually intact but the aircraft destroyed.

The terrain around the crash site was hilly. The aircraft had impacted on a southerly heading on a 5 degree rising slope, and a short distance further on, the ground rose abruptly by another 400 feet. Wind velocity was from the north-west at 5-10 knots and the temperature was 23 °C.

The cause of this accident was straightforward: notwithstanding his experience and qualification as an instructor, the pilot had allowed his aircraft to stall.

An examination of the Pilots Handling Notes for the Airtruk showed that, for the aircraft's weight at the time of the accident, the flaps-up stalling speed was 56 knots. In subsequent discussions the pilot stated that he had been maintaining an IAS of 78 knots. However, the stalling speed of 56 knots was, of course, applicable only to straight and level flight, and in this case the pilot was banking his aircraft to line up on the spreading run — during which he felt his aircraft 'shudder'.

Assuming an angle of bank of between 40 degrees and 60 degrees was used, the load factor on the aircraft would have increased by between 1.4 and 2.0. As stalling speed increases proportionately to the square root of the load factor, the stall speed in this case would have risen to between 64 and 79 knots. Further, the turn on to the spreading run was made over rising terrain (see diagram) and it seems possible that airspeed may have inadvertently been allowed to decay slightly as a constant height AGL was maintained.

In short, the aircraft was being flown close to the ground at a speed which provided no margin for manoeuvring. The 'shuddering' which the pilot felt was pre-stall buffet.

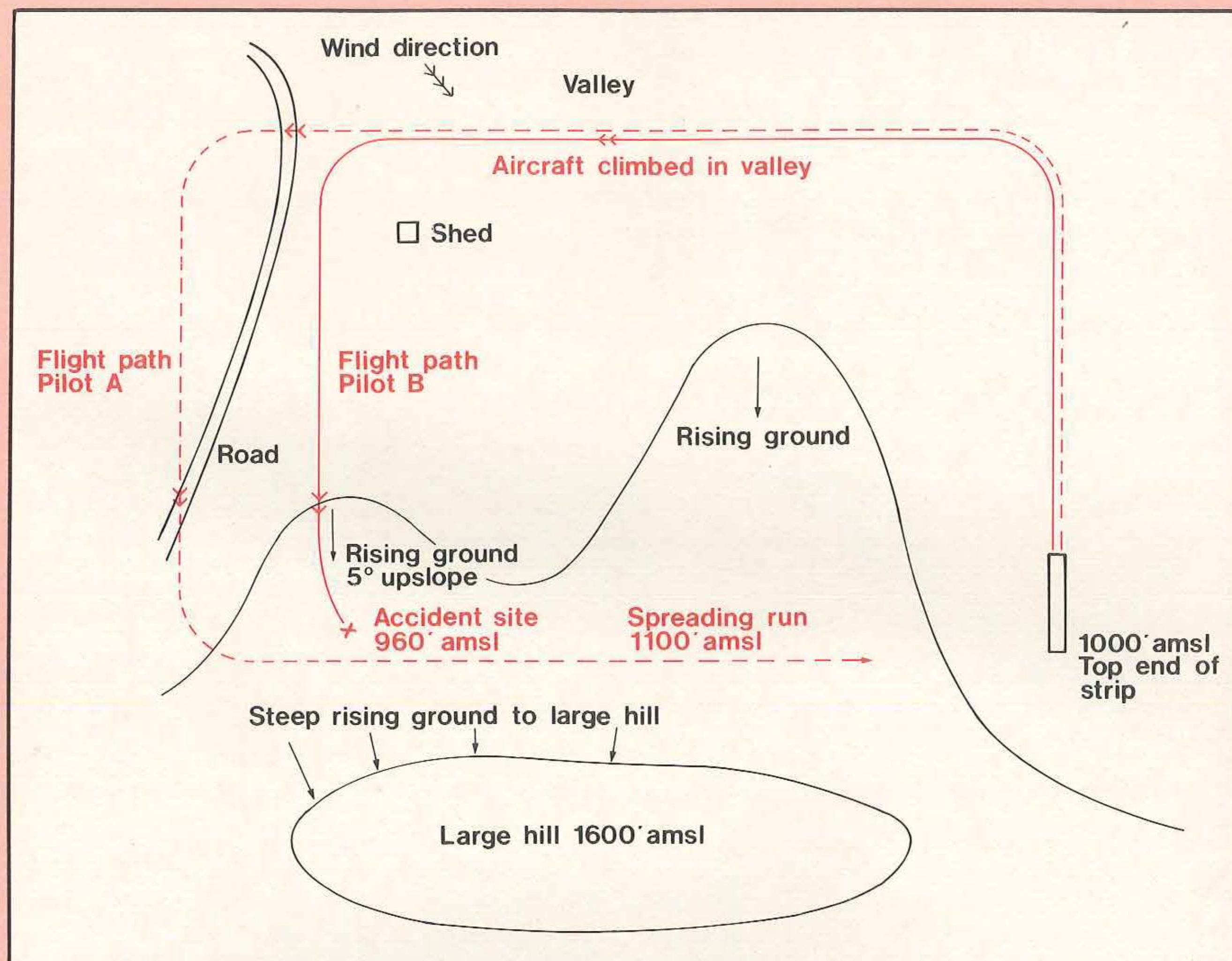
The message here is simple, but that fact does not diminish its importance; on the contrary, it highlights the truism that aeroplanes and the physics of flight are no respecters of experience, qualifications or reputations — if you fail to observe the basics, it CAN happen to you.

* * *

A further interesting point arising from this occurrence revolves around the circuit patterns flown by the two pilots. At various times before the accident both pilots had flown this circuit. However, the pilot with 10 000 hours agricultural time had flown a pattern which went further downwind on the circuit than that flown by the pilot who eventually crashed (the circuits are marked as Pilot A and Pilot B respectively on the diagram).

By flying further downwind, Pilot A obviated the need to start the turn on to the spreading run while over rising ground, i.e. unlike Pilot B, he did not have to climb while in the turn to maintain a constant height AGL. Unfortunately this procedure was not discussed between the two pilots: given the experience level of each, perhaps they did not feel any need to compare techiques. Yet, clearly, the pattern flown by Pilot A was better planned and safer.

In the sometimes demanding and unforgiving business of aviation, no pilot can afford to take anything for granted. It costs nothing to compare ideas or notes, and while the thoughts or advice of others may often be superfluous, none of us gets it right all the time — regardless of experience. Pilots also need to remember that, as this accident showed, experience in one sphere of flight operations is not necessarily transferable to another. This point is particularly pertinent for supervisors ●



Looking back along flight path showing valley and rising terrain (right).

Auxiliary fuel pumps

'. . . The probable cause of the loss of power was fuel vapour accumulation in the fuel system — a vapour lock — which could have resulted in some degree of interruption to engine power output. Turning on the auxiliary fuel pump most probably would have cleared the vapour lock and remedied the situation.'

'The pilot . . . energised the EMERG half of the auxiliary fuel pump switch . . . The resulting grossly over-rich mixture would have adversely affected the performance of the aircraft . . .'

The circumstances under which the auxiliary fuel pump fitted to many GA aircraft is used often seem straightforward — turn it on for takeoff and landing and, when at a safe height in the climb out, turn it off. However, there can be far more to the operation of an auxiliary fuel pump than that, as for some aircraft, in an engine-related emergency, the way in which it is used can be equally as important as the way in which controls like the mixture and throttle levers are used. Consider the following two accidents.

Fuel vapour lock

Having just reached top of climb, a Cessna 206 pilot was setting the cruise configuration when the engine lost power completely. The pilot changed fuel tanks and endeavoured to restart the engine, without success. Unaware that the Emergency Section of the Pilot's Operating Handbook for the Cessna 206 states that the auxiliary fuel pump should be turned on following an engine failure in flight, the pilot left it off. Power could not be restored and the aircraft was destroyed in the subsequent attempted forced landing into timbered terrain.

It was not possible to determine with complete certainty the cause of the engine failure. However, there was adequate fuel in the aircraft's fuel system and there were no pertinent defects or system malfunctions. The engine later operated satisfactorily in a test rig.

The investigator postulated that the probable cause of the loss of power was fuel vapour accumulation in the fuel system — a vapour lock — which could have resulted in some degree of interruption to engine power output. Turning on the auxiliary fuel pump most probably would have cleared the vapour lock and remedied the situation. It is also important to note that, had the loss of power been attributable to failure of the engine-driven fuel pump, then the immediate actions to be taken again would have included that of turning on the auxiliary pump. Significantly, the pilot had minimal experience on type.

* * *

Over-rich mixture

A Cessna 206 was observed flying close to the ground, with the engine running roughly and emitting black smoke. Shortly afterwards the aircraft struck trees and cartwheeled into a creek bed. A fierce fire broke out immediately and engulfed the wreckage. Both occupants were killed.

Again, it was not possible definitely to determine the reason for the apparent engine malfunction. Following an intensive investigation, the air safety investigator was nevertheless able to reconstruct a likely series of events.

The aircraft had taken off from a high altitude runway at close to maximum all-up weight. The altitude of the runway was such that it was normal to lean the engine fuel mixture before takeoff. Because the pilot was unfamiliar with high altitude operations, it seems possible that he took off with the mixture set at full rich. Further, the pilot was inexperienced on type, having done most of his recent flying in Islanders. In that aircraft, the auxiliary fuel pump is switched on for takeoff, but in the Cessna 206 it has to be off. Assuming that in this instance the pump was erroneously selected on, then, when allied to the setting of the mixture control, the pilot would have been taking off with an over-rich mixture.

Some comment on the mechanics of the Cessna 206 auxiliary fuel pump is necessary here. It is controlled by a yellow and red split-rocker type switch. The yellow right half of the switch, which is labelled START, is used for normal starting, minor vapour purging and continued engine operation in the event of an engine-driven fuel pump failure. It was this part of the switch which the investigator believed the pilot erroneously switched on for takeoff. The red left half of the switch is labelled EMERG, and its upper HI position is used in the event of an engine-driven pump failure during takeoff or high power operation. This position may also be used for extreme vapour purging.

To return to the accident, the investigator postulated that, because of the excessively rich mixture the pilot had set, rough running was experienced on takeoff. The pilot incorrectly interpreted this as a problem stemming from fuel starvation and reacted by energising the EMERG half of the auxiliary fuel pump switch. This would have exacerbated the existing over-rich mixture to which the engine was being subjected, and would explain the black smoke from the engine seen by the witnesses. The resulting grossly over-rich mixture would have adversely affected the performance of the aircraft so that, at the high altitude and high all-up weight, it would have been unable to avert a collision with the rising terrain.

* * *

Comment

It seems possible that, in the accidents cited, the pilots' lack of understanding of how to use the auxiliary fuel pump contributed to the loss of two lives and two aircraft. In the latter accident it seems reasonable to suggest that the pilot assumed — erroneously — that a common set of procedures could be used for auxiliary fuel pumps, regardless of aircraft and engine type.

A comparison of three popular types of light aircraft is instructive in laying to rest such assumptions. The aircraft and their engine types are:

- Beech Bonanza A36, Continental IO-520-BA
- Piper PA32-300, Lycoming IO-540-K series
- Cessna 206, Continental IO-520-F

The engines are similar (in the case of the 206 and the A36, almost identical) in that they have six cylinders, fuel injection and produce about 300 horsepower. This might lead pilots to believe that they can observe the same engine handling procedures for each. Yet the procedure for using the auxiliary fuel pump for the different aircraft types is, in certain circumstances, quite different. For example, the 206 has the split-rocker switch for its pump, with a number of possible settings, while the A36 has a single control switch, which is either on or off. The PA32 Pilot's Operating Manual states that the auxiliary fuel pump (referred to in that manual as the electric fuel pump) is to be turned on before takeoff or landing, while the checklists for the 206 and A36 stipulate that the pumps in those aircraft should be off.

Summary

The intention in this article has not been to go into a detailed examination of how auxiliary fuel pumps operate or how they are to be used in particular aircraft types. Rather, it has been to draw attention to the fact that it can be a dangerous practice to apply a common set of procedures — checklists, emergency actions, etc. — across the range of GA aircraft. There is, of course, a large degree of commonality in certain aspects of GA aircraft operations, but this does not mean that procedures which are correct for one aircraft can automatically be used for another. In this case, auxiliary fuel pumps provided the example which proved the point but, clearly, the lesson applies to the whole spectrum of aircraft systems. There is only one way — the *right* way — to operate systems, and that information, which appears in the Owner's Manual or Pilot's Operating Handbook, must be known by pilots in relation to *every* different aircraft type they fly ●

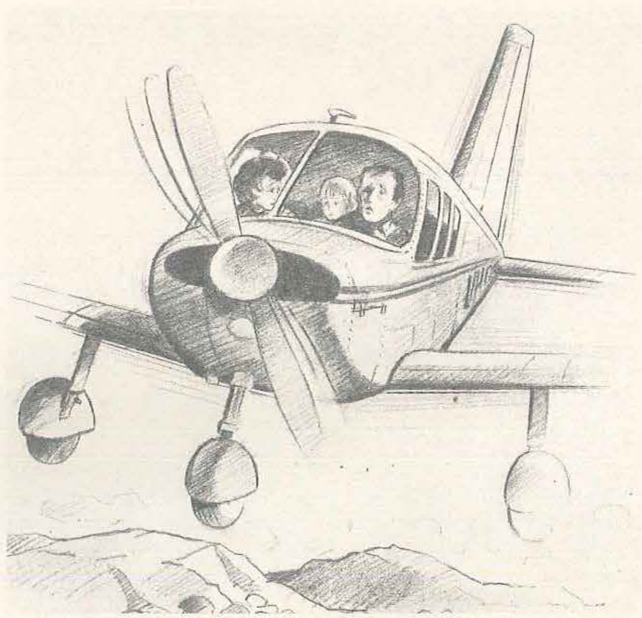
Answers to 'Wake turbulence quiz'

1. (c)	2. (d)	3. (c)	4. (b)	5. (a)
6. (b)	7. (b)	8. (c)	9. (c)	10. (c)

Preventing engine power-loss accidents

In the three-year period 1979–81 inclusive there were 135 General Aviation aircraft accidents in Australia in which engine power-loss was a relevant factor. The total of 135 was about 20 per cent of all GA accidents, making 'power-loss' the largest single accident factor during that period.

It is significant to note that, while losses of power due to mechanical malfunction continue to occur, these are relatively few. The majority of engine failures are attributable to the human rather than the mechanical component of the system. Far too many accident investigations reveal occurrences such as fuel starvation and operations outside the limits of the power plant as relevant factors. This article reviews engine power-loss accident causes, and makes recommendations as to how pilots and LAMEs can reduce the possibility of such occurrences.



Accident causes

Preventable accidents can generally be ascribed to either pilot or LAME error. It will be apparent to readers that in many of these occurrences there must also be a large element of deficient supervision from senior personnel such as operations managers, chief pilots or flying instructors, and chief engineers.

Common pilot errors include the following:

- **Inadequate systems knowledge.** If a pilot has an inadequate knowledge of his aircraft's power plant limitations, then he is likely to operate the engine outside its design limits. Component failure may result if an engine is subject to such conditions as overboosting or overspeeding, or if excessive or inadequate operating temperatures and pressures are allowed. A deficient knowledge of engine handling procedures can also generate problems with carburettor icing, mixture leaning, etc., which in turn can lead to loss of power.
- **Fuel mismanagement.** Fuel starvation (i.e. when fuel is on board the aircraft but is not supplied to the engine/s) and fuel exhaustion (i.e. when no fuel is left in the system) arise as factors in over 50 per cent of engine failure accidents. The reason almost without exception is either improper in-flight fuel system management or incorrect pre-flight planning.

As far as LAMEs and maintenance are concerned, the following three main problem areas can be identified:

- approved engine maintenance procedures are sometimes not observed;
- on occasions there appears to be non-compliance with airworthiness requirements regarding inspection, overhaul, repair, the replacement of parts, and adherence to schedules; and
- modifications and repairs and alterations are made without proper evaluation and approval.

The final common cause of engine failures is that of fuel contamination, a subject which was addressed most recently in two articles in *Aviation Safety Digest* 117. Notwithstanding the generally high standard of fuel quality control in Australia, engine power-loss associated with contaminated fuel — especially by water — continues to occur.

Recommendations

The recommendations for minimising the possibility of engine power-loss accidents are listed under the broad headings of general engine handling, fuel system management, and maintenance. The first two groups are mainly applicable to pilots and the latter to LAMEs, although obviously a degree of overlap will exist in some instances. Some of the advice offered may seem self-evident, but unfortunately the accident rate and relevant factors prove that it is not so for too many operators.

General engine handling

Pilots must know all limitations pertaining to their aircraft's power plant and they must avoid operating outside those limitations. This means that a thorough knowledge of all engine and associated systems procedures, including emergency actions, must be acquired and retained.

The engine runup during the before takeoff checks should never be carried out until all temperatures and pressures are within limits, and it must be completed in accordance with the manufacturer's instructions (i.e. as per the Pilot's Operating Handbook or the Owner's Manual). An engine must perform to its defined parameters during a runup.

During flight the possibility of problems such as overboosting or overspeeding arising will be minimised if engine controls are operated smoothly. Power settings should be made only in accordance with the Operating Handbook, while conditions conducive to engine inlet or carburettor icing, and the appropriate remedial actions, must be known.

Pilots will find that they will be better able to appreciate engine handling requirements if they stay abreast of technical information related to their aircraft's fuel, oil, engine components, airworthiness directives, etc.

Finally, pilots should exercise the greatest caution before accepting aircraft for flight with a known engine defect. Check the maintenance release before flight to ascertain that the aircraft is serviceable, and make sure that you meet your responsibilities to other pilots after flight by recording all defects so that they can be rectified by a LAME.

Fuel system management

Thorough pre-flight preparation will remove almost any chance of fuel exhaustion. There must be sufficient clean fuel of the correct grade on board the aircraft for you to fly to your destination, with stipulated reserves. Several important points to be noted here are:

- Only the usable fuel should be included in flight plan calculations.
- Fuel contents must be checked visually by the pilot-in-command — do not rely solely on the gauges or someone else's memory.
- If you are using a partial fuel load, check the exact contents by some precise method, e.g. dipping with a properly calibrated stick. A visual check is only accurate for FULL tanks.
- Complete trust in fuel gauges has often resulted in fuel exhaustion short of the destination.
- It is most important to remember that, while refuellers have responsibilities with regard to fuel type and quality, ultimately it is the pilot-in-command's responsibility to verify fuel quality, quantity and type, and to check for water content.

Thorough pre-flight preparation refers not only to planning but also to the daily or pre-flight inspection. In addition to confirming fuel contents this inspection must include a careful fuel drain check of all sumps before the first flight of the day and after each refuelling, and a check that all fuel tank vent openings are unobstructed. Fuel type and grade (e.g. AVGAS not AVTUR or vice versa) must be confirmed. Tank caps must be secure and fuel drains closed.

A surprising number of engine failure accidents are caused by fuel starvation resulting from incorrect operation of fuel selector valves. If you are not totally familiar with the various valve positions in your aircraft and any in-flight restrictions which might apply to some positions, then refresh yourself thoroughly before flight. The same can be said for the auxiliary fuel pump (if fitted): when and how to use these pumps can differ markedly between aircraft types, even if they have a similar engine; and misuse of the pump can lead to a loss of power.

After the engine has been started fuel flow from each tank to the engine/s should be checked. Sufficient time must be allowed to be certain that a newly selected tank is in fact feeding, as residual fuel in the lines and the carburettor from the previously selected tank will keep the engine running for some seconds. Hand-operated primers must be verified 'off' and locked.

Before changing fuel tanks in the air, confirm the fuel quantity in the tank to be selected and ensure that the position to which you are going to move the valve is correct. Monitor the fuel pressure after you have changed tanks until you are certain that there is satisfactory fuel flow.

Maintenance

All servicings and inspections must be carried out in accordance with approved schedules. Unauthorised changes or modifications to engines must not be effected: they invite disaster.

In addition to normal engine servicing, maintenance should include inspection of fuel cells and tanks for such things as signs of collapse, contamination, vent obstruction, internal damage, security, leaks and general condition. The fuel filter should be checked periodically for condition and/or contamination. A check of the operation and security of the fuel system selectors and control levers should be made, while the accuracy and condition of the components of the fuel contents indicating system should be confirmed.

One item of an aircraft's propulsion system which is sometimes neglected is the propeller. All blade nicks, dents, scratches, etc., must be dressed out in accordance with the manufacturer's recommended procedures to prevent fatigue cracks which could cause propeller blade failure, resulting in the loss of a section of the blade. Imbalance forces could create a catastrophic situation if a sizeable portion of the blade were lost. At the least, this would necessitate a prompt RPM reduction to minimise vibration. This would mean engine power could not be converted into much more than idle thrust.

The dressing of propeller blades must be carried out only by a LAME.

Conclusion

A loss of engine power in flight is one of the most serious emergencies a pilot can face. There are about 45 accidents annually in Australia in which power-loss is a relevant factor. It must be stressed, however, that relatively few of these failures can be attributed solely to mechanical malfunction: modern aircraft engines are generally extremely reliable. The main weak link in the system is the human.

By adhering to the procedures detailed in this article, pilots and LAMEs should be able to eliminate some of the factors that have in the past led to needless engine power-loss accidents ●

Supervision and self-discipline

Supervision and self-discipline are integral components of flying operations. To a fair extent they are interrelated: as a pilot or LAME develops increased self-discipline, less supervision is usually required.

Supervision itself can be a difficult skill to develop and exercise. Some aspects, such as monitoring a subordinate's performance, may be relatively straightforward through the application of established tenets of management. On the other hand a supervisor may need to use acquired or intuitive understanding of such complex variables as human nature in deciding how much supervision an individual requires, and whether or not that supervision is likely to stifle initiative rather than contribute to safe and effective operations.

It is not the *Aviation Safety Digest*'s role to teach operations managers and chief pilots and engineers how to become good supervisors; that is an individual or company responsibility. However, it is right that the *Digest* should draw attention to occurrences in which it is clear that deficient supervision was a factor in prejudicing air safety. Numerous examples are available:

- An instructor sent a student pilot on a period of solo circuits in conditions conducive to carburettor icing. The pre-flight briefing did not include specific advice on the use of carburettor heat. On downwind during the first circuit the engine lost power: this was later attributed to carburettor icing.
- A pilot was authorised for his first solo cross-country navex despite forecast weather conditions that were clearly unsuitable. He encountered thunderstorms, low cloud and heavy rain, and eventually became lost. Emergency procedures were initiated by air traffic control and, after some very tense moments, the aircraft was located and guided to an airfield which was open to VMC traffic.

Each of these examples is relatively straightforward, with the problem being primarily one of deficient supervision. Often, however, the lines of responsibility between supervisors and individual pilots can become blurred: this will inevitably happen from time to time. It is on such occasions that the self-discipline which is crucial to all of those associated with aviation becomes so important. When that self-discipline is absent, the potential for accidents is high, as the pilot of a Cessna 210 discovered.

The accident

A young, inexperienced commercial pilot had been operating in a remote area without supervision for some time. He was working with an oil exploration team and when the contract was completed a party was held. On the morning after the party the pilot got up at about 0400, having had only 3-4 hours rest.

Several flights were completed, in the course of which the pilot had to refuel his aircraft twice, both times with a hand pump in very hot conditions.

By the time he commenced an approach into a 900-metre-long ALA at about 1000 hours, he was extremely fatigued. While the ALA was satisfactory, in the prevailing conditions and at the Cessna's landing weight, an accurately flown approach was necessary. Instead, the pilot failed to complete his pre-landing checks and did not lower full flap, used too high an approach speed for the aircraft's weight, and landed with a strong tail wind. Although he recognised during the final approach that his groundspeed was excessive, he did not take any corrective action. To complete his litany of woes he misjudged his landing speed and flare. Touchdown was made 300 metres into the strip and the aircraft bounced several times before settling properly with only 200 metres to run. Heavy braking failed to stop the aircraft, which overturned and sustained substantial damage after it ran off the ALA.

In addition to the pilot's fatigued state, several other significant factors emerged. First, it became apparent that, during his lengthy period of unsupervised operations, this young pilot's skill level had deteriorated to the extent that it was no longer adequate for the tasks he was expected to complete. Subsequent flight testing showed that his general flying skills were below the standard required for commercial operations: a short session of retraining was necessary before the satisfactory standard was regained. It does not seem unreasonable to question the wisdom of the operations manager/senior pilot who sent this inexperienced pilot off by himself for a protracted period of commercial operations without taking positive action to ensure that the pilot did not neglect the need to remain proficient in all relevant flying and operational procedures.

As a second point, it transpired that the pilot was in a hurry to complete his flying on the day of the accident as he was scheduled for a period of leave. In his own words, he was looking forward to the break and 'just wanted to get this final job done and get out'. Thus, he was intent on landing and at no stage even considered a go-around for another circuit.

Comment

Regardless of natural flying skill and technical knowledge, any individual who does not have a highly developed level of self-discipline is not a good pilot. Supervisors share with those who work for them the responsibility for developing that discipline ●

Aircraft accident reports

FIRST QUARTER 1984

The following information has been extracted from accident data files maintained by the Bureau of Air Safety Investigation. The intent of publishing these reports is to make available information on Australian aircraft accidents from which the reader can gain an awareness of the circumstances and conditions which led to the occurrence.

At the time of publication many of the accidents are still under investigation and the information contained in those reports must be considered as preliminary in nature and possibly subject to amendment when the investigation is finalised.

Readers should note that the information is provided to promote aviation safety — in no case is it intended to imply blame or liability.

Note 1: All dates and times are local
Note 2: Injury classification abbreviations
C = Crew   P = Passengers   O = Others   N = Nil
F = Fatal   S = Serious   M = Minor
e.g. C1S, P2M means 1 crew member received serious injury and 2 passengers received minor injuries.

PRELIMINARY REPORTS (The following accidents are still under investigation)

Date / *Time*	*Aircraft type & registration* / *Location*	*Kind of flying* / *Departure point/Destination*	*Injuries* / *Record number*
18 Jan 1500	Robinson R22 VH-CIA / Albany Whaling Stn, WA	Non-commercial—aerial application/survey / Albany Whaling Stn, WA/Albany, WA	C2N / 8451002

Following a partial loss of engine power, the pilot attempted to carry out a landing on a downhill slope with a 15-knot tailwind. During the landing run the helicopter began to roll over. The pilot was unsuccessful in his attempt to prevent the rollover.

18 Jan 0730	Beech 95-C55 VH-ATB / Surfers Gardens, Qld	Non-commercial—pleasure / Surfers Gardens, Qld/Warwick, Qld	C1N, P1N / 8411002

The pilot abandoned his trip due to the wet and boggy conditions of the grass strip. While taxiing to the parking area he tried to avoid a large puddle adjacent to parked aircraft. Realising that he had misjudged his wingtip clearance from a parked aircraft, the pilot braked but could not prevent his wingtip striking the engine cowl of a Cessna.

20 Jan 0834	Rockwell 685 VH-MML / Ben Lomond, NSW 4NW	Charter—cargo operations / Armidale, NSW/Glen Innes, NSW	C1F / 8421004

During the flight the pilot reported that he would descend to cruise at 500 ft agl. Witnesses saw an aircraft at low level on the expected track and others heard aircraft noise and then the sound of an impact. Weather conditions were overcast with low cloud covering the hills. The wreckage was found on the northern side of an east-west-oriented ridge line. Impact had occurred while the aircraft was tracking to the north.

21 Jan 1130	Piper 28-235 VH-IMT / Mundabullangana	Non-commercial—aerial application/survey / Mundabullangana/Mundabullangana	C2N / 8451004

The aircraft had been parked in a hangar and not flown until the day before the accident. After landing on that occasion, the pilot noticed that the airspeed indication was slow to return to read zero. The next day the pilot believed the airspeed took longer than usual to reach the normal cruise indication. When on final, with an indicated airspeed of 80 knots, the stall warning light illuminated, the aircraft stalled and struck the ground.

29 Jan 1212	Beech V35 VH-CFH / Corowa, NSW	Non-commercial—pleasure / Corowa, NSW/Corowa, NSW	C1N, P3N / 8421005

During the takeoff the left wing dropped suddenly and the aircraft began to drift left. The pilot abandoned the takeoff and commenced braking but the aircraft veered further left into long grass beyond the strip boundary. A fire started in the grass under the left wing; however, it was extinguished before the aircraft caught fire.

29 Jan 0950	Pitts S1 VH-IGZ / Darwin River Dam, NT	Non-commercial—pleasure / Darwin, NT/Batchelor, NT	C1N / 8441002

During cruise at 1500 ft the fuel pressure dropped and the engine lost power. Attempts to restore fuel pressure failed and the pilot elected to land on the edge of a dam. During the landing roll, the aircraft nosed over and came to rest after sliding inverted for about 10 metres.

03 Feb 1137	Piper 31 VH-KFD / Moorabbin, Vic 6SSE	Test / Moorabbin, Vic/Moorabbin, Vic	C1N, P1M / 8431002

Following routine replacement of the right engine, a pilot experienced a drop in CHT and EGT on the right engine at 4000 ft in the cruise. Complete power loss followed and the propeller was feathered. A similar failure occurred on the next flight despite a prior ground check and air test. Further ground tests were completed, including replacement of the fuel control unit. On the next air test the problem recurred. The left engine then failed and damage was sustained on landing in a paddock.

04 Feb 1450	Schneider ES60 VH-GQH / Latrobe Valley, Vic 2NE	Non-commercial—pleasure / Latrobe Valley, Vic/Latrobe Valley, Vic	C1S / 8431003

After release from an aerotow launch at 2000 ft, the pilot detected significant sink. Attempts to find lift were unsuccessful and, judging he would be unable to return to the strip, the pilot elected to make an outlanding. The aircraft collided with a tree during the approach into the selected area and subsequently struck the ground heavily. Witnesses reported that the airbrakes were extended from the time of release from the aerotow.

PRELIMINARY REPORTS (The following accidents are still under investigation)

Date / *Time*	*Aircraft type & registration* / *Location*	*Kind of flying* / *Departure point/Destination*	*Injuries* / *Record number*

05 Feb — Hiller UH12-E VH-XRG — Aerial agriculture — C1N
0900 — Beaudesert, Qld 8SE — Aroona Stn, Qld/Aroona Stn, Qld — 8411003
At the end of a 180-deg turn the pilot attempted to level out but there was no cyclic response. The helicopter continued in the turn and the application of back cyclic could not prevent the nose dropping. The helicopter struck the bank of a creek, shearing off the tailboom, main rotor and gearbox, and came to rest in the water. The pilot escaped unhurt and unaided from the partially submerged cockpit.

05 Feb — Burkhart ASTIR-CS VH-GDS — Non-commercial—pleasure — C1N
1305 — Maryvale, Qld 7E — Boonah, Qld/Dalby, Qld — 8411004
The pilot elected to do an outlanding and selected a paddock which had a power line running east-west on its southern side. An approach was made into the paddock on a westerly heading but the glider struck another power line running at a right angle to the one noticed by the pilot.

08 Feb — Piper 28-140 VH-CNS — Instructional—solo (supervised) — C1N
0810 — Cessnock, NSW — Cessnock, NSW/Cessnock, NSW — 8421006
Having completed his first solo the previous day, the pilot was given a dual check and authorised to carry out five solo circuits. The first landing was reported as normal; however, on the second, the pilot carried out a go-around after the aircraft bounced to about 30 ft. After a slight bounce on the next landing, a go-around was carried out and the aircraft adopted a noseup attitude and turned left. The left wing struck a fence before the aircraft was landed in a field.

08 Feb — Cessna A188B-A1 VH-WJR — Aerial agriculture — C1N
1130 — Icy Creek, Vic — Nar Nar Goon, Vic/Nar Nar Goon, Vic — 8431005
The pilot intended to spray several crops in the same general area and noted that the first crop had power line obstructions. The spraying of this crop was completed, except for clean-up runs, and the pilot returned to carry out these runs after treating the other crops. On the first run the pilot saw the power line but was unable to prevent the aircraft colliding with it. The aircraft remained controllable and the pilot made a normal landing at the destination strip.

09 Feb — Amer Air 5B VH-WXH — Non-commercial—pleasure — C1S
1545 — Falconhurst, WA — Jandakot, WA/Quairading, WA — 8451005
After a severe vibration developed, the pilot advised that he was diverting to a nearby airstrip. The vibration worsened and the pilot attempted a landing on rocky terrain. The aircraft overturned during the landing.

14 Feb — Cessna 182L VH-UCX — Charter—passenger operations — C1N
0930 — Borroloola, NT — Borroloola, NT/Robinson River Stn, NT — 8441003
The aircraft had been parked for some days and had been subjected to numerous rain showers. A substantial amount of water was drained from the fuel system during the pre-flight inspection. Shortly after takeoff, the engine lost power and the pilot began to manoeuvre the aircraft for a forced landing. He was able to obtain partial power for a brief period following which the engine failed completely and the pilot was committed to a landing on soft wet ground.

18 Feb — Cessna 150M VH-BFA — Ferry — C1F
1651 — Parafield, SA 2NE — Griffith, NSW/Parafield, SA — 8441004
The pilot departed Toowoomba early on the same day to ferry the aircraft via refuelling stops at Walgett and Griffith. The flight evidently proceeded normally until the aircraft was on approach to land at Parafield. At this time, the pilot advised that the engine was failing and shortly afterwards he reported that he was experiencing fuel problems and would attempt a forced landing. Control of the aircraft was subsequently lost and it crashed inverted into a suburban property.

20 Feb — Cessna Citation 500 VH-FSA — Charter—cargo operations — C2F
2018 — Proserpine, Qld 4SE — Townsville, Qld/Proserpine, Qld — 8411007
After descent clearance, the aircraft reported at 2600 ft. Following a frequency change, a further descent was advised and no other calls were received from the aircraft. Witnesses reported a heavy rain squall in the area about this time and one witness saw the aircraft with navigation and strobe lights on some 8 km from the aerodrome on approach to runway 11. This witness then saw a bright red flash and fireball further east. The aircraft crashed while in a shallow descent with wings level and gear and flap extended about 5 km from the runway.

21 Feb — Piper 32-300 VH-MVT — Non-commercial—pleasure — C1M, P2S, P1M, P1N
2005 — Aldinga, SA — Aldinga, SA/Aldinga, SA — 8441005
After returning from a flight in the local training area, the pilot went around from an approach which was too high. On the second approach, touchdown occurred about half-way along the 820 m strip. The aircraft started to skid under heavy braking and the pilot considered that the aircraft might overrun the strip into a gully. Power was applied and, although the aircraft became airborne at the strip end, it then descended and collided with the far bank of the gully.

22 Feb — Piper 36-375 VH-ALQ — Aerial agriculture — C1N
1525 — Griffith, NSW 68SW — Griffith, NSW 68SW/Griffith, NSW 68SW — 8421008
During takeoff, with a full load, the aircraft became airborne as expected but then sank back onto the ground. The pilot initiated dumping of the load while continuing the takeoff. A large fence post was struck by the right wheel, detaching the strut from the aircraft and causing the ailerons to jam temporarily. The aircraft was flown to the operator's base and a flapless landing made on a grass strip.

26 Feb — Beech V35 VH-CFK — Non-commercial—practice — C1N, P1N
1600 — Gayndah, Qld 19NW — Binjour, Qld/Binjour, Qld — 8411008
The pilot had not flown for some time and was practising circuits with her husband who was also a pilot. On downwind, her pre-landing checks were interrupted by a radio call. The aircraft was subsequently landed with the gear retracted. The gear warning horn was not serviceable prior to the flight.

28 Feb — Cessna 182B VH-RFG — Non-commercial—business — C1N, P2N
1230 — Coober Pedy, SA — Cowell, SA/Coober Pedy, SA — 8441007
The pilot reported that the aircraft was higher than normal during the approach to land in crosswind conditions. The aircraft touched down heavily and bounced. Control was not regained and the aircraft stalled at about 10 feet above the runway. It then struck the ground in a nosedown attitude, sustaining damage to the forward fuselage and the propeller.

PRELIMINARY REPORTS (The following accidents are still under investigation)

Date / *Time*	*Aircraft type & registration* / *Location*	*Kind of flying* / *Departure point/Destination*	*Injuries* / *Record number*

02 Mar — Cessna A188B-A1 VH-SHK — Aerial agriculture — C1N
1000 — Boggabri, NSW 20N — Merriendi, NSW/Merriendi, NSW — 8421009
Just after takeoff for spraying operations the aircraft sank back to the ground and drifted to the left. The pilot dumped the load but the aircraft became entangled in a fence running along the left side of the strip.

03 Mar — Britnor BN2-A21 VH-NTC — Charter—passenger operations — C1N, P5N
1425 — Darwin, NT 200NE — Cape Don, NT/Smith Point, NT — 8441006
The intended destination had been rendered unsuitable due to recent rain. A nearby disused strip was inspected and the pilot was advised that it was serviceable. After the inspection about 38 mm of rain fell and water about 20 cm deep lay on a section of the strip when the pilot landed. As the main wheels entered the water, the nosewheel was pulled into hard contact with the strip and collapsed rearwards.

03 Mar — Mooney M20F VH-ERS — Non-commercial—pleasure — C1N, P1N
0830 — Redcliffe, Qld — Redcliffe, Qld/Redcliffe, Qld — 8411009
The pilot reported that prior to touchdown all gear down indications were normal. Shortly after touchdown, the right gear collapsed and the aircraft came to rest on the right wingtip 6 metres from the edge of the runway.

09 Mar — Cessna T188C VH-MXJ — Aerial agriculture — C1N
0641 — Ayre, Qld 8WNW — Hoey's Strip, Qld/Hoey's Strip, Qld — 8411010
Shortly after takeoff for rice spraying operations the pilot noticed that engine power was decreasing. He was unable to prevent a continuing loss of power and after dumping the hopper load he attempted to guide the aircraft towards a relatively clear area. One gear wheel entered the rice crop and the aircraft swung into an adjacent cane crop and overturned.

10 Mar — Bryan HP-18 VH-GJZ — Test — C1F
1618 — Kingaroy, Qld — Kingaroy, Qld/Kingaroy, Qld — 8411012
The aircraft was undergoing its second test flight since construction had been completed. After the test sequence had been completed satisfactorily, the pilot positioned the aircraft for landing. When the glider was about 150 ft agl, the pilot reported by radio "something broke". The aircraft was observed to enter a steep spiral descent which continued until ground impact. Initial investigation revealed that an asymmetric flap condition existed at the time of impact.

11 Mar — Hiller UH12-E VH-FBQ — Aerial agriculture — C1N
1345 — Casino, NSW 15S — Belara Station, NSW/Belara Station, NSW — 8421010
The helicopter was climbing through a height of about 30 ft when the pilot heard a loud snapping noise. This was followed by temporary loss of control and severe vibration. The pilot retained sufficient control of the aircraft to carry out a forced landing at about 10-knot ground speed.

12 Mar — Cessna 172N VH-IVO — Non-commercial—pleasure — C1N, P3N
2004 — Aeropelican, NSW — Port Macquarie, NSW/Aeropelican, NSW — 8421011
Following an approach flown at 70-75 knots, the aircraft touched down about half-way along the runway and bounced a number of times. Near the runway end the pilot initiated a go-around but the aircraft failed to climb and collided with the airport boundary fence before coming to rest in the middle of a highway.

12 Mar — Cessna U206G VH-FRT — Charter—passenger operations — C1N, P5N
0909 — Wilpena, SA — Wilpena, SA/Wilpena, SA — 8441008
During the landing flare the aircraft ballooned and assumed a nose-high attitude. The pilot attempted to take corrective action but the tail contacted the ground before the mainwheels. The aircraft bounced and on subsequent touchdown the tail again struck the ground.

13 Mar — Cessna 182Q VH-EIL — Ferry — C1N
0845 — Taggerty, Vic 5SSW — Eildon, Vic/Taggerty, Vic — 8431006
The pilot carried out a straight-in approach to the 760-metre-long grass strip. Rain was falling at the time. The aircraft touched down about 200 metres beyond the threshold and the pilot reported that the brakes seemed ineffective. After overrunning the strip, the aircraft overturned when it entered a ditch.

14 Mar — Cessna A188A VH-KZE — Aerial agriculture — C1N
0930 — Condamine, Qld 5W — Dalby, Qld 124NW/Dalby, Qld 124NW — 8411014
The pilot was conducting the last run of a spraying operation. Because of the wind conditions, the aircraft was displaced over the boundary fence line to achieve the desired spray coverage. The pilot was distracted by a radio call and the right mainwheel struck a fence post. Although the gearleg was torn off, the pilot retained control of the aircraft and subsequently carried out a successful emergency landing at his normal base of operations.

14 Mar — Mooney M20-J VH-MIY — Non-commercial—pleasure — C1M
0945 — Great Kepple Is — Great Kepple Is/Rosewood Island, Qld — 8411013
Shortly after takeoff, the pilot heard a loud noise and noticed that the luggage locker door was open. A 180-degree turn was carried out for an approach to the departure runway. As the aircraft approached the end of the runway the right wing struck the ground and the aircraft slid sideways along the runway. All the landing gear legs collapsed before the aircraft came to rest.

15 Mar — Cessna 182-D/A1 VH-DZL — Ferry — C1N, P1N
1300 — Northam, WA — Toodyay, WA/Northam, WA — 8451006
The model specification for this aircraft indicates that it has been converted to tailwheel configuration. The pilot reported that the windsock was indicating a wind of 270 degrees, 10 to 13 knots. He elected to land on runway 13 and after a three-point touchdown the aircraft began to turn right. The pilot was unable to regain directional control and the aircraft ground looped, bending the left wing and tailplane.

PRELIMINARY REPORTS (The following accidents are still under investigation)

Date / Time	Aircraft type & registration / Location	Kind of flying / Departure point/Destination	Injuries / Record number
18 Mar 1445	Cessna 182K VH-KRH Mt Alaric, NT	Sport parachuting (not associated with airshow) Batchelor, NT/Batchelor, NT	C1N, P2N 8441009

Whilst airborne for parachuting-dropping operations, the pilot noted that the weather at his destination had deteriorated. He elected to divert to a clear area and carry out a precautionary landing. The area selected was soft and during the landing roll the nosegear strut collapsed.

19 Mar Piper 28-140 VH-MGG — Instructional—solo (supervised) — C1N
1050 Murray Bridge, SA — Murray Bridge, SA/Murray Bridge, SA — 8441010

After a number of dual circuits, the pilot was authorised to carry out solo circuits with touch-and-go landings. After the first touchdown the pilot applied full power, then selected the flap to 10 degrees. The aircraft entered a rapid turn to the left and the pilot abandoned the takeoff. The aircraft slid sideways off the strip and the nosewheel was broken off.

22 Mar Beech 35-C33 VH-CEA — Non-commercial—pleasure — C1N, P3N
2019 Essendon, Vic — Moorabbin, Vic/Essendon, Vic — 8431007

On the downwind leg of the circuit, the pilot selected the landing gear down and observed the gear down light illuminate. During the landing roll, the left wing began to lower and the left aileron and flap contacted the ground. The aircraft veered off the runway before coming to rest. The left main gear leg was found to be still in the up position.

23 Mar Cessna U206E VH-TSR — Charter—passenger operations — C1N, P3N
1538 Bathurst Harbour, Tas — Cox Bight, Tas/Bathurst Harbour, Tas — 8431008

After overflying the strip, the pilot noticed the wind was about 030/15-18 knots and fluctuating about 30 degrees either side of the mean direction. He elected to land to the southeast on strip 12. On landing he did not begin braking immediately and let the aircraft roll while raising the flaps. He then braked intermittently and finally applied heavy braking as he neared the end of the strip. The aircraft overran the strip and subsequently overturned.

24 Mar Piper 28-R201 VH-FSD — Non-commercial—pleasure — C1N
1930 Dubbo, NSW 102SW — Moree, NSW/Griffith, NSW — 8421015

While cruising at 6000 feet on a night VMC flight the pilot encountered a heavy rain shower. During an attempted 180-degree turn the aircraft entered a spiral dive and in the recovery from this dive the aircraft was evidently overstressed. After diverting to Parkes the pilot flew to his planned destination on the following day. The damage sustained by the wings was not detected until a subsequent daily inspection.

24 Mar De-Hav Sea Fury-308 VH-HFG — Ferry — C1N
0957 Leyburn, Qld 12S — Toowoomba, Qld/Scone, NSW — 8411015

The pilot had limited experience on type. After establishing the aircraft in level flight following a climb to flight level 130, the pilot noted that the oil temperature was rising. To prevent engine damage he elected to make a wheels-up landing in a paddock. Post-accident inspection revealed that the oil cooler shutters were closed. These shutters should have been in the open position.

24 Mar Cessna 172N VH-RWQ — Non-commerical—pleasure — C1N, P3N
1000 Rottnest Is, WA — Jandakot, WA/Rottnest Is, WA — 8451007

The pilot was landing into the east with a 10- to 12-knot southerly wind. On short final approach at a speed of 60 knots the aircraft encountered sink. Touchdown was heavy and resulted in damage to the propeller, nosegear and engine firewall.

24 Mar Cessna 150G VH-KUB — Non-commercial—pleasure — C1N
0930 Stud Park Stn, NSW — Stud Park Stn, NSW/Stud Park Stn, NSW — 8421013

At about 300 feet after takeoff the pilot noticed a restriction in forward movement of the control yoke. He carried out a landing in a paddock to his left but the aircraft struck a levee bank and overturned.

24 Mar Bell 47-G4 VH-UTQ — Activities associated with aerial agriculture — C1S
1425 Werris Creek 23W — Burwood, NSW/Burwood, NSW — 8421014

The pilot was inspecting areas of noxious weeds to check on the results of recent spraying. The helicopter struck a power line which severed the bubble windscreen. The wire then contacted the pilot's throat before being cut by the main rotor. The helicopter struck the ground tail rotor first about 35 metres beyond the point of collision. After extricating himself from the wreckage, the pilot swam across a river, walked 3 km to a homestead and drove 15 km for help. He was later admitted to intensive care in hospital.

28 Mar De Hav 82-A VH-ATJ — Non-commercial—practice — C1N
1635 Berwick, Vic — Berwick, Vic/Berwick, Vic — 8431010

The pilot was conducting a series of touch-and-go landings. The area being used was to one side of the gravel runway in order to avoid risk of gravel damage to the aircraft fabric covering. As power was being applied for the fourth takeoff, the main gear became caught in an area of long grass, the nose pitched down rapidly and the aircraft overturned.

28 Mar Cessna 172G VH-DJE — Aerial mapping/photography/survey — C1M, P1M
0945 Cann River, Vic — Bairnsdale, Vic/Noorinbee, Vic — 8431011

On arrival at his destination, the pilot made a low inspection pass over the strip at about 20 feet agl in a flapless configuration at 80-90 knots. As he neared the end of the strip he pulled up steeply to about 150-200 feet. At the top of the climb the aircraft banked to the left, descended rapidly while turning through some 135 degrees and struck the ground in a left wing down attitude.

29 Mar Piper 30 VH-TON — Non-commercial—business — C1N
1755 Kalumburu, WA — Kununurra, WA/Kalumburu, WA — 8451008

The landing gear had been selected down during descent to the destination. On arrival overhead the strip the pilot noticed some cattle on the strip. He became concerned with the onset of darkness and selected the gear up to make a quick pass to clear the cattle from the strip. The gear was selected down on downwind and the selection was again checked on final approach but the aircraft landed without the gear being down and locked.

PRELIMINARY REPORTS (The following accidents are still under investigation)

Date / Time — Aircraft type & registration / Location — Kind of flying / Departure point/Destination — Injuries / Record number

29 Mar Bell 206-L1 VH-BJX — Construction work — C1S
1107 Leigh Creek 85SSE — Oraparinna HS, SA/South Mount Hayward, SA — 8441011

As part of a communications propagation test, personnel were to be positioned in the Oraparinna National Park by helicopter. One person was being lowered by winch when, at about 3 metres below the helicopter and 4 metres above the ground, his harness became detached from the winch hook and he fell to the ground.

30 Mar Hiller UH12-E VH-FBZ — Activities associated with aerial agriculture — C1N, P1N
1030 Muttaburra 52NE — Elabe Station, Qld/Potosi Station, Qld — 8411017

The pilot in command was occupying the rear control position, which did not have tail rotor control pedals, while another pilot flew the aircraft. During the approach to land, the pilot in command became concerned when the airspeed decayed and he pushed the cyclic control forward to initiate a go-around. The aircraft yawed to the right, control was lost and the aircraft struck the ground heavily, coming to rest on its right side.

FINAL REPORTS (The investigation of the following accidents has been completed)

Date / Time / Pilot licence — Aircraft type & registration / Location — Age — Kind of flying / Departure/Destination / Hours Total, Hours on Type, Rating — Injuries / Record number

06 Jan Cessna 172N VH-WSL — Non-commercial—pleasure — C1N
0938 Moorabbin, Vic — Moorabbin, Vic/Moorabbin, Vic — 8431001
Private restricted — Age 42 — Hours total 81 — Hours on type 4 — Rating None

As the aircraft was taxiing for a runway 35 departure, there was a westerly wind change. As runway 31 was temporarily unavailable the pilot elected to take off on runway 35. During the ensuing circuit, he was advised of a crosswind and possible downwind component. After touchdown the propeller and left wing contacted the runway when the pilot lost control of the aircraft during the landing roll.

15 Jan Burkhart Twin Astir VH-IUF — Instructional—solo (supervised) — C1N
1245 Gawler, SA — Gawler, SA/Gawler, SA — 8441001
Glider — Age 22 — Hours total 15 — Hours on type 15 — Rating None

The normal final approach was flown but just after the aircraft was flared it dropped to the runway, bounced once, then contacted the runway heavily.

The inexperienced student was flying a solo circuit after a dual check when he misjudged the landing flare.

05 Feb Piper 32-300 VH-TLT — Non-commercial—practice — C1N, P2N
1612 Moorabbin, Vic — Moorabbin, Vic/Moorabbin, Vic — 8431004
Private — Age 36 — Hours total 214 — Hours on type 23 — Rating None

After takeoff, the pilot noticed that the engine cowl had lifted slightly. He decided to complete the circuit and land. During the crosswind leg of the circuit, the cowl lifted completely from the left attachment points and obscured, to a large extent, the pilot's forward vision. An approach was then made to a cross-strip and on short final the pilot lost sight of the runway and the aircraft landed heavily.

The top engine cowl had not been correctly secured before flight. Inspection of the aircraft revealed that the lug holes that accept the cowl locating pins were not fitted with the required nylon inserts. It was possible for the cowl side latches to appear to be fastened when in fact they were not properly engaged.

09 Feb Cessna A188B-A1 VH-SHK — Aerial agriculture — C1N
1200 Boggabilla, NSW — Boggabilla, NSW/Boggabilla, NSW — 8421007
Commercial — Age 34 — Hours total 4350 — Hours on type 3000 — Rating Agricultural class 1

Shortly after becoming airborne the performance of the aircraft began to deteriorate. The pilot dumped the load but the aircraft failed to climb normally. The pilot abandoned the takeoff and the aircraft touched down on the strip, ran through the boundary fence and sustained damage to the tail assembly.

No fault was subsequently found with the engine and associated systems. The takeoff had been attempted in gusty wind conditions and with a tailwind component. It was probable that the aircraft had encountered windshear immediately after liftoff.

13 Feb Cessna 402B VH-UBZ — Charter—passenger operations — C1N, P1N
1310 Yam Island, Qld — Warraber Island, Qld/Yam Island, Qld — 8411006
Commercial — Age 22 — Hours total 855 — Hours on type 413 — Rating Instrument rating 1st class or class 1

The aircraft touched down normally on the 760-metre-long strip and the pilot commenced braking immediately. He was then distracted by the sudden appearance of two cyclists at the edge of the strip and was concerned that they might attempt to cross the strip in front of the aircraft. This did not occur and the pilot, returning his attention to the landing roll, realised that the rate of deceleration was less than expected. Despite pumping the brakes, he was unable to prevent the aircraft from overrunning the end of the strip and colliding with a large rock.

Heavy rain had fallen on the strip shortly before the aircraft arrived. The grass surface was slippery and resulted in reduced braking effectiveness. When the pilot realised that the rate of deceleration was abnormal, there was insufficient strip length remaining to ensure a successful go-around.

FINAL REPORTS (The investigation of the following accidents has been completed)

Date / Time / Pilot licence	Aircraft type & registration / Location	Age	Kind of flying / Departure/Destination / Hours Total	Hours on Type	Rating	Injuries / Record number
14 Feb	Partenavia P68-B VH-UUG		Non-commercial—business			C1N, P2N
0630	Chum Plains, Qld		Charleville, Qld/Cowley Station, Qld			8411005
Private		38	600	300	None	

The pilot had obtained a briefing on the strip at the intended destination and was aware that it was in good condition. On arrival a normal circuit was flown and on short final approach the pilot noticed bushes on the strip. He prepared to go around but before this could be effected the nose and left main wheels struck anthills which were obscured by the bushes. The left gear leg was detached and the aircraft ground-looped.

The pilot made a navigation error and had made an approach to a disused strip 13 km from the intended destination. The strip had appeared serviceable when viewed from circuit height, but the pilot had not checked the orientation of the strip which was 20 degrees different from that at the intended destination.

09 Mar	Cessna 402B VH-CWG		Charter—passenger operations			C1N, P3N
1408	Kidston, Qld		Townsville, Qld/Kidston, Qld			8411011
Commercial		37	5400	875	Instrument rating 1st class or class 1	

The pilot was familiar with the area and his last flight to the strip had been four days prior to the accident. A circuit was made in light rain and on downwind the pilot thought the runway looked longer and different in colour. On flareout for landing the pilot noticed some cone markers on the left of his landing path. The nosewheel collapsed on the landing roll.

The pilot had landed on a newly ploughed area to the right of the strip. The area gave the illusion of being a prepared landing area when seen from the air. Although he thought the strip looked different as compared to his previous landing, the pilot did not attempt to find the reason for this difference.

20 Mar	Beech E55 VH-TTL		Non-commercial—pleasure			C1N, P4N
1000	Tocumwal, NSW		Tocumwal, NSW/Tocumwal, NSW			8421012
Commercial		40	1230	409	Flight instructor grade 3	

During the course of the flight, the pilot learned that the passenger in the right-hand front seat held an American pilot licence and was experienced on the type. He allowed the passenger to manipulate the controls until the aircraft was on final approach and allowed him to keep his hands lightly on the controls during the flare and touchdown. During the landing roll the passenger, unnoticed by the pilot, inadvertently selected the landing gear up. The aircraft slid to a halt with the gear partially retracted.

27 Mar	Piper 23-250 VH-IAC		Non-commercial—corporate/executive			C1N, P1N
1922	Burketown, Qld 3W		Mornington Is, Qld/Karumba, Qld			8411016
Commercial		19	290	93	Instrument rating class 4	

Prior to departure for the planned 50-minute flight, the pilot had added fuel to give an endurance of 100 minutes. Adverse weather was encountered enroute and the pilot became uncertain of his position. In fading daylight he recognised the Burketown area and requested Flight Service to organise strip lighting. Before this could be arranged the left engine failed and the pilot attempted to land on an old road. Touchdown occurred in a rough area adjacent to the road and the landing gear collapsed.

The left engine had failed from fuel exhaustion. When refuelling the aircraft, the pilot had not added sufficient fuel to allow for 60 minutes holding at the destination as required because of the forecast adverse weather.

FINAL UPDATES (The investigation of the following accidents has been completed. The information is additional to that previously printed in the preliminary report)

Date / Pilot licence	Record number / Age	Aircraft type / Hours total	Hours on type	Rating
20 Jan	8311004	Cessna 172N		
Private	46	3064	2984	None

On the evening preceding the accident the pilot indicated his intention to commence mustering early the next morning. The pilot arose at about 0530 hours and it is believed that the aircraft took off at about 0600. The aircraft was seen at about 0620 by the stockmen. It was flying at about 100 ft agl and when the engine noise ceased, and the aircraft was not seen again, one stockman rode to a nearby bore and found the inverted aircraft wreckage.

The aircraft had impacted the ground in a near-vertical attitude. No contributory fault could be found with the aircraft or the associated systems. The pilot did not hold a mustering approval and no evidence of him having undergone such training could be found. It is probable that the aircraft stalled at low level and that the pilot was unable to regain control before ground impact.

14 Feb	8321022	Cessna 180		
Airline transport	43	12000	300	Instrument rating 1st class or class 1 and flight instructor

The pilots were engaged on the second of two periods of circuit and landing practice. Towards the end of the twelfth landing, the aircraft ground looped to the left and the starboard wingtip and tailplane contacted the ground.

FINAL UPDATES (The investigation of the following accidents has been completed. The information is additional to that previously printed in the preliminary report)

Date / Pilot licence	Record number / Age	Aircraft type / Hours total	Hours on type	Rating
21 Feb	8341004	Coñaero LA4 200		
Senior commercial	22	1732	30	Instrument rating 1st class or class 1 and flight instructor

At 50 ft after takeoff the aircraft failed to continue to climb, the airspeed decayed and the aircraft began to lose height. To avoid trees ahead the pilot turned the aircraft. The right float struck the water, the aircraft yawed to the right and skipped sideways to the left across the water before coming to rest.

The takeoff distance available was less than the distance required in the prevailing conditions. The takeoff was made with a 5- to 10-knot headwind into the south-east. The wind backed to a north-easterly above the tree line. This probably resulted in the loss of performance when the pilot turned the aircraft to the right after takeoff.

25 Feb	8351006	Bell 47-G3B1		
Commercial — helicopter	31	1380	375	None

While established in cruising flight the pilot felt something strike the airframe and noticed that a pillow supporting an external litter patient had been dislodged. About one minute later the helicopter began to yaw to the right with increasing speed. The pilot entered auto-rotation, aiming for a run-on landing in a small clearing; however, as collective pitch was re-introduced control was lost, the aircraft struck the ground heavily and was destroyed by fire.

The pillow had struck the tail rotor and the tail rotor driveshaft subsequently failed. The pilot had not received adequate training in the actions to be taken following the loss of tail rotor control in flight and the flight manual instructions were not sufficiently clear.

24 Mar	8351011	Cessna 150L		
Private restricted	40	221	221	None

After locating some cattle for a mustering party, the pilot flew along a creek line at about 400 ft agl and 60 knots with 10 degrees of flap. To keep the ground party in sight the pilot commenced a left turn and the aircraft stalled. The pilot was unable to regain control of the aircraft before it hit the ground.

The pilot had received no training in low-level operations and had not adequately monitored the airspeed prior to commencing the turn.

23 Apr	8331012	Beech A36		
Private	24	141	4	None

The pilot and his four passengers had planned a trip to Sydney and return for the Anzac Day long weekend. In preparation for the trip the pilot obtained a flight check in a Beech Bonanza aircraft.

On the morning of the accident the pilot obtained weather forecasts for the route to be flown, prepared a flight plan for the trip and submitted it to the Briefing Officer at Moorabbin Airport at 0755 hours. The flight plan indicated that the aircraft would proceed to the first nominated reporting point at Mangalore outside Melbourne Controlled Airspace and at an altitude below 5000 feet above mean sea level (amsl).

When the pilot submitted the flight plan, he was advised by the Briefing Officer that the route through the Kilmore Gap was not suitable for flight under visual meteorological conditions (VMC). The pilot agreed to delay his departure until conditions improved in the Kilmore Gap.

The pilot and passengers then proceeded to the aircraft and after loading the aircraft was taxied for takeoff. The departure time from Moorabbin was reported by the pilot as 0900 hours. No request for any update of the weather situation in the Kilmore Gap area had been received from the pilot before departure.

Shortly after departure, the aircraft was identified on Melbourne radar after having inadvertently entered Melbourne Control Zone. The pilot was instructed to maintain the aircraft's present altitude and heading, until about four minutes later at 0908 hours when the pilot was cleared to resume his own navigation after reporting he had Yan Yean reservoir in sight.

At about 0918 hours, VH-DAJ was observed over Kilmore at an altitude of approximately 600 feet above ground level (agl) heading in a north-westerly direction. Shortly afterwards the pilot was asked by Melbourne Flight Service for his appreciation of the weather in the Kilmore Gap. In reply the pilot advised he was unsure of the aircraft's location and was going to carry out a 180-degree turn; he also requested the aircraft's bearing from Melbourne. The pilot was then advised that the aircraft was not within radar coverage and asked if the aircraft could be climbed to 4000 feet amsl and remain in VMC, to which the pilot replied that the aircraft was not in VMC at that time. The pilot was then advised that three minutes earlier his aircraft had been 30 nautical miles north of Melbourne and that if he turned to the south the aircraft would be expected to come within radar coverage shortly. Two minutes later Melbourne Flight Service asked the pilot the direction and the altitude at which the aircraft was flying. The pilot answered that the heading was 'one two zero' and then that the aircraft's level was 'two thousand'. This was the last transmission received from the aircraft.

Weather in the area at the time was reported as low cloud and rain. The search for the aircraft was hampered by the weather.

The wreckage was finally located by a motorbike rider later in the afternoon. The initial impact had been in a slight right wing low attitude on a heading of approximately 135 degrees at a height of 2180 feet amsl on the slopes of Mt William, the top of which is 2639 feet amsl. After the initial impact, the aircraft had rolled inverted before striking the ground again, 70 metres beyond the initial point of impact. Fire broke out and engulfed the wreckage.

The investigation did not reveal any fault with the aircraft that would have contributed to the accident. Witnesses in the area reported that the position VH-DAJ struck the ground was shrouded by cloud at the time of the accident.

03 May	8311027	Hughes 269C		
Commercial — helicopter	29	3600	1500	None

The helicopter was weaving back and forth driving cattle. Height was about 30 ft and airspeed about 25 knots. The pilot heard a loud bang and believed the engine had failed. An autorotation was carried out into trees.

The cause of the loud bang and the power loss reported by the pilot could not be determined. There was no suitable area available for the subsequent autorotational landing initiated by the pilot.

05 May	8351016	Beech 95-C55		
Commercial	41	5800	4600	Instrument rating 1st class or class 1

While cruising at 7500 ft, the pilot became aware of a fire behind the throttle quadrant. An immediate descent was commenced and attempts by passengers to extinguish the fire were unsuccessful. After landing, the occupants evacuated the aircraft and were again unsuccessful in extinguishing the fire.

The cause of the fire was not determined. Attempts to control the fire by use of the portable extinguisher were unsuccessful as the item failed to operate.

FINAL UPDATES (The investigation of the following accidents has been completed. The information is additional to that previously printed in the preliminary report)

Date / *Pilot licence*	*Record number* / *Age*	*Aircraft type* / *Hours total*	*Hours on type*	*Rating*
07Jun	8321046	Piper 28-R180		
Private	49	230	10	None

While the aircraft was cruising at 2000 ft below an overcast at 2500 ft, a large bird struck the outer leading edge of the left wing.

12 Jun	8311036	Cessna P206D		
Commercial	21	200	15	Instrument rating class 4

The pilot was unable to start the engine with the starter. He set the park brake, explaining to his passenger the foot brake operation and briefed her to slightly open the throttle if the engine looked like stopping after he had started by hand swinging the propeller. As the engine started the aircraft moved forward. The passenger inadvertently fully opened the throttle, the aircraft collided with a fence and hangar door before coming to rest embedded in the side of the hangar.

The cause of the malfunction in the electrical system could not be determined.

17 Jun	8311037	Cessna 404		
Commercial	40	8765	1336	Instrument rating 1st class or class 1

On approach the landing gear down indications were normal. However, when the nosewheel was lowered after touchdown, the nosewheel leg collapsed and the nose section impacted the runway.

The rod end of the nosewheel retract rod had failed in overload prior to touchdown.

27 Jun	8311039	Cessna 182G		
Private	55	549	395	None

While cruising at 1500 ft amsl the engine began to run roughly and backfire. The pilot was unable to recitfy the problem and shut the engine down. A forced landing was carried out on a beach and after landing the pilot found a fire in the engine compartment. He was unable to extinguish the fire until the arrival of a fire tender from a nearby airport.

The engine muffler had deteriorated to the extent that it was torching onto the carburettor air intake duct and air box. Pieces of the duct and air box broke away and blocked the induction system. The torching induced the engine fire. The aircraft had flown only 56 hours since the last major inspection which was considered to have been inadequate. The engine cowls did not provide accessibility for pre-flight inspection of the engine area.

03 Jul	8321053	Rutan Vari Eze		
Private	52	4800	150	None

Following receipt of advice that the aircraft had failed to return from a no-sar, no-details flight, searchers found the wreckage washed up on the edge of a lake. A power line 20 metres above the lake surface and about 1.5 km from the wreck had been debraided over a two-metre length.

The aircraft had struck the power line which severed the right canard, a section of the right wing and the propeller blades. The aircraft struck the water and the main wreckage floated to the shore of the lake. The investigation did not reveal any fault with the aircraft that could have contributed to the accident and no operational reasons could be found for the aircraft having been flown at low level over the lake.

12 Aug	8321061	Cessna A188-A1		
Commercial	27	2573	Not known	Agricultural class 1

On the fourth run of a weed-spraying operation, the aircraft passed under a power line which the pilot had not seen. The power line struck the deflector cable which failed adjacent to the fin attach point. The top section of the fin and rudder mass balance were severed and two rudder hinges failed, allowing the rudder to hang loose and foul the elevators. The aircraft struck rising ground 800 metres after the wire strike.

The spray run was flown on a westerly heading into the afternoon sun. Although the pilot was aware of the position of the power line, he did not see it on this occasion because of sunglare.

05 Sep	8331025	Cessna 182P		
Private	47	703	33	Instrument rating class 4

Being unable to continue to his destination because of deteriorating weather, the pilot decided to land at an airfield enroute. The aircraft touched down about 140 m behind the strip threshold but then bounced. After the second touchdown the pilot applied braking which had little effect. He then attempted to steer the aircraft onto an adjacent grass strip; however, the aircraft continued straight ahead, passing over two ditches and a fence before overturning.

The approach was carried out with only 20 degrees of flap set and at an airspeed higher than specified in the aircraft flight manual. The strip had pools of water on it which reduced the effectiveness of the brakes. The pilot did not initiate a go-around after the aircraft floated and bounced.

05 Sep	8331026	Gulfstream 695-A		
Commercial	59	9680	95	Instrument rating 1st class or class 1

After the gear was lowered during the approach, a normal gear down indication was observed by both crew members. The aircraft touched down on the main wheels and as the nose was lowered the pilot heard a loud noise and noticed that the nose attitude was lower than normal. The nose was raised and when subsequently lowered the nosewheel contacted the runway and all nosewheel functions operated normally.

The cause of the malfunction of the nosegear system could not be determined.

09 Sep	8321069	Cessna A188B-A1		
Commercial	38	11000	2000	Agricultural class 1 with flight instructor

The operation involved the spraying of a series of cultivated paddocks. The last swath run of the task was carried out along one of the paddock boundaries. Shortly after the run was begun, the aircraft struck a set of power lines. The tops of the fin and rudder were torn off and the aircraft struck the ground 50 metres beyond the wires. The aircraft cartwheeled and came to rest inverted.

The pilot had a map of the area showing the position of the power lines. Prior to commencing the run he overflew the area to be sprayed, to check the position of the wires, and now believes he mistook a spur line for the main line that was marked on his map. The pilot saw the line after commencing the run but was unable to avoid the collision.

FINAL UPDATES (The investigation of the following accidents has been completed. The information is additional to that previously printed in the preliminary report)

Date / *Pilot licence*	*Record number* / *Age*	*Aircraft type* / *Hours total*	*Hours on type*	*Rating*
10 Sep	8311056	Burkhart Astir CS		
Glider	44	900	120	Glider

During the course of a soaring flight it became necessary to make an outlanding. A suitable landing area was not available and the pilot elected to land in a ploughed field. During the landing run the right wingtip struck the rough ground, the glider groundlooped to the right and the landing gear collapsed.

The pilot misjudged his circuit and overshot his approach. He initiated a groundloop to avoid standing cane at the end of the field. A tailwind component was present on final approach.

18 Sep	8321074	Piel-100		
Commercial	26	437	3	Instrument rating 1st class or class 1

The purpose of the flight was to show the passenger the characteristics of a tailwheel aircraft. After a normal approach and touchdown, the aircraft was observed to go-around and fly level at a low height above the runway. The aircraft was then seen to climb steeply, stall and to impact the ground in a steep nosedown attitude whilst rotating to the right.

No fault was found with the aircraft that could have contributed to the accident. The pilot was inexperienced on the aircraft type and did not maintain adequate flying speed when manoeuvring the aircraft after takeoff.

26 Sep	8321075	Cessna 182Q		
Commercial	25	450	25	Instrument rating 2nd class

After experiencing erratic engine operation, the pilot elected to make a precautionary landing on a nearby golf course. The initial approach was unsatisfactory and a go-around was made. As the aircraft turned onto a base leg for landing the engine lost power completely. The aircraft descended steeply, struck a television antenna and a tree, bounced off a sealed road and collided with the boundary fence of the golf course.

The engine had failed from fuel exhaustion. The pilot had planned on a lower fuel consumption rate than that recommended in the aircraft operating manual for the power settings being used.

08 Oct	8321079	De Hav 82A		
Private	45	350	5	None

After a one-hour flight in the local training area the pilot entered the circuit for a fullstop landing. The ATIS broadcast indicated that 10 knots of crosswind could be expected. The initial touchdown was heavy and the aircraft bounced. The pilot then attempted to land in a three-point attitude but the touchdown was again heavy and the maingear partially collapsed.

The pilot was inexperienced in the aircraft type, and had limited experience on tailwheel aircraft in general. Correct recovey action had not been taken when the aircraft bounced.

09 Oct	8331029	Pitts S1		
Private	46	742	44	Instrument rating class 4

The aircraft was one of many which had flown into a barbecue at a private airfield. The pilot was asked if he would provide an aerobatic display and during the day, carried out three. After completing the third display, the aircraft flew past the gathering at about 500 feet above the ground, pulled up steeply and turned through 180 degrees to land straight ahead. It then descended steeply at low forward speed and struck the ground heavily in a nosedown attitude.

The pilot was inexperienced in low-level aerobatics. He did not maintain flying speed during a manoeuvre when attempting to align the aircraft for final approach.

13 Oct	8321080	Piper 25-235/A1		
Commercial	32	1700	550	Agricultural class 2

The pilot carried out an aerial survey of the area to be treated and commenced spraying. The initial run was made below power lines crossing the centre of the crop and the third run was in the same direction. As the aircraft approached the power lines, the pilot's attention was distracted and the windscreen and canopy struck the lower two cables. The aircraft turned to the right and crashed into an adjoining field.

16 Oct	8341029	Piper 25-235		
Commercial	27	486	295	Agricultural class 1

The pilot was engaged in spraying a crop of lupins. The aircraft was observed to fly from one paddock to another on the property. A short time later a tree in that paddock was observed to be on fire. The wreckage of the aircraft was later found in the paddock. The aircraft had struck the ground in an inverted attitude and was completely burnt out by the ensuing fire.

No evidence of aircraft failure or pilot incapacitation was found. The reason for the loss of control leading to the accident could not be determined.

22 Oct	8321082	Cessna A188-A1		
Commercial	42	10500	500	Agricultural class 1

The aircraft completed a spraying run and landed on a strip located in an oatfield in which the surrounding crop averaged one metre in height. A section of this crop which was growing on a low earth mound was half a metre higher. After touchdown, the right wingtip entered this section of oats, the aircraft swung rapidly to the right and the left wingtip and tailplane struck the ground.

The mown area was 15 m wide and the aircraft wingspan was 12.7 m. Although the pilot had landed there on a previous flight, on this occasion he did not maintain the aircraft in the middle of the strip with sufficient accuracy to prevent the wing coming into contact with the crop.

26 Oct	8331031	Piper 25-235		
Commercial	36	1350	750	Agricultural class 2

After the pilot had refuelled the aircraft, loaded spray and carried out a fuel drain check, he commenced spraying a nearby wheat crop. Part way through a procedure turn at the end of a spray run, the engine lost all power. The pilot levelled the wings and after avoiding a farm house ahead, dumped the spray load. The aircraft struck a power line, trees and the ground and fire broke out immediately. The pilot escaped from the wreckage.

The cause of the engine failure could not be determined due to total destruction by fire. The pilot had poorly planned his spray run pattern as the procedure turn at the end of the runs was conducted over farm buildings. When the engine lost power, the pilot had to manoeuvre the aircraft clear of the buildings thus reducing the time available for him to plan a landing.

FINAL UPDATES (The investigation of the following accidents has been completed. The information is additional to that previously printed in the preliminary report)

Date / *Pilot licence*	*Record number* / *Age*	*Aircraft type* / *Hours total*	*Hours on type*	*Rating*
29 Oct / Commercial	8351027 / 38	Cessna 172N / 622	59	None

The pilot intended taking some friends for a local flight. The takeoff was commenced from the threshold of the 750 m gravel strip with 30 degrees of flap set. The pilot reported that the aircraft was not performing normally and when the stall warning sounded he elected to land in a paddock. During the landing attempt the left wing struck the ground.

The pilot had only limited flying experience. He was concerned about the position of obstacles at the end of the strip and used a non-standard takeoff technique which degraded aircraft performance. No contributing fault was found with the engine or other aircraft systems.

01 Nov / Private	8321083 / 22	Piper 28-R180 / 275	25	Instrument rating class 3

There was a low cloud base in the circuit area and the pilot concentrated on remaining clear of the cloud. He stated that he flew a tight circuit and carried out downwind checks but omitted to lower the gear. The gear override selector was in the inoperative position and the aircraft was landed with the gear retracted.

02 Nov / Private	8321084 / 21	Amer Air 5A / 202	20	Instrument rating class 4

On completion of several orbits at about 600 feet agl, the pilot applied full power to climb to his intended cruising altitude. A rapid knocking noise was heard from the engine and the pilot discovered that the frequency of the noise was related to the throttle setting. He elected to conduct a precautionary landing on a nearby agricultural strip. The aircraft touched down normally but during the landing roll it collided with a temporary fence erected across the strip.

The engine was found to be serviceable and the origin of the knocking noise was not determined. The noise apparently occurred at a full-power setting and was also related to the pitch attitude of the aircraft. The owner of the aircraft had been aware of the noise but had not alerted the pilot before the flight.

04 Nov / Private	8321086 / 40	Piper 28-R201 / 400	20	Instrument rating class 4

The pilot believed that he had selected gear down as the aircraft turned on to base leg but it touched down with the gear retracted.

Earlier in the day the pilot had de-activated the automatic gear extension system. During the circuit he was distracted by other traffic in the area and by sunglare. Although the gear warning horn was subsequently found to be serviceable, none of those on board the aircraft recalled hearing it during the approach.

06 Nov / Private	8331033 / 38	Piper 28-140 / 212	11	None

The aircraft had landed in a paddock with 10 cm long grass. While taxiing for the subsequent takeoff, the pilot conducted a satisfactory acceleration check. On takeoff, the aircraft lifted off at 60 knots, cleared the boundary fence but then sank and struck another fence. The impact tore out the right gear leg. The pilot was not aware of the full extent of the damage but elected to divert to Moorabbin and made a successful emergency landing.

Although the pilot considered that the paddock was long enough for the intended takeoff, reference to the flight manual would have revealed that the distance available was not sufficient for the prevailing conditions.

06 Nov / Commercial	8331034 / 36	Piper 25-235 / 1400	800	Agricultural class 2

The pilot made one takeoff under a power line which crossed the strip 150 metres from the northern boundary. He then completed a number of spraying runs. He uplifted the same quantity of spray and commenced the second takeoff in the same direction. The aircraft passed under the power line but the undercarriage and left wing struck the boundary fence. The pilot dumped the load and returned to land.

The pilot took off the wrong way on the one-way strip and encountered windshear from the nearby trees as he approached the fence.

06 Nov / Private	8321087 / 33	Piper 28-161 / 95	48	None

The pilot was conducting a takeoff from a strip with a 2 per cent upslope. He reported that the takeoff was normal until the aircraft had reached a height of about 20 ft at which point the rate of climb decreased to zero. The stall warning sounded and the pilot lowered the nose and flew the aircraft back onto the ground. It collided with the boundary fence and the pilot then abandoned the takeoff. The aircraft came to rest about 300 metres beyond the end of the strip.

The ground beyond the upwind end of the strip rose at a gradient of about 3 per cent. After the aircraft became airborne, the pilot selected the climb angle with reference to the horizon formed by the upsloping terrain. This resulted in a higher-than-normal climb attitude and thus a decrease in the climb performance of the aircraft.

08 Nov / Private	8321090 / 39	Auster 3F / 537	35	None

During the course of a local flight, strong gusting winds were encountered and the pilot decided to return for a landing. He stated that as the aircraft was about to touch down, it was affected by a sudden strong tailwind and the nose struck the runway. The wooden propeller was shattered, both wingtips came into contact with the runway and the tailwheel was torn off before the aircraft came to rest.

When the aircraft was on late final approach, a squall passed over the aerodrome. This resulted in a change of wind direction of about 180 degrees.

09 Nov / Senior commercial	8321092 / 22	Cessna 152 / 2500	1500	Flight instructor grade 1 or 2 with instrument rating

The pilot reported that after the aircraft struck a bird the engine began to overheat. It then started to run roughly and the pilot decided to land the aircraft on a golf course. After touching down on a fairway, heavy braking was applied and the nosewheel and propeller dug into the soft ground.

No evidence of damage due to the birdstrike was found. The engine rough running had been caused by lead fouling of several spark plugs and was not related to the birdstrike.

FINAL UPDATES (The investigation of the following accidents has been completed. The information is additional to that previously printed in the preliminary report)

Date / *Pilot licence*	*Record number* / *Age*	*Aircraft type* / *Hours total*	*Hours on type*	*Rating*
11 Nov / Commercial — helicopter	8341032 / 26	Bell 47-G5 / 2579	1980	None

The pilot was engaged in mustering a group of buffaloes towards a gate between two paddocks. As he began to transition from the hover to forward flight, the pilot reported that the aircraft shook violently and the engine then lost all power. The aircraft yawed to the right, descended steeply and struck the ground.

Subsequent engine examination and performance checks failed to detect any abnormality which could have caused the power loss. The engine failure had occurred over scrub and at a height and speed such that a successful landing could not be executed.

13 Nov / Glider	8341033 / 26	Schneider ES-49 / 111	40	Glider

The glider was aligned on final approach above the desired glidepath. The instructor decided to demonstrate sideslipping as a method of losing excess height. At about 200 ft AGL the demonstration was discontinued but a high rate of sink persisted. The glider landed 70 m short of the threshold and the pilot was unable to avoid obstacles during the ground run.

Meteorological conditions prevailing at the time were conducive to the formation of a downdraft on final approach. The inexperienced instructor continued the sideslip demonstration to too low an altitude for the prevailing conditions.

20 Nov / Student	8331037 / 29	Piper 28-140 / 14	14	None

On the landing roll during a solo training exercise, the aircraft drifted to the left side of the runway. The student pilot over-corrected and the aircraft ran off the runway. The nosegear folded back and the propeller struck the ground.

The pilot was carrying out only her second solo flight and the loss of control was attributed to the wheelbarrow effect.

22 Nov / Student	8331038 / 56	Cessna 172M / 22	22	None

After a period of dual training, the pilot was sent on his first solo flight. The landing approach was made at 75 knots to the flare point and touchdown was in a three-point attitude. The aircraft bounced, the nose dropped and the second touchdown collapsed the nosegear. The aircraft skidded off the runway and overturned.

24 Nov / Private	8331039 / 36	Cessna 210L / 337	50	Instrument rating class 4

On final approach the pilot opened the throttle to adjust the glide path but the engine failed to respond. The aircraft landed in a paddock about 150 metres short of the aerodrome boundary and ran through a fence and a ditch before coming to rest with the nosegear assembly dislodged.

The engine stopped because of fuel starvation. Inspection of the aircraft revealed only a small quantity of fuel remained in the aircraft tanks, and the fuel lines to the engine contained no fuel. At the previous landing point the aircraft had been parked on sloping ground and fuel had been observed draining from the wing vent. The fuel gauges in the aircraft were faulty and the pilot had not visually checked the tank contents before departure. The person who had seen the fuel draining from the aircraft had not brought the matter to the pilot's attention.

27 Nov / Private	8331040 / 52	Piper 28-140 / 340	110	None

The pilot had previously checked the strip dimensions and, on arrival over the top, made a thorough appraisal of the area. He noted that there was a crosswind from the right gusting to 15 knots. He stated that on short final approach at a low height the aircraft dropped suddenly and, despite the application of power, struck the lip of a ditch. The gear legs were detached and the aircraft slid to a stop on the runway.

The pilot had planned to touch down on the threshold. No allowance was made for the gusty wind conditions and windshear was encountered at the critical point of the approach.

03 Dec / Glider	8351028 / 34	Czech Blanik L13 / 550	150	Glider

At about 50 feet after liftoff on a winch launch, a winch power failure occurred. The instructor disconnected the tow cable and landed straight ahead. In the resulting heavy landing the main wheel was pushed upward through the cockpit floor.

The instructor, who had been on duty for most of the day, was slow to take control of the glider when the winch system inadvertently changed gears. He allowed the speed to reduce excessively and flared late for the landing. The wind at the time was gusting between 10 and 25 knots.

04 Dec / Senior commercial	8321095 / 24	Piper 30 / 3700	800	Instrument rating 1st class or class 1 and flight instructor

The pilot was undergoing initial twin-engine endorsement training. On the third touch-and-go landing, the instructor retracted the flaps, advised the pilot that he had done so and instructed him to proceed with the takeoff. The pilot inadvertently retracted the gear and the aircraft settled to the runway.

07 Dec / Private	8311080 / 25	Pitts S1-S / 500	295	None

At the end of the landing roll, the pilot unlocked the tailwheel and commenced to taxi back along the landing path. While travelling at about 20 knots with the wind from the right rear-quarter, the aircraft began to veer to the right. The pilot attempted to correct the situation but the aircraft groundlooped to the right and the lower left wing struck the runway.

08 Dec / Commercial	8321096 / 39	Cessna A188B-A1 / 3250	880	Agricultural class 1

The aircraft was being used to spray a rice crop. While conducting the final clean-up run in an east-west direction at the southern end of the paddock, and in the lee of a line of trees, the pilot flew the aircraft under a power line. The aircraft was affected by a gust of wind which caused it to rise and strike the power line with the wire deflector cable. The power line rode up the deflector cable, pushed the fin aside and cut the rudder off above the top rudder hinge. The pilot was able to retain control of the aircraft and land it without further damage.

FINAL UPDATES (The investigation of the following accidents has been completed. The information is additional to that previously printed in the preliminary report)

Date / *Pilot licence*	*Record number* / *Age*	*Aircraft type* / *Hours total*	*Hours on type*	*Rating*
10 Dec	8311081	Cessna 182Q		
Private	43	420	250	Instrument rating class 4

The aircraft had not been flown for about two months. During that time it had been washed regularly and had been parked in the open. The pilot conducted a water check before ground running the engine and he then elected to fly the aircraft. Further water checks were conducted before the aircraft was positioned for takeoff. At about 200 ft agl the engine failed completely and the aircraft overturned during the subsequent forced landing.

Although the pilot carried out fuel drain checks prior to flight, he did not check the fuel sump drain. After the accident the carburettor float chamber was found to contain only water.

14 Dec	8331042	Cessna P210N		
Private	47	2200	2000	Instrument rating class 4

After touching down on a mown area of a paddock, the aircraft became airborne over a slight hump. Following the second touchdown, the pilot applied the brakes but was unable to prevent the aircraft hitting a gate. It then ran across a road and struck an earth bank, collapsing the gear.

The strip length available was insufficient for a safe operation based on the flight manual performance. The pilot also landed downwind and overshot his approach. A power line at the upwind end of the strip precluded a go-around had such an action been considered.

18 Dec	8331043	Volmer VJ21		
Private	50	950	325	None

At about 400 feet agl, on climb after takeoff, the pilot reported hearing a loud bang. Engine power was reduced but the source of the noise could not be located. As power was reapplied the engine ran roughly and the pilot decided to land the aircraft in a paddock. During the approach, the pilot realised the aircraft was overshooting and forced it onto the ground to avoid a fence. The left wing struck the ground and the aircraft turned through 180 degrees before coming to rest.

The source of the bang reported by the pilot could not be established but it is probable that one of several loose objects in the cabin fell on the floor. The roughness from the engine on re-introduction of power is thought to have been caused by airflow at low speed — a known phenomenon in this aircraft.

24 Dec	8331044	Czech L40		
Private	53	539	451	None

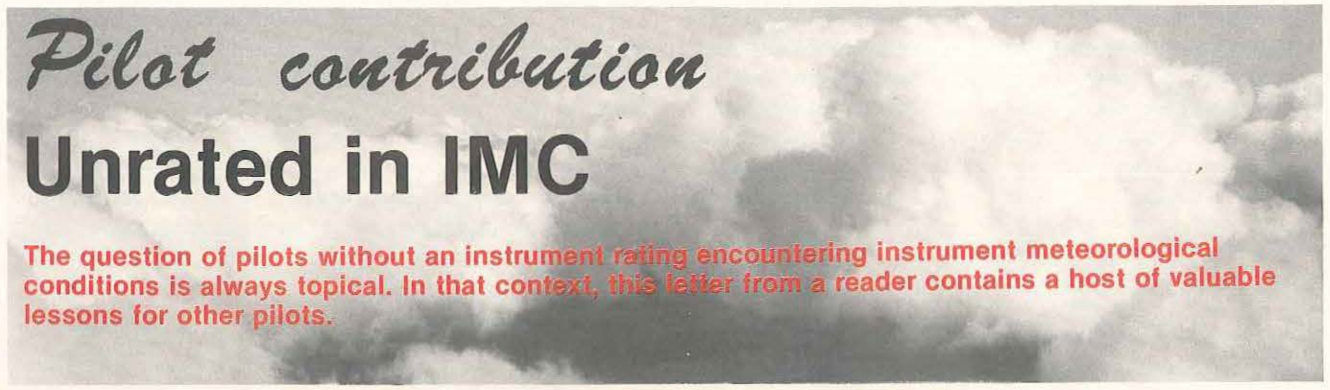
During the cruise the engine began to misfire and lose power. The pilot carried out a precautionary landing on a road but during the landing roll the left wing struck a road signpost. The force of this collision caused the aircraft to swing to the left and it ran through a fence before coming to rest in an adjacent paddock.

The engine malfunction was attributed to fouled plugs from oil escaping past the piston rings. Excessive wear of the pistons was caused by the use of an incorrect oil during the running-in period. In his haste to land the pilot selected an unsuitable area.

30 Dec	8341034	Cessna 172N		
Private	37	162	162	None

The pilot reported that as the aircraft was being manoeuvred for landing with a right crosswind, a gust from the left lifted the left wing and caused the aircraft to touch down to the right of the strip on a heading about 30 degrees from the runway direction. During the landing roll, the aircraft was turned towards the runway but the right wing and landing gear collided with a parked car.

The car was positioned outside the boundaries of the flight strip. When he experienced directional control difficulties before touchdown, the pilot did not carry out a go-around.



Pilot contribution

Unrated in IMC

The question of pilots without an instrument rating encountering instrument meteorological conditions is always topical. In that context, this letter from a reader contains a host of valuable lessons for other pilots.

I had commenced pilot training five months prior to the flight and had accumulated 11 hours following the lifting of my area restriction one month earlier. I was thus very inexperienced and my only advantage was that my training lessons were still recent.

The purpose of the flight was to return to Melbourne after a long Easter weekend in Sydney. There were three passengers, two of whom were expected back at work on the Tuesday while I was expected back at work on the Wednesday. We had been staying with a friend of mine in his two-bedroom flat. He did not know the other three and as the weekend wore on so did his patience with one of my passengers.

The flight up had been via Albury and Canberra and had been uneventful. I had planned weeks before to travel coastal on at least one of the two trips and intended to decide closer to the time whether it would be on the way up or back, depending on the weather. So I was in many ways attuned to the idea of bad weather on this return leg.

After reviewing the meteorological forecast, I discussed the situation with the gentleman behind the counter who said that there would be visual meteorological conditions but marginal on the way back. He then related his experiences of people who had been in a hurry to get back home after the Easter weekend who had not made it.

There were many airports down the coast on my intended route and any was suitable for landing if the weather proved to be worse than forecast for the rest of the route. The aircraft did not have HF for the south-eastern region and so a Sartime flight was necessary due to the low altitude required.

I decided on the basis of the above factors to head off on the flight with the intention of seeing if I could get back in Visual Meteorological Conditions as forecast, despite intermittent changes at some of the Victorian airports. I was planning to stop at any of the many airports on the coast if required. I had the aircraft fuel tanks filled to the brim and briefed my passengers to remain in seat belts all the way and gave them a forced landing briefing, knowing that in the event of engine failure at that altitude I would have no time to repeat it due to the low level anticipated on the route. The remainder of the preparation was routine.

The flight

I was pleased to see that the conditions down the N.S.W. coast were better than forecast and that each of the airports that I passed was suitable for landing. In particular the weather seemed to clear considerably about the south-east point and I was able to maintain 2000 feet for some time. There was some occasional low stratus which forced me down again 10 miles after Malacoota. Nevertheless, when I passed Orbost I had a clear view of the strip which was quite suitable for landing, despite low stratus at about 1000 feet. I made a mental note of each of the en route airports with a view to returning there if needed, and continued.

I had tried to contact Melbourne Flight Service Unit (FSU) from Cape Howe but was unable to do so until just before Lakes Entrance. I asked whether the East Sale restricted area was operational and received a very broken reply which I eventually worked out was saying that R390 was active but the General Aviation lane was clear. For a brief moment I thought of requesting coastal clearance but the communication was so poor that I did not bother. Nor did I bother to ask for weather reports of the area for the same reasons and decided to land the aircraft at the next suitable airport.

By Lakes Entrance the weather had deteriorated over the coast and I could not clearly see an ALA which was marked on my map somewhat inland. I had no other information about the ALA and rather than search in below Visual Meteorological Conditions I pressed on for Bairnsdale. I did this on the basis that it was further inland and would therefore (I thought) have less of the coastal cloud than I had so far seen. Thus, I tracked up the lakes past Metung, keeping to the north lake. I dialled up the NDB and aimed for it, not having the airport in sight at that time.

Loss of Visual Meteorological Conditions

As I crossed the shore at 500 feet I struck a wall of cloud which I suddenly appreciated was down to the ground. However, at this time I was at the end of a lake surrounded on three sides by what I now realise was this same cloud, and terrain which I did not know other than it was below 660 feet. The ground in front of me was sloping up, further disturbing me about the prospect of flying into ground, trees or power poles. The cloud I could now see was sloping down. I decided not to turn around as it was not safe. At that time and position any turn would have taken us into the cloud (which appeared to be very close indeed) and I would then have been committed to recover from an instrument turn at 500 feet not knowing how high that was above ground level, if at all. I thus elected to climb through the cloud as the safest alternative with my limited instrument flight experience and seek assistance. My decision was further forced by entry into the cloud a fraction of a second later which demonstrated that the cloud was closer than I had thought and would have meant that virtually the entire turn (if I had elected to do this) would have been in cloud. I should emphasise that this decision process took a second or two to make and we were still travelling at about 140 knots.

On climb I turned on the pitot heat, which remained on from there and, on later occasions in cloud where I was not on a high power setting, I used carburettor heat. I radioed a Mayday call that went something like 'Mayday, Mayday, VFR pilot in climb through cloud east of Bairnsdale. Request urgent navigational assistance'. This call was not heard due to low altitude. I had no trouble keeping the wings level but did wander off course since in my near panic I was not using a full instrument scan but rather was concentrating on the artificial horizon. After about 2 minutes in the cloud I became very worried about what had happened and the danger I had inadvertently taken my passengers and myself into. An article on the back of the *Aviation Safety Digest* suggesting that we did not have much longer to live came into my mind. At one stage I thought that the easiest thing would be to just give up and go into a spiral dive and get it over with quicker. I was able to quell these fears by logical reassurances that my task ahead was just to fly the aircraft level, a task that I had had at least 5 hours experience in over the past few months, and to seek assistance from the FSU; however, I hope never to experience such fear ever again. After this time I ignored the passengers' presence and concentrated on getting the aircraft down safely. I did not relax this concentration until some time after landing.

After I broke through the cloud at 4000 feet and set the aircraft up for a cruise I was then in continuous contact with ATC.

I then gave up a lot of the responsibility for navigation to ATC, and dealt with flying the aircraft. This happened for a number of reasons. Firstly, I was very disturbed about the situation I was in and was happy to give away some of my responsibilities and I was under the mistaken belief that they had heard my earlier call. Secondly, ATC was asking me questions about my endurance which I was unable to give precisely and this acted as a distraction. Thirdly, I made the simplistic decision to head 270M towards Melbourne where I thought that the weather would be better and that radar assistance would be available to assist me in a descent through cloud over Port Phillip Bay, a possible action which I had suggested to ATC. I did not, however, until some time later, realise that because I had been tracking coastal, I had left the DG unadjusted since Sydney. The effect of this heading decision was to take me on a track in excess of 280T because of the prevailing wind. This led me further into the north and its high country.

I was at this stage stuck in between two layers of cloud at 4000 feet and these layers gradually merged. I did a back bearing from East Sale and Bairnsdale NDBs and found I was 20 miles north of East Sale and then checked the spot heights in the ranges and saw that the highest was about 5000 feet and thus, against the previous instruction of ATC to stay in visual meteorological conditions which were rapidly reducing, I elected to climb to at least 6000 feet through cloud and notified them of my intentions.

This second time in cloud was less worrying since I had had more time to make the decision and I had steadied myself since my last episode. I did not, however, give enough thought to the possibility of surface ice, which fortunately was not a problem. On climb my scanning was better and when I got to 7000 feet I elected to maintain level flight in cloud rather than climb higher. During this time I inadvertently entered what must have been a weak cumulo-nimbus or a cumulus as there were indicated updrafts and downdrafts in excess of 1000 feet per minute. I was not aware of any excess gravity forces, being easily able to maintain the wings level, and the indications may just have been pressure changes but I was too preoccupied to answer a radio call from ATC at the time. There were CBs forecast that day and I was very lucky that I did not enter one of them.

Another aircraft had been sent up to help me out and the presence of this other pilot in the air was a great morale booster and relieved a lot of the feeling of loneliness. After about 10 minutes I came out of the cloud, again being between layers. I now continued on my new heading of 225M to bring me to Moorabbin from my last plot.

Eventually, I was located on radar squawking 7700, was identified and instructed to change to 1700. I was then vectored south and found a break in the clouds over a burnt-out bushfire area with cloud scudding about the tops of the trees. I decided not to risk this area and continued. Further south I found a trough-like gap in the clouds which was very narrow (about 300 metres) and quite long (about 2000 metres). At this stage it appeared to me as the parting of the Red Sea and was greeted as such. I requested my position and when I found that I was near Longwarry and was then able to see that the cloud appeared to be 2000 feet AGL, I went into a rapid descent of 1000 feet per minute to get through it without hitting cloud at the other end.

After breaking through the gap I was able to identify the Princes Highway and headed along it towards Moorabbin at 1500 feet. On approaching Pakenham I was instructed to hold there and after some hesitation about the surface, conducted a precautionary landing as instructed which was totally uneventful. I then confirmed to ATC that I was safely on the ground and intended to remain there.

Summary

Unfavourable factors

1. The peculiar cloud which over the water was quite high and then merged down to the land over the coast. This I had not seen before and did not really appreciate until just before I went into it.
2. The position at the end of the lake which acted as a cul-de-sac forcing me up rather than allowing me to turn.
3. My relatively brief experience of instrument flying and my general inexperience as a pilot.
4. The fact that we had been travelling so low as to preclude VHF radio communication in an aircraft not fitted for HF in that region. This really isolated me from advice on actual weather which I otherwise would have sought.

Favourable factors

1. The continuing help and instructions of the ATC staff throughout the flight.
2. The moral support and advice of the other pilot sent up to help me.
3. The high standard of my quite recent flying training which covered many tasks that were required of me and prepared me to deal with emergencies.
4. A reliable and easy-to-handle aircraft which although I had only just learnt to use responded as anticipated in all situations.
5. A recent purchase of a set of headphones which was a crucial factor in freeing my overworked hands and ears. They allowed me to concentrate entirely on the task at hand and isolated me from the passengers, and them from the gravity of the situation which they did not fully appreciate until after we had landed.

Errors of judgment

1. To leave in the first place when the weather ahead was marginal. This I feel was a relative error as I was subsequently in a position to land at several en route airports with adequate weather conditions and this had been a major planning consideration. But it was this very flexibility which caused me to continue beyond those airports with adequate weather.
2. Not to turn back from Lakes Entrance to a known suitable airport. This was my major error, as was my continued flight towards Bairnsdale, for even though I was in Visual Meteorological Conditions it was at the very limit. What I did was legal, and I could have turned around at any time before I hit the cloud, but when I did it was too late.
3. Not to make a reasonable flight plan once above the clouds using the aids available. In retrospect I should have headed straight for the East Sale NDB and then on a track to La Trobe Valley and then to the Moorabbin NDB. This would have been safer than the route I took which eventually led me up to the Upper Yarra Reservoir. It is possible that if I had kept to the La Trobe Valley I could have kept in the gap between the clouds, which reduced as I headed further north on my 'westerly heading', and thus I could have avoided a hazardous second entry into cloud.

I have not included my climbs into cloud as errors, as I believe that in the situations described they were the safest actions available and given this same situation I would do the same again. However, the level of fear that I felt while doing it and the risks of ice, severe turbulence with structural failure, engine failure, etc., combine to make me much more wary than before.

Lessons learnt

1. I have learnt to be more demanding of good weather conditions and I would not leave on such a flight in similar conditions again, nor will I be unduly swayed by the exigencies of work, commitments or personal ties.
2. The lesson from my second error has been my most valuable which I have very firmly learnt and my own standard of Visual Meteorological Conditions is now significantly higher than the legal one.
3. My third error I hope never to be in the position of making again, but it is a lesson about planning that I will keep for diversions in Visual Meteorological Conditions.
4. I have generally learnt a lot about flying from this experience, which will improve my standard of flight.

Lastly, I would like to thank everyone who was involved in assisting me and am most deeply grateful.

Editor's comment

This pilot deserves full credit for the calm and rational way he acted after placing his passengers and himself in a potentially hazardous situation. His decision to call for assistance straight away was particularly wise, as once it was given, it relieved him of much of his workload, enabling him to concentrate his efforts toward retaining control of the aircraft in cloud.

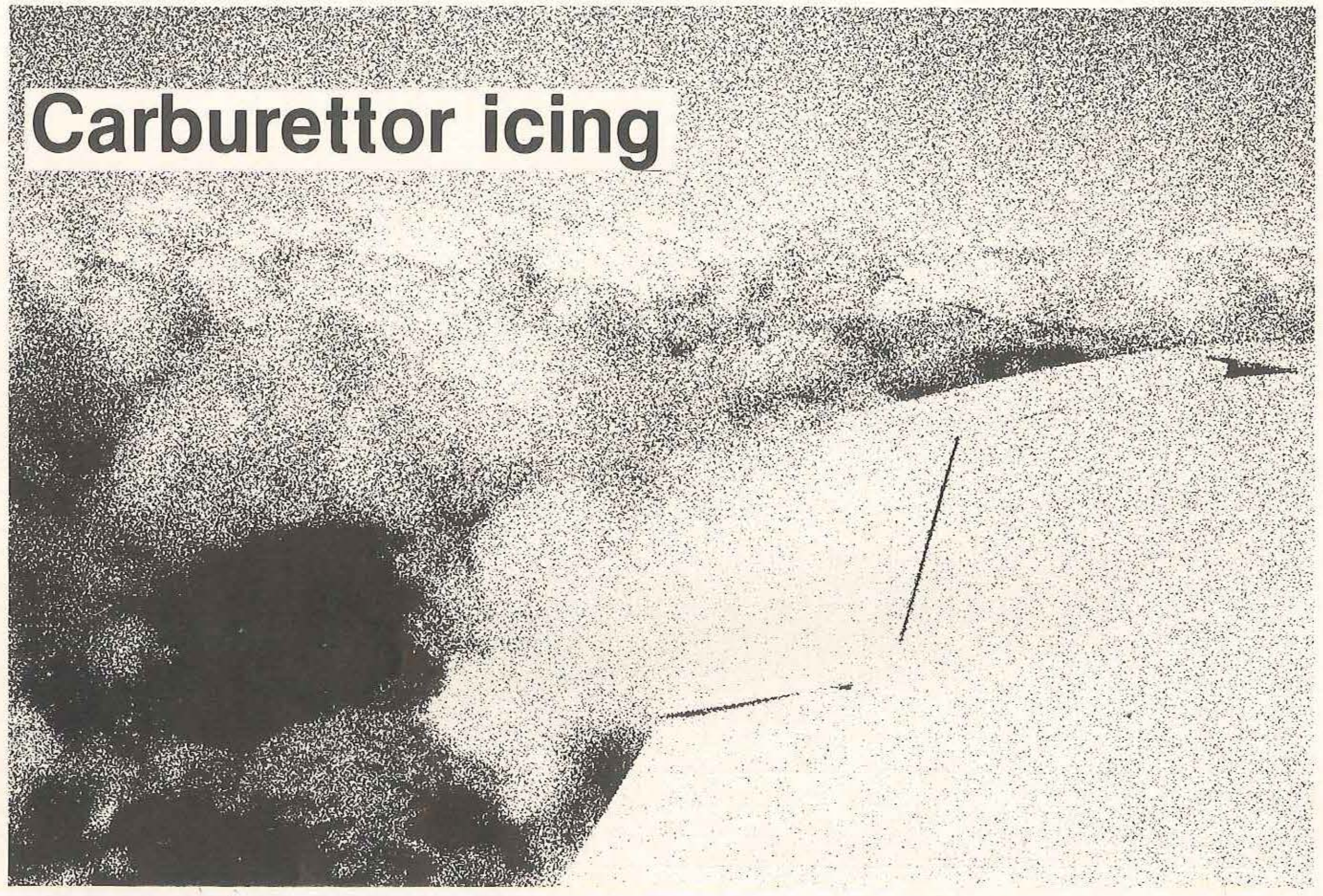
Other key points arising include:

- the danger of allowing external factors to affect a decision of whether to fly or not, despite predicted poor conditions;
- the 'suddenness' with which the pilot found he had entered cloud;
- the hazards of 'pressing on' into obviously deteriorating weather; and
- the extreme workload faced by pilots without an instrument rating who allow their aircraft to penetrate adverse weather.

In this case, the pilot was perhaps fortunate that help was readily available. Acknowledging that the pilot did well once he had placed himself in this dire situation, the fact remains that, in his account of the incident and his actions, there are obvious examples of his inexperience and inadequate ability to make correct decisions. This is likely to be the case with any unrated pilot who flies in IMC.

Doubtless there are many unrated pilots who have penetrated IMC uneventfully. For many, however, it has proved to be a fatal decision. Statistically, the facts are that it is a highly dangerous practice. This occurrence was typical in that there were many opportunities — at the pre-flight meteorological briefing, and in flight — for the pilot to reach the correct, safe decision; that is, to cancel the flight, or to turn back or divert well before approaching deteriorating weather. Regardless of exceptions, this remains the only prudent and safe course of action ●

Carburettor icing



One of the perennial topics of the *Aviation Safety Digest* is that of induction icing, perhaps more commonly referred to as carburettor icing. Education on this topic is most important, for accident and incident records continue to show icing as the probable cause of a number of engine power-loss occurrences.

While the phenomenon is by no means limited to the colder months of the year, the onset of winter makes a general review of carburettor icing worthwhile.

This article discusses a number of aspects and procedures which are generally applicable to most GA aircraft. The point must be stressed, however, that when educating yourself on the 'ins and outs' of this important operational technique, it is *essential* that you refer to your aircraft's Pilot's Handbook/Owner's Manual/Operations Manual to ascertain the exact procedures stipulated by the manufacturer.

Indications of induction icing

The possibility of induction icing should always be considered when the temperature is between zero and plus 20 degrees Celsius, with a relative humidity greater than 50 per cent, or when the temperature is below freezing with visible moisture in the air. The chart opposite provides a guide to icing conditions, relating engine power settings to dry bulb temperature and relative humidity.

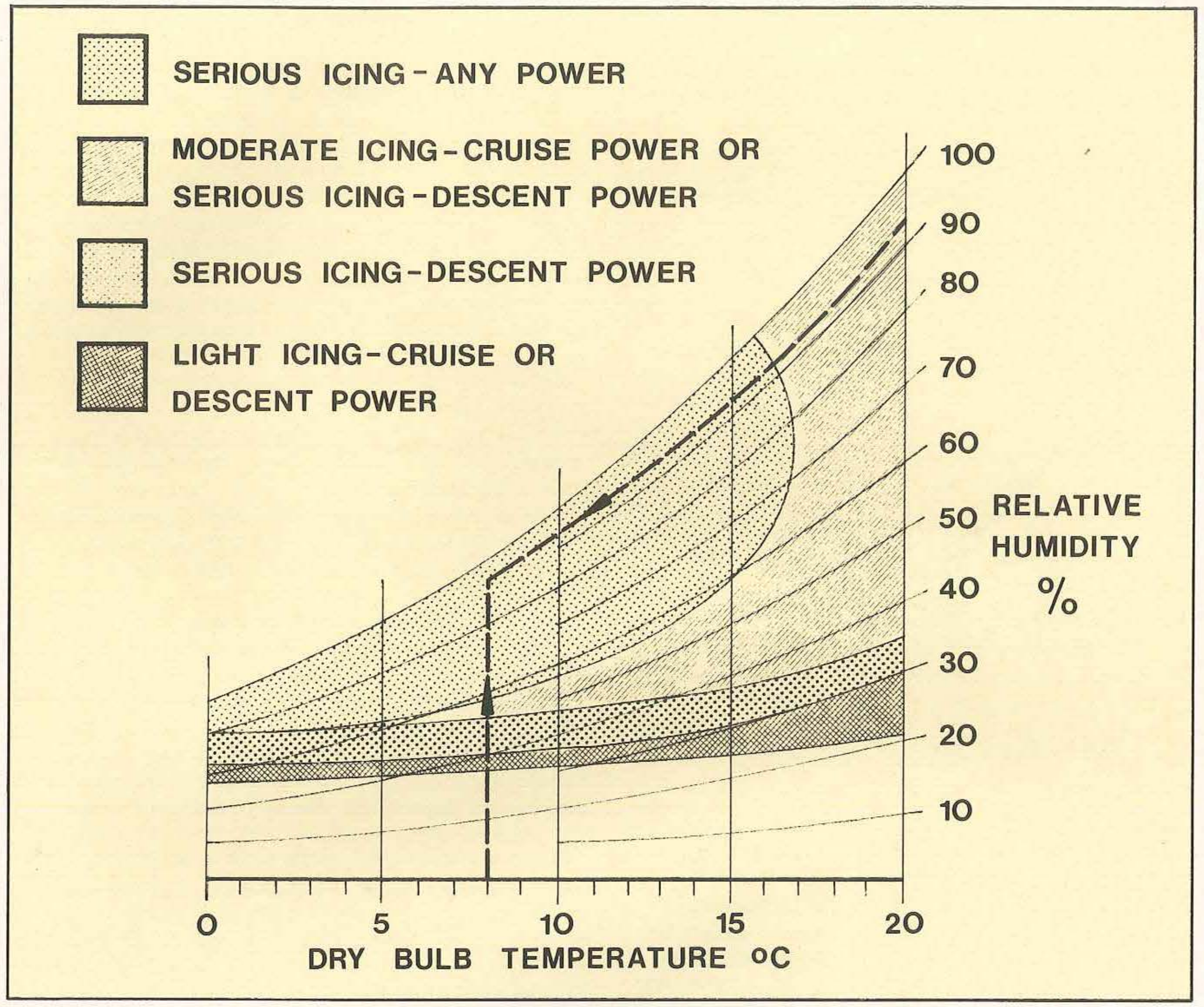
The effect of induction icing is a gradual, progressive decline in the power delivered by the engine. With a fixed pitch propeller, this is evidenced by a loss in engine RPM and a loss of altitude or airspeed unless the throttle is slowly advanced. With a constant speed propeller, there will normally be no change in RPM but the same decrease in aircraft performance will occur.

With a manifold pressure gauge, a decrease in manifold pressure will be noted before any significant decrease in engine RPM or aircraft performance. With an exhaust gas temperature indicator, a decrease in exhaust gas temperature will occur before any noticeable decrease in engine and aircraft performance. If these indications are not noted by the pilot and no corrective action is taken, the decline in engine power will probably continue progressively until it becomes necessary to retrim to maintain altitude; and engine roughness will occur probably followed by backfiring. Beyond this stage, insufficient power may be available to maintain flight; and complete stoppage may occur, especially if the throttle is moved abruptly.

Preventive or remedial actions

To prevent accidents resulting from intake icing, pilots should regularly use carburettor heat under conditions known to be conducive to icing and be alert at all times for indications of icing in the induction system. The following precautions and procedures will tend to reduce the likelihood of intake icing problems:

- Periodically check the carburettor heat systems and controls for proper condition and operation.
- Start the engine with the carburettor heat control in the COLD position to avoid the possibility of damage or fire should the engine backfire during startup.
- As a pre-flight item, check the carburettor heat effectiveness by noting the power drop (when heat is applied) on run-up.
- When the relative humidity is above 50 per cent and the temperature is below 20 degrees Celsius, apply carburettor heat immediately before takeoff to remove any ice which may have been accumulated



during taxi and run-up, and then return the control to the COLD position before commencement of takeoff. Generally, the use of carburettor heat for taxiing is not recommended because of possible ingestion of foreign matter with the unfiltered air admitted with the control in the HOT or ALTERNATE AIR position.

- Conduct takeoff without carburettor heat, unless extreme intake icing conditions are present.
- Remain alert for indications of induction system icing during takeoff and climb-out, especially when the relative humidity is above 50 per cent, or when visible moisture is present in the atmosphere.
- With instrumentation such as carburettor or mixture temperature gauges, partial heat should be used to keep the intake temperature in a safe range. Without such instrumentation, full heat should be used intermittently as considered necessary.
- If induction system ice is suspected of causing a power loss, apply full heat or alternate air. Do not disturb the throttle until improvement is noted. Expect a further power loss momentarily and then a rise in power as the ice is melted.
- If the ice persists after a period with full heat, gradually advance the throttle to full power and climb at the maximum rate available to produce as much heat as possible. Leaning with the mixture control will generally increase the heat but should be used with caution as it may stop the engine under circumstances in which a re-start is impossible.
- Avoid clouds as much as possible.
- Heat should be applied for a short time to warm the induction system before beginning a prolonged descent with the engine throttled back, and left on during the descent. Pilots should be prepared to turn the heat off after power is re-applied to resume level flight or initiate a go-around from an abandoned approach, but once again the manufacturer's instructions for the aircraft are the final authority.
- Remember that while intake icing is most likely with temperatures below 20 degrees Celsius and relative humidities above 50 per cent, it can occur outside those parameters. The possibility of icing increases as the temperature decreases (down to zero degrees Celsius) and as the relative humidity increases.

Summary

All pilots must know the conditions conducive to carburettor icing and the preventive or remedial actions appropriate to their particular aircraft. The effects and recommendations described in this article are general in nature. Pilots must refer to all available operating instructions pertaining to their aircraft to determine whether any special considerations or procedures apply to its operation ●

Studies have been carried out in both Canada and the U.S.A. to determine the societal costs to the community resulting from aircraft accidents. A similar study has recently been undertaken within the Bureau of Air Safety Investigation in an attempt to provide a quantitative dimension to the measurement of aircraft accident severity in Australia. The results, although preliminary, make interesting reading.

First, some brief comments ought to be made about the conceptual and methodological problems associated with accident cost research. The concept of 'social cost', as it applies to aircraft accidents, needs to be clarified. There are in fact three distinct concepts of cost which overlap to some extent, namely:

- Financial costs or accounting costs associated with day-to-day receipts and payments in the economy.
- 'Real' economic or resource costs which are a measure of the value of scarce resources produced and consumed in the economy (e.g. would exclude some financial transactions such as the sale and purchase of land or a used motor vehicle, since no new scarce resources are produced or consumed).
- Social costs. This is a broader term and refers to the value of goods and services generally provided by the public sector of the economy because supply cannot be efficiently or adequately achieved by the private sector, e.g. roads, education, defence and airways/airports facilities. Environmental pollution is recognised as a further category of social cost involving the imposition of external costs upon society which are not fully met by the producer or consumer.

The costs associated with aircraft accidents belong in the social cost category because of the external cost effects upon society, such as hospital, police and accident investigation services, and also a significant component of non-market and intangible costs, including pain and suffering, grief to families and inconvenience to the community. Therefore, for the purposes of the study, accident 'costs' fell within the broad term 'societal costs', meaning that they include social and economic costs associated with aircraft accidents. The purpose of accident costing is to identify and measure the real resources displaced as a result of accidents, but quite clearly not all factors can be identified or measured in monetary terms.

There are two principal methods of determining accident costs:

- The ex post, or loss accounting, approach which is based on a measurement mainly in national income accounting terms.
- The ex ante, or 'willingness to pay', concept based on the amount in dollar terms that individuals (society) are prepared to pay to reduce the risks of future accidents.

Both of these approaches are, however, subject to a number of shortcomings. Although the ex ante approach is conceptually more appropriate, the most common approach has been the 'loss accounting' or 'after the event' historical costing of accidents. This was the method employed in the aircraft accident cost study. The main drawback to loss accounting accident costing has been the approach to valuation of loss of human life. Determining a monetary value for human life is probably the most contentious issue in accident costing but, despite its emotional connotation, it is necessary for society to place a value on life in its public expenditure decision making. Although many would consider that the value of human life is 'infinite', the fact that not all possible safety projects or programs are actually implemented is clear enough evidence that society does implicitly place an upper limit on this value.

For this particular study, the human capital or foregone income method was used to value human life. This has been the most frequently applied method in accident studies. It considers a fatality to be a loss to society of the expected future income of the individual (production/consumption equivalent) between the time of premature death and the end of the normal working lifespan. This method of valuation produces a 'minimum value' estimate of the value of life. Those not working for monetary reward, e.g. homekeepers and the unemployed, are included in the overall accident sample by attributing to them an income level equal to the workforce average for each age group. It should be emphasised that there is no apparent readily available, ideal solution to the problem of valuation of human life and that the fatality and serious injury costs determined from the study represent *minimum* values.

Main findings of the report

Preliminary accident cost estimates were calculated for 1980. In that year there was a total of 253 General Aviation accidents involving 56 fatalities in Australia. There was a total of 28 gliding accidents with five fatalities. The total ex post cost to the community of aircraft accidents in 1980 was approximately *$31 million.* Two cost components accounted for around 78 per cent of total annual costs: foregone income and aircraft hull damage and loss. Aircraft damage/loss was estimated at approximately $6 million although the loss of just two aircraft, a Beech Super King Air 200 and a Swearinger Metroliner, accounted for a significant proportion of this.

The average cost of a single fatality was calculated at *$482 000* (1980). This figure was derived from the age and income profiles of users of aviation services and thus reflects a uniform value of life for the aviation population at risk. Owing to the lack of data on Australian aviation sector income profiles, it was considered feasible to use data derived from an income survey undertaken in Canada.

The study found that quite significant hospital and medical resources were called upon despite the relatively few serious injury cases. Twenty-six cases in 1980 required nearly 1000 hospital bed days with hospitalisation periods ranging from two days to over six months. Approximately half of these cases sustained spinal injuries, including one case of paralysis as a result of a gliding accident. Hospital and medical costs, however, contributed only approximately 1 per cent of total accident costs.

Having developed a framework of aircraft accident cost and arrived at a figure for the cost of a fatality, it is then possible to determine the proportion of total cost attributed to the various categories of flying. This will give an indication of the specific areas where resources need to be directed to reduce the risk of accidents and as a consequence reduce total accident costs. As we would expect the cost of accidents for scheduled Regular Public Transport operations is relatively low per hour and relatively high per accident. In 1980 an accident in the commuter category (now Supplementary Airline or SAL) with 13 fatalities contributed to over 20 per cent of total accident costs for that year. Yet commuter flying hours were only 7.4 per cent of the total hours flown for all categories, and commuter accidents comprised 2.1 per cent of total accidents.

During the years 1977–81, 'private/business' flying accounted for about 32 per cent of total flying activity but 48 per cent of total accidents and around 55 per cent of all accident costs.

Gliding activity contributed significantly to accident costs in 1980 at around 8 per cent of total costs while accounting for around only 4.4 per cent of total flying hours. In 1981, gliding accounted for approximately 10 per cent of total costs.

The report concludes that the preliminary cost estimates need careful qualification in their use and that scope exists for refinement of the data in any future research. However, the framework of costs developed from the study provides a set of minimum social cost estimates for Australia capable of some application in the evaluation of air safety programs ●

Check your fuel contents — visually

A Piper PA-18 had been fully refuelled late in the afternoon in readiness for a flight the following morning. Refuelling was carried out by the aircraft's pilot.

During his preflight inspection the next day the pilot confirmed that the fuel caps were tight but, because he had personally refuelled the aircraft, and it had not been flown since, did not lift the caps to check the fuel contents visually. He did, however, check the fuel gauges. In the Super Cub these are direct reading sight gauges in which a floating ball in a clear tube shows the level of fuel in each tank. Because of the design of the sight gauges the floating ball cannot be seen when the tank is either completely full or completely empty. Given the circumstances described thus far, when the pilot checked the gauges and could not see either floating ball, it confirmed in his mind that both tanks were full.

Startup and takeoff were normal. However, about five minutes after departure, with the left fuel tank selected, the engine cut out. The pilot changed to the right tank and power was restored. About three minutes later the engine cut out again. An emergency was declared and the aircraft configured for a forced landing. This was successfully effected on a road, but as the aircraft was slowing down to about taxi speed a gust of wind caused it to drift to the right and the right wing clipped a tree. The aircraft ground looped and tipped on its nose.

Comment

Apparently the AVGAS from the Super Cub had been drained out overnight by a thief, leaving only enough for the brief, ill-fated flight described above.

It is difficult not to sympathise with this pilot: this was an unfortunate and unlucky accident. The occurrence also highlighted a design limitation of the PA-18's fuel gauges. Nevertheless, the fact remains that the pilot failed to observe the fundamental check of lifting the fuel caps to confirm the fuel contents visually during his before-flight inspection. Had he done so, this accident would not have happened ●

Skill fatigue

Skill fatigue is defined as 'the deterioration in performance caused by work that demands persistent concentration and a high degree of skill'.

The dangers of this condition need to be understood by all pilots. Although the accidents described in this article concern very low-level helicopter operations, the general thrust of the article applies to any pilot whose task can at times place great demands on him. Clearly, this encompasses the complete range of aviators, from the RPT captain to the private pilot.

Skill fatigue is associated with failure of memory, judgment, integrating ability and presence of mind. Its effects may occur in conjunction with, and be accentuated by, other fatigue-inducing factors such as sleep loss. The phenomena were first described in a classic series of experiments carried out in the U.K. and published in 1948. Subjects were tested for 2-hour spells in a simulated aircraft cockpit under blind flying conditions during which they had to deal with a series of manoeuvres. This was a very high workload task, designed to demand sustained concentration and skilled performance throughout the entire 2-hour period. In these studies it was found that skill-fatigued subjects accepted lower standards of performance and accuracy. At the commencement of the testing sessions 'fresh' pilots would scan and use all the instruments systematically, but with increasing fatigue this integrative ability failed and they would 'chase' one instrument at a time. Memory also decreased and the pilots would forget to monitor side instruments and neglect to reset instruments and controls. Eighty of the 140 pilots tested forgot to lower the undercarriage for at least one 'landing'.

Subjects in these experiments took longer to observe and interpret instruments as the tasks progressed. Performance under these conditions tends to suffer disruptions that build up in a vicious circle. Increases in times taken to observe and interpret instruments mean that the resulting errors tend to be greater before the pilot takes any corrective action. When this action is eventually taken, it may, so as to make up time lost, be poorly controlled and thus require additional subsidiary corrections, which in turn take up more time and require subsequent corrective actions to be even greater.

The characteristics of skill fatigue are listed on the opposite page.

Research by the Bell Helicopter Company, among others, has demonstrated significant qualitative differences in the visual workload of pilots flying helicopters at low and very low altitudes. At 500 feet, pilots' average eye scan fixation time was 1.5 seconds, in comparison to approximately 4 seconds at 300 feet. Further, at the lower altitude the pilots were operating at their maximum visual workload capacity in just flying the aircraft, even over familiar terrain*.

It must be emphasised that pilot skill level and task workload should not be considered in isolation. The two factors are interdependent. In other words, identical flying tasks may represent quite different workload levels to pilots with different individual levels of skill. In general, the greater the level of *relevant* and *applicable* skill of a pilot in a particular flying situation, the less is the task workload for that pilot. Consequently, when evaluating the level of workload for a particular pilot involved in an accident and the possible incidence of skill fatigue, the appropriate skill level of the pilot related to factors such as time-on-type, currency, experience of the specific task (e.g. night flying, mustering), total flying hours, etc., *must* be taken into account, remembering that certain kinds of flying represent high workload environments for even the most experienced and current pilots.

Research into stressors such as skill fatigue have typically found considerable differences in the onset and manifestation of fatigue effects, both between pilots and within a single pilot. Consequently, it is impossible to provide a simple 'index' of fatigue, e.g. in terms of hours flown. The problem is a complex multi-factored one, but it *can* be dealt with. The essential point to remember is that when the observable effects of skill fatigue do become apparent in a pilot, these effects are either one, or a selection, of those listed in the above table.

Characteristics of skill fatigue

- Loss of accuracy and smoothness of control column and rudder movements.
- Unawareness of the accumulation of rather large errors in azimuth, elevation and attitude.
- An increase in control movements involving greater fluctuation in order to produce the same effect.
- Under- and over-control movements.
- Forgetting of side tasks.
- Errors of inattention. Failure to scan sky; fixed vision.
- Preoccupation with one task component to the exclusion of others.
- Allowing various elements of operational sequence to appear out of place with respect to one another.
- Easy distraction by minor discomforts, aches, pains, noises, etc.
- Increasing unawareness of performance deficiencies and, in extremes, signs of physical breakdown such as fainting, cardiac arrhythmias, etc.
- The requirement for larger than normal stimuli for evocation of appropriate responses.
- Errors in timing.
- Overlooking of important elements in a task series.

Typical accidents

The effects of skill fatigue on pilot performance are considered by research psychologists in the Bureau of Air Safety Investigation to have been probable relevant factors in the following accidents:

The pilot of a Bell 47 was taking a geologist and his assistant to selected points in order to collect mineral samples. The wind conditions were variable, but generally northerly at about 5 knots. The temperature was 36 degrees. The pilot had landed in a small clearing surrounded by trees 30–35 feet tall. While waiting for his passengers to return, he tied flagging to the trees in order to assess the wind velocity for takeoff; he determined the wind direction as varying from north-west to east. He also polished the aircraft and the rotor blades to maintain peak performance.

When the passengers returned, the pilot carried out a careful pre-takeoff check, which included a hover to assess surplus engine power available for takeoff. He selected a takeoff path to the north to take advantage of the slight headwind. The helicopter cleared the first trees but was unable to outclimb rising terrain and started to sink. The pilot then attempted to gain lower ground by turning to the right but the aircraft continued to sink, struck a small tree and then hit the ground. The subsequent investigation established that a more suitable takeoff direction existed towards the south-east where the trees were not so tall and the ground was level. Moreover, the helicopter's capability to achieve the steep gradient was marginal and the pilot inadvertently overpitched the main rotor.

The pilot was obviously conscientious, but he lacked experience in helicopter operations under high ambient air temperatures. More significant from the standpoint of this article is the fact that he had been flying continuously for 22 days prior to the accident. The geosurvey work on which he was latterly engaged was conducted at low level and involved numerous takeoffs and landings. It is considered that the effects of accumulated fatigue and heat stress may have led to a deterioration in the pilot's capacity to process and integrate the information he was receiving.

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*The visual workload of the primary task of flying was measured in terms of changes in pilots' ability to perform simultaneously a secondary visual task. At maximum visual workload on the flying task the pilots had no 'spare capacity' to perform the secondary visual task. In flight situations where pilots were able to perform the secondary task to some degree, the primary flying task was not occupying all their available capacity.

Consequently, pilots' performance on the secondary task was a direct measure of the degree to which the task of flying the aircraft was occupying their available visual workload capacity. This dual task experimental method has been used in many studies of pilot workload because of the difficulty of measuring pilot workload levels on the flying tasks alone.

The second accident occurred during a low-level ferry flight, also in a Bell 47. Approximately 25 minutes after takeoff, while overflying a lake, the aircraft entered a descent and struck the water in controlled flight, slightly nosedown and with a slight bank to the left. Shortly after the aircraft entered the water the pilot removed his helmet, released his harness and left the helicopter.

Pilot mishandling and mechanical failure were discounted as factors in the accident. The pilot himself could offer no explanation. In his own words:

> When I crossed the hills prior to the lake, I was about 1000 ft AMSL or about 500 ft AGL. I wasn't contour flying. As I flew out over the lake I remember sighting Mt X and checked that the track took me to the south-west of Mt X and I looked back in an attempt to sight the dam wall just to confirm my position. The next thing I remember is being in the water.

It seems significant that there was evidence that the pilot had been under stress from personal problems for some days, while at the time of the accident he had been working for 10½ hours. Although he had only been flying for 25 minutes of this time, the low-level flight over changing terrain of hills and water would have been very demanding. In the opinion of an aviation psychologist the pilot's action in looking back over his left shoulder to check the dam wall and thereby losing his forward visual reference may have led to an unperceived loss of height; that is, where the rate of angular acceleration of the aircraft was below the threshold level required to enable it to be detected by the pilot's organs of balance. The aircraft's configuration at the point of impact (slightly nosedown, slight left bank) was consistent with this low rate of descent and the pilot's actions in the cockpit just prior to the accident.

View from helicopter cockpit showing flight path and point of impact with the water.

Comment

The intention of this article has been to make pilots and supervisors aware of the insidious nature and dangers of skill fatigue. In General Aviation the onus is on the pilot to safeguard himself as far as possible from vulnerable circumstances. Skill fatigue feeds on dedication, ambition, greed, overconfidence, pressures from the employer and customer, not knowing your own limits and a reluctance to say 'enough' . . .

Prevention or remedial actions

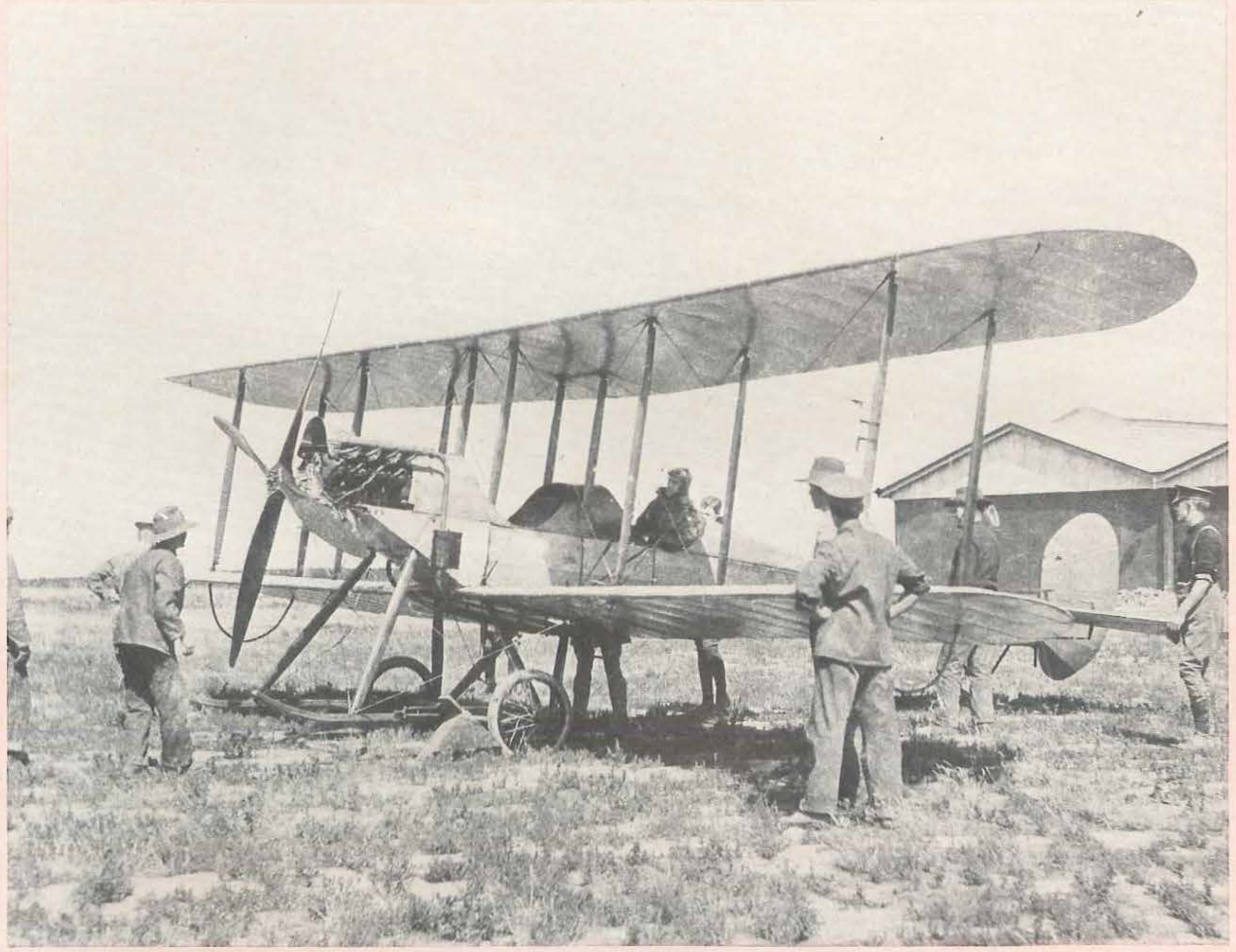
Know what kinds of flying conditions for *you* as an individual will constitute high workloads.

Know what the behavioural effects characteristic of skill fatigue are (see table) and try to be aware of them in yourself *and others* so that remedial action can be taken before it is too late. For example, if you find yourself making mistakes in procedures, errors in timing, taking longer than usual to carry out normal actions, overcontrolling, forgetting side tasks (e.g. ATC instructions), the chances are that these symptoms *may* indicate a fatigue state which could become dangerous, and cessation of flying for the day could save your life, and/or your aircraft. Fatigued pilots do not always have accidents, but their *chances* of doing so are increased — particularly if they have to cope with an unforeseen emergency.

Apart from restricting flying hours, personal discipline should include:

- A program of suitable exercise.
- Regular meals.
- Plenty of water intake to prevent dehydration (avoid caffeine which induces dehydration).
- Control of alcohol intake before flight and smoking during flight. (One cigarette raises the carbon monoxide in the blood to a level that equates to a state of hypoxia at 7000 feet. Two cigarettes smoked consecutively raise the level to 10 000 feet, and these levels are further aggravated by actual cabin altitude.)
- Awareness that psychological and emotional problems are an insidious drain on energy reserves, a particularly important consideration in very high workload flying operations ●

The good olde days . . .



The following monthly summary of accidents was taken from the December 1917 records of the Royal Flying Corps.

Avoidable accidents

There were six avoidable accidents:

1. The pilot of a Shorthorn, with over seven hours experience, seriously damaged the undercarriage on landing. He had failed to land at as fast a speed as possible, as recommended in the Aviation Pocket Handbook.
2. A BE2 stalled and crashed during an artillery exercise. The pilot had been struck on the head by the semaphore of his observer who was signalling to the gunners.
3. Another pilot in a BE2 failed to get airborne. By error of judgment he was attempting to fly at mid-day instead of during the recommended best lift periods, i.e. just after dawn and just before sunset.
4. A Longhorn pilot lost control and crashed in a bog near Chipping Sodbury. An error of skill on the part of the pilot in not being able to control a machine with a wide speed band of 10 mph between top speed and stalling speed.
5. Whilst low flying in a Shorthorn the pilot crashed into the top deck of a horse-drawn bus, near Stonehenge.
6. A BE2 pilot was seen to be attempting a *banked* turn at a *constant* height before he crashed. A grave error by an experienced pilot.

Unavoidable accidents

There were 29 unavoidable accidents.

1. The top wing of a Camel fell off due to fatigue failure of the flying wires. A successful emergency landing was carried out.
2. 16 BE2s and nine Shorthorns had complete engine failures. A marked improvement over November's figures.
3. Pigeons destroyed a Camel and two Longhorns after mid-air strikes.

Cost of accidents

Accidents during the last three months of 1917 cost £317-10-6: money down the drain and sufficient to buy *new gaiters* and *spurs* for each and every pilot and observer in the Service ●