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Contents

Cover

The cover design, by Leo Di Rago, from the Department of Aviation's Graphic Design Section, depicts the movement of flight through space (horizontally) and time (vertically). Images are the Cairns Birdwing Butterfly, the Sulphur-crested Cockatoo, the Qantas DH86 and the Qantas 747SP.

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En route mid-air collisions:

how to avoid them

Pilots could be excused for perhaps thinking that the likelihood of a mid-air collision in Australia is remote: there is a lot of sky out there and aircraft are relatively small, so the chances of two being in the same place at the same time would seem to be minuscule. Yet the statistics show that this is not the case.

In the two-year period preceding the preparation of this article over 60 occurrences of reduced separation were reported. There were doubtless more which went unreported because pilots remained blissfully unaware of the proximity of other aircraft.

Many of these incidents occurred in the circuit area, where pilots should have had an acute awareness of the position of all traffic at all times.

On the other hand, 16 of the incidents involved aircraft which were established in an en route cruise. Given that there indeed is a lot of sky out there, there is often an understandable tendency during the cruise to be less assiduous in maintaining a lookout. It is therefore interesting to note that in almost all of these 16 incidents, the aircraft involved passed so close to each other that either one or both pilots had to initiate evasive action to avoid a collision.

This article addresses the issue of detecting other aircraft during an en route cruise by examining some of the physical, physiological and psychological problems of 'lookout' or visual search.

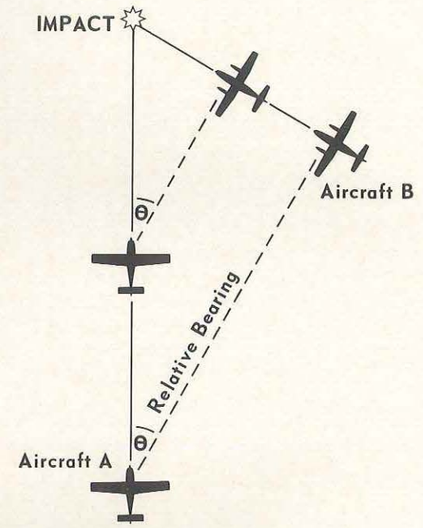


Figure 1. *Constant relative bearing equals collision risk.*

Relative motion

If two aircraft are on a collision course and these aircraft are flying on constant headings at constant horizontal and vertical speeds, then each aircraft has a constant relative bearing to the other right up until the moment of impact. Figure 1 makes this clear. Even though aircraft A is going twice as fast as aircraft B, their relative bearings are constant. The effect of this, of course, is that if you are going to collide with another aircraft, then that aircraft has no apparent motion with respect to you and will stay at exactly the same point on your windscreen until you hit it; in other words, it will in many respects behave in the same way as a fly squashed on the outside of the windscreen.

This absence of any relative motion is important from the point of view of detecting the other aircraft because most of the retina (the sensitive layers of cells at the back of the eye which turn light into nerve impulses to the brain) is wired up to be especially sensitive to the detection of small movements. It is not hard to imagine why this has evolved to be so. If you and your fellow cavemen were sitting around the camp-fire munching your mammoth steak you would not need to have your attention drawn to the woods while they were still, but even a small movement could have signalled danger. Apart from this physiological reason for moving targets being easier to detect than stationary ones there is probably a psychological reason as well, and this is that the experienced pilot will have learned to use movement as a cue to detection for the simple reason that all the aircraft he has ever seen will have had some relative movement with respect to him — unless he is one of those pilots who has had to take real evasive action to avoid a collision.

So, the relative motion problem is a very real one and can be summarised by saying that motion is a good cue to detection, pilots probably learn to use it, and all aircraft possess some relative motion except for the odd ones that you are likely to bump into (which is a bit of a shame really — much better if it were the other way round).

Time, distance and size

Some pilots may wish to argue that while the information on relative motion may be true it does not really explain how mid-airs occur: if you are going to hit another aircraft it must look as big as a barn door before you collide with it; whether it appears to be moving or not is, to put it mildly, of academic interest only.

To answer this point, look at Figure 2 to see just how an oncoming aircraft appears to get larger as it gets closer. It is roughly true to say that the apparent size of an oncoming aircraft (i.e. the angle which it subtends at your eye) doubles with each halving of that aircraft's

Photograph courtesy of Flt Lt Allan Edwards

range. Imagine the case in which a GA aircraft and a military jet are approaching each other head-on at speeds of 150 knots and 450 knots respectively — a closing speed of 600 knots. At about twenty seconds before impact the two aircraft might be about 6000 metres apart and each will present a target to the other of only around a sixteenth of a degree. Ten seconds from impact the distance will have halved and the target size will have increased to all of an eighth of a degree; at five seconds the size will have again doubled but is still only about a quarter of a degree.

In other words, the oncoming aircraft remains extremely small until very, very late, and then it suddenly expands into something that fills the windscreen. These abstract calculations match up with the accounts of many pilots who have had mid-airs or near misses: they often describe themselves as having maintained a good lookout, then diverted their attention inside the cockpit for two or three seconds to complete some checks, only to look up and be horrified to find that the way ahead was full of aeroplane. As reaction time is usually two seconds or more this amounts to a situation pregnant with danger.

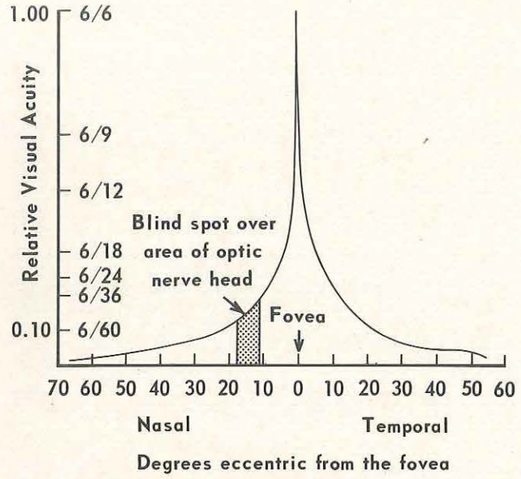


Figure 3. *The variation of visual acuity at retinal sites eccentric to the fovea. The acuity at 5 degrees to the fovea is only one-quarter that at the fovea.*

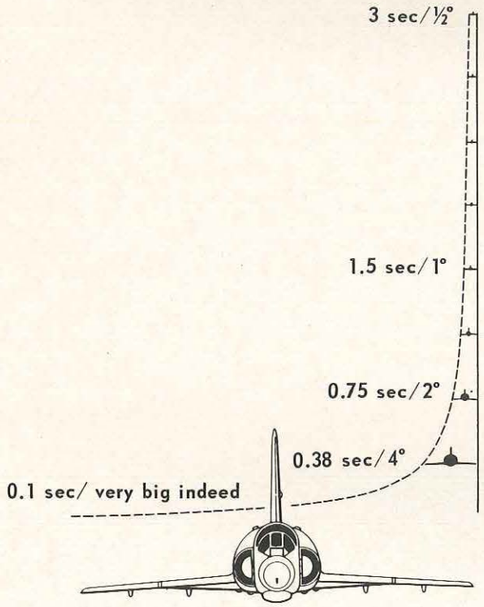


Figure 2. *Time to impact and angular size of oncoming aircraft.*

Some readers may still not be convinced that there is any perceptual problem in seeing other aircraft and might argue — with some justification — that although, for example, a quarter of a degree may sound small, it is actually a reasonably large target (it equates roughly to the size of a 20-cent coin viewed at a distance of about six metres) to miss completely, and that anyone keeping a good lookout should not really miss it. There is an element of truth in such an analysis, but it really hinges on what is meant by a good lookout, and this again bears some psychophysiological comment.

Visual acuity

The first point to be made is that the retina is not equally sensitive over all its surface. Figure 3 shows that it is only in a small, central area of retina (the fovea) that visual acuity is good. Even at very small angular departures from this central area acuity drops off alarmingly to a small fraction of the central acuity. This does not cause any problems in everyday life because we can always use the central part of the retina to investigate anything that we are interested in and use the rest of the retina to 'fill in' the rest of the world (and attract our attention to anything interesting out there), but it does mean that if we are conducting a visual search for a small target, and the object of our search does not happen ever to fall on the foveal area, then we are extremely unlikely to see it. This is especially true, as noted at the beginning of this article, if the target has no relative movement. It is, of course, this unequal distribution of acuity over the retina which produces results such as those shown in Figure 4. In this experiment subjects were required to detect the presence of a Douglas DC3 (not a small target) at three different ranges and at differing locations on the retina. It is clear that the subjects' chances of spotting the aircraft dramatically mirror the sensitivity of the retina.

Many pilots will have experienced similar effects; it is a common experience to spot another aircraft, look away for a few moments, and then look back to the area of sky where it was but be unable to see it again because this time the aircraft's image just does not happen to land on the right bit of the retina. Sometimes, though, the aircraft will appear to pop up from nowhere as it is acquired in the right place.

Lookout and scanning

Accepting the comments presented thus far, the question now arises of how best to move the eye over the external world in order to maximise the chances of detecting aircraft out there.

Some pilots believe that the best way of searching is to move the eyes in a smooth, continuous way over the area of interest. Unfortunately, it is impossible to move the eye in such a smooth, continuous movement unless there is something out in the world also moving smoothly which the eye can track. In the absence of such a moving stimulus, the eye can be moved only in fast jerks (called saccades) with interposed rests. What is more, it is only during the rests that it is possible to see anything. You can easily demonstrate the saccades to yourself by trying to move your eye smoothly around your room: pay careful attention to what you are doing and it will become apparent that actually you are moving your eye in jerks. However, if you hold up your finger in front of your face and move it about, you can track it smoothly and easily. Alternatively, watch someone else's eyes whilst he does it.

So, when searching an empty sky the eye does not move smoothly but jerks about. There is some good evidence to suggest that if you are conducting a search it does no good to prolong the rests: that is, if you are going to see something in one of the rests, you will see it straight away and it does no good to leave your eye hanging around in the same place — it just wastes time. Thus, in experimental situations, the people with the best detection scores were those with the highest frequency of eye movements. Those people who thought perhaps that they were making slow methodical searches were in fact losing out.

The last point to make about visual searches is that of where to look. It is possible that you could collide with an aircraft that was descending (in which case you should have seen it silhouetted against the sky) or climbing (in which case it should have been seen against the ground). In the first case it probably does not matter much what colour the aircraft is painted, but in the latter case it matters a lot. Australian GA and RPT aircraft generally show up fairly well against the countryside, although this does of course vary with the aircraft paint scheme and the terrain. The effectiveness of military camouflage on low-flying aircraft, on the other hand, has to be not seen to be believed. However, it is most likely that you will bump into another aircraft that is level with you, for in this case the other aircraft will (at low to moderate altitudes) be between you and the horizon and will present to you its least conspicuous aspect, i.e. you will probably be viewing it from the front or side and the wings will effectively have disappeared. So, again it looks as though all the factors conspire to make the most threatening possibility the least easy to detect.

Conclusion

The final, crucial question is whether all this actually results in any useful advice. The first important point is that pilots should understand what they are actually doing when they search the sky — and if you have read this article up to here you should now be in that happy situation. There are a few more concrete tips that may be worth remembering. They will not guarantee that you will not have a mid-air, but if you follow them your chances of picking up that potential collision risk will be considerably enhanced.

- Remember that the aircraft you are going to collide with is the one that appears to be stuck in the same place on the windscreen — if it moves, you will miss it (but take positive avoidance action just in case).
- Remember that you are looking for a small target that gets rapidly bigger only when it is too late to be avoided. It can easily take two seconds or more to appreciate the situation, make a response and get your aircraft to change course, so minimise the time spent with your head in the cockpit.
- Concentrate your search in the area of most likely conflict, which, in many situations, will mean along the horizon, looking for those aircraft at the same level as you.
- Do not imagine that you can make a smooth, continuous search. Keep your eyes scanning the world in quick movements ●

Adapted from Air Clues

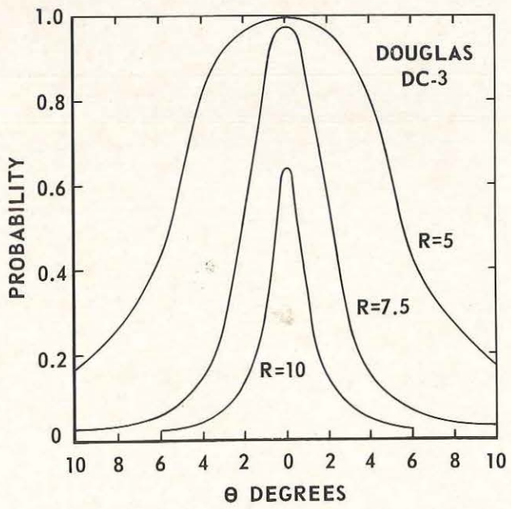


Figure 4. *Probability of detection as a function of eccentricity from point of fixation at various ranges.*

In brief

An agricultural application aircraft was carrying out weedicide spraying at a height of about 15–20 feet AGL. After a spray run from east to west, the pilot commenced a procedure turn over an adjacent paddock. During the turn he decided to call up his loader driver who was en route to another job.

To do this, it was necessary for the pilot to remove a headset plug from the jack point and replace this with the plug for his helmet headphones. The jackpoint was above and behind his left shoulder. Without climbing to increase terrain clearance, the pilot turned in his seat to transfer the plugs, which apparently caused him inadvertently to release back pressure on the control column. The right wing struck the ground and the aircraft cartwheeled before coming to rest about 100 metres from the initial impact point ●

Fasten your seat belts

Loose seat belts can produce alarming inflight disturbances, as two Cessna 150 pilots found out. It is because of this that aircraft checklists invariably include the requirement for seat belts and shoulder harnesses to be checked on two occasions: once during the Before Starting list and again during the Before Takeoff list. Some aircraft manufacturers also adopt the procedure — which should be observed regardless of aircraft type or make — of placarding aircraft to advise pilots that all seat belts not in use should be fastened and tightened, to prevent them flapping about in the cockpit during flight or inadvertently becoming trapped outside a closed cockpit door.

The incidents

Almost immediately after becoming airborne, the pilot reported hearing 'very loud, strange noises'. He turned back straight away and landed on an unserviceable grass area adjacent to the sealed runway he had used for takeoff. Fortunately the aircraft was not damaged.

The source of the noise was found to be the end of a seat belt which was hanging outside the closed cockpit door.

In the second incident, the Cessna was cruising at 2000 feet when a 'loud knocking noise' developed in the aircraft. The pilot later described the sound as being similar to a major component failing in the engine. To turn to the pilot's report: 'On hearing the noise I immediately prepared for a forced landing, and after going through the checks transmitted a Mayday. After further checks of the engine and airframe I noticed that although noisy, the engine seemed serviceable. I then found that approximately one-half of the passenger seat belt was outside the closed cockpit door. Assuming this was causing the knocking sound I retrieved it and the noise ceased.'

Comment

Given that both pilots believed they were experiencing serious problems, most probably associated with an engine malfunction, then their initial actions were sensible and justifiable. However, the fact was that neither was faced with an emergency. On the contrary, because of their inadequate Before Starting and Before Takeoff Checks, each had set himself up to take precipitate action unnecessarily, action which may well have resulted in far more serious consequences. The lesson and the message are loud and clear.

As a final comment, note that the pilot who retrieved the seat belt did so in straight and level flight at 2000 feet. This is perfectly safe as long as you ensure that everything in the cockpit — including passengers — is secure beforehand. It could be most awkward if flight plans, maps, FISCOMS, etc., disappeared out the door.

In the incident cited the pilot dealt with the matter sensibly. However, there have been occasions where a knocking noise associated with loose objects outside the aircraft, or where a door has popped open during takeoff, have led a pilot to become dangerously distracted from his primary job — flying the aircraft safely. A trapped seat belt or an open door is most unlikely to constitute a major flight safety hazard. If you find yourself in this situation, attend to it when you are in a position to do so safely ●

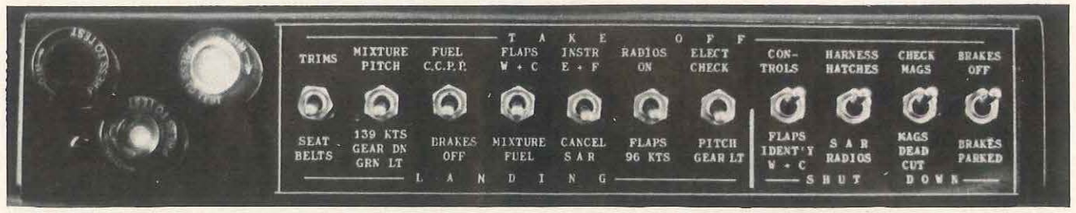
Ah-hem . . .

This story is going the rounds at an overseas airport where an airline has its new autoland fitted in various stages to its aircraft:—

Technical Log entry from pilot: 'Autoland carried out. The aircraft landed very firmly and well to the left of centre-line. Most unsatisfactory.'

Engineer's entry: 'Autoland not fitted to this aircraft . . .' ●

Action and reaction



Sir Isaac Newton once said something to the effect that for every action there is an equal and opposite reaction. A practical manifestation of this particular law of motion is apparent every time an aircraft flies. Obviously, propulsion is a matter of fundamental importance to all pilots of heavier-than-air machines. Also important, but unfortunately sometimes neglected, is another action/reaction relationship in flying — that which takes place in the cockpit during the completion of a checklist. The following accident, describing an inadvertent wheels-up landing, highlights the importance of a disciplined approach to completing checklists.

On arrival in the circuit area, the pilot extended two stages of flap and moved the landing gear selector to what he thought was the DOWN position. He was at the same time trying to cancel his SARWATCH on the HF radio and did not check the undercarriage indicator lights. In other words, the pilot had made the mistake of interrupting his checklist, and failed to confirm that the action required — selection of the gear down — was accompanied by the appropriate reaction, which in this case should have been the actual extension of the undercarriage, accompanied by the illumination of the indicator DOWN lights.

The aircraft touched down smoothly but with the landing gear still retracted, and slid over 200 metres before coming to rest. Subsequent investigation revealed that the undercarriage system, including the indicator lights and the warning horn, was fully serviceable. Examination of the landing gear selector switch showed that it was in the OFF (centre) position.

It transpired during later discussion that, when selecting the landing gear down, the pilot had been holding the microphone in his right hand. Apparently when he operated the landing gear switch, also with his right hand, the microphone contacted the elevator trim wheel. This felt to the pilot as though the undercarriage selector had 'clicked' into the DOWN position. By then not checking the indicator lights, the pilot had set himself up for a wheels-up landing. He did not hear the undercarriage warning horn when the throttles were retarded because of the high noise level of the HF radio from the cockpit speaker.

The main lesson to be drawn from this accident is that of cockpit checks and checklist discipline. Additionally, some worthwhile points can be raised concerning the allocation of work priorities, distractions in the cockpit, and the correct operation of this particular landing gear selector.

Checklist discipline

Many words have been written about the use of checklists. Regardless of the type of checklist used — roller blind, printed pages, mnemonics committed to memory, etc — the pilot must ensure that it is completed and the correct results obtained at the appropriate time; that is, that the action demanded is satisfied by the correct reaction.

If an aircraft is fitted with a mechanical checklist then it should be used, as it provides a positive record of how many checks have been completed should the sequence be interrupted. When the mnemonic system is used, it is safest to return to the beginning of the list if an interruption occurs, rather than trusting to memory. While our memories usually do the right thing by us, it only needs one seemingly minor oversight to precipitate an accident.

It is sound airmanship in using checklists to have a 'backup' system for the most crucial items. For that reason a 'finals' check covering those items is almost invariably used by experienced pilots operating without the benefit of a question and response system; that is, operating by themselves, as is the case in the majority of GA flights.

There are three vital items which should be checked on final approach before a GA aircraft reaches the point from which it is committed to land:

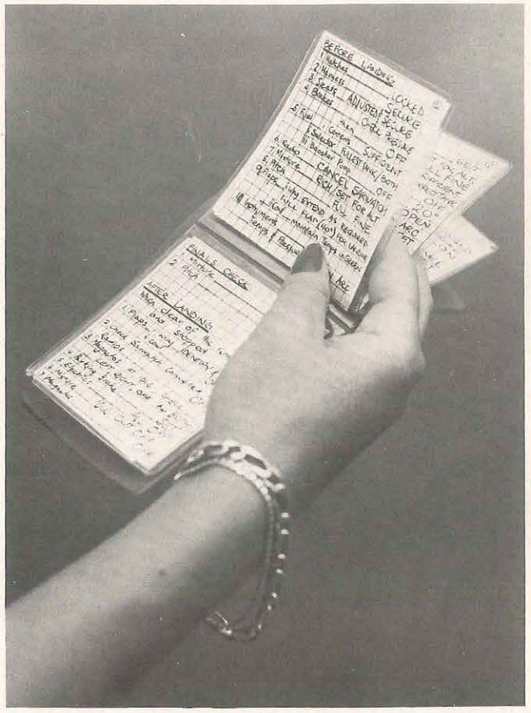
- the landing gear must be down and locked;
- flaps must be set correctly for the type of approach; and
- the engine controls must be set to permit the application of maximum power if it becomes necessary.

Although the gear check does not apply to fixed undercarriage aircraft, it is good practice to include it in all 'finals' checks — it is better to develop the habit rather than run the risk of forgetting the check when you fly a retractable gear machine. Significantly, the pilot of the aircraft in the accident described at the start of this article did not complete a 'finals' check.

Depending on circumstances, it is also a sound procedure to confirm to yourself during the 'finals' checks that a clearance to land has been given.

Work priorities

Again turning to the accident cited at the start of the article, part of the problem there stemmed from the fact that, while attempting to lower the undercarriage, the pilot allowed his attention to be diverted.



The electronic checklist system shown on page 8 was developed by Missionary Aviation Fellowship. For each checklist sequence the lights will illuminate in a set pattern once all the checks from that sequence have been completed.

Pictured above is a simple but effective and flexible 'photo album' checklist, also used by MAF.

There are basically three levels of activity associated with the safe operation of an aircraft:

- the completion of those items on the checklist which will prevent damage occurring to the aircraft, e.g. selection of the landing gear down before landing;
- the completion of those items which could possibly jeopardize the safety of the aircraft, e.g. the selection of full flap before a short field landing; and
- the completion of those items which cannot have any effect on safe operations, e.g. cancelling SARWATCH.

The order of priority to be allocated to the above three levels of activity is quite obvious. There is no room for the division of attention while completing checks in the first two categories. The pilot's attention must be undivided while he ensures that the action called for is completed, and the necessary reaction obtained. In the case of the third level some latitude clearly is permissible, as long as checklist discipline is such that all items are ultimately completed in good time.

Distractions

The effectiveness of a warning indicator of any type is significantly reduced if distracting influences are allowed to remain in the cockpit. Audio warnings can become inaudible if the background noise level is too high, while visual warnings may become invisible if the light level is too high or other indicators are excessively bright. Every effort must be made to ensure that distracting influences are removed from the cockpit, especially during critical phases of flight.

Correct operation of the landing gear selector

While the importance of checklist discipline is the main lesson arising from this accident, some useful observations can be made concerning the operation of the gear selector.

The landing gear selector fitted to this aircraft is a three-position switch, identified by a wheel-shaped knob. The possible switch positions are UP, OFF (centre) and DOWN. This type of switch is common to those Cessna aircraft fitted with an electrically-powered landing gear system; the range of aircraft includes the following models:

310 and 320 series
340, 340A
401, 401A, 401B
402, 402A, 402B
411 and 414 series
421, 421A and 421B

To operate the landing gear the switch knob is pulled out and moved to the desired position. The three positions of the switch are physically set by a flat 'gate' between the UP and DOWN positions. In the OFF position the switch knob is resting on the gate.

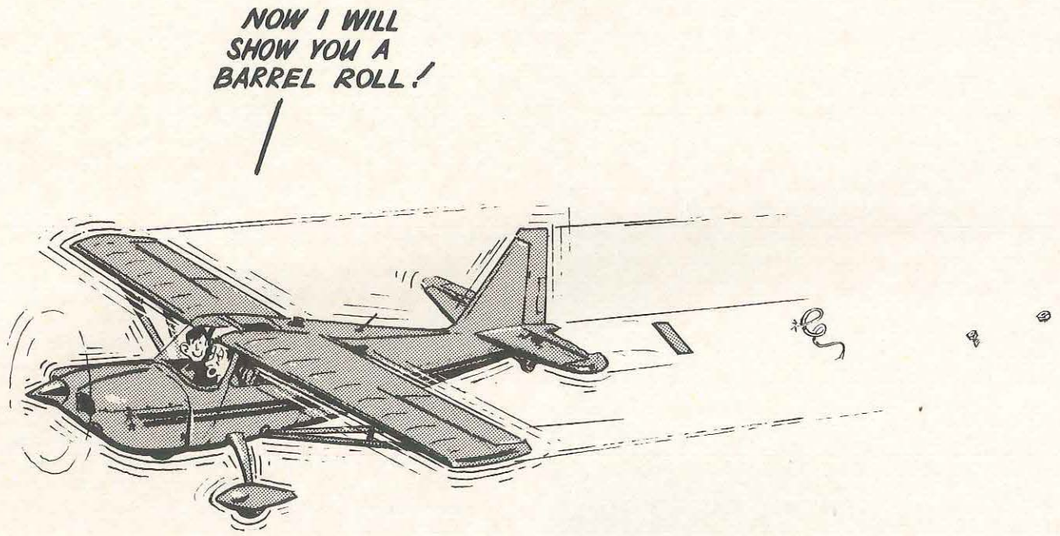
Obviously the UP and DOWN selections should result in a corresponding position of the landing gear. The OFF position is only used during manual extension of the landing gear. Its purpose is electrically to isolate the landing gear motor during manual extension, thereby providing an additional safety measure should the actuator motor fail to mechanically disengage when the manual handcrank is engaged.

Care must be taken when using this type of switch to ensure that the desired selection is made. It is not difficult inadvertently to move the knob to the OFF position and leave it there instead of in either the UP or DOWN position.

Summary

This accident was a consequence of an undisciplined approach by the pilot, who allowed himself to be diverted from his primary task, namely, that of landing the aircraft. The accident particularly highlighted the importance of the 'action and reaction' relationship during cockpit checks. For every checklist action there is an appropriate response; a response that may vary from a gauge changing its indication or a light illuminating, to the confirmation of performance data. Whatever form that response may take, the thorough and disciplined observance of the 'action and reaction' procedure in the cockpit is crucial to safe operations ●

Inflight vibration



A very experienced pilot intended carrying out a period of aerobatics in his local training area. He was taking a passenger who was a student pilot.

After completing a daily inspection the pilot strapped into his aircraft and uneventfully carried out the start-up, taxi, run-up and takeoff.

During the climb the student pilot, who was occupying the rear seat, inquired how the engine was performing, as he had heard that recently it had run roughly on occasions. The engine in fact operated satisfactorily during the climb but soon after the pilot had levelled at 1500 feet and set cruise power, short periods of apparent rough running were noticed. A climb to 2000 feet was then carried out and excessive vibration which seemed to be associated with rough engine running was again evident. Once level flight was resumed increased periods of more severe vibration occurred.

In an attempt to isolate the source of the problem the pilot established himself in the training area and experimented with engine power settings, the fuel mixture and carburettor heat. By this stage the apparent engine vibrations had become even more severe, although confined to periods of short duration. Altering the setting of any engine control would temporarily alleviate the vibration.

Because he did not want to disappoint his passenger the pilot decided that he would still go to the aerobatic area — notwithstanding the vibrations, which should have been cause for serious concern if not alarm. Again, short periods of severe 'engine roughness' were experienced, and again the pilot tried to locate the source.

Finally the pilot decided he could no longer accept the aircraft's abnormal behaviour so he turned back towards the airfield. A descent to 1500 feet was commenced and that altitude was maintained until the circuit was rejoined on the dead side. There was no vibration during this phase of the flight.

Following the rejoin, a normal circuit was flown. On final approach, with an airspeed of 70–75 knots, the pilot found that the elevator trim was ineffective when he tried to apply nose-up trim, but worked normally for nose-down. He moved the trim control to the full nose-up position and continued with the landing. The stick force required to flare and complete a three-point landing was noticeably heavy but presented no difficulty.

Post-flight inspection revealed that the elevator trim tab was damaged and that the nose-up elevator trim tab cable was broken at the turnbuckle. Further investigation led to the detection of a broken rib in the elevator and cracks in the leading edge torque tube near the inner end.

It was this fault which, in addition to depriving the pilot of nose-up trim during landing, had caused the apparent 'rough running' and vibration: there was nothing wrong with the engine.

The specialist engineering report prepared by the Bureau of Air Safety Investigation concluded that because of the fracture of the trim tab hinge at the inboard left bolt location, tab buzz had developed. In addition to the ensuing structural damage which the fracture caused, the tab buzz was also responsible for the vibration which had been mistaken for rough engine running. The defect was considered to have been present for some period, and the specialist report commented that 'this damage should have been visible to, and detected by, the pilots on their preflight inspections'.

Comment

The reason why the trim tab hinge was fractured was the subject of considerable investigation. What is of interest here, however, are the operational aspects of the occurrence relating to maintenance, supervision, and the pilot's actions.

First, concerning maintenance, on several occasions prior to this sortie, inflight vibration had been experienced and reported. Because the pilot reports indicated that the engine was the source of the vibration, no consideration was given to the possibility of airframe vibration, so maintenance inspections were limited to the engine. It does not seem unreasonable to suggest that, once the initial inspection had failed to identify any problems with the engine, further investigation into other components should have been instigated. This was not the case.

Second, these reports of recurring vibrations should have attracted — but apparently did not — the immediate and direct involvement of the operating organisation's maintenance and flying supervisors.

The lot of a supervisor is, admittedly, often difficult. Sometimes his direct involvement can be counterproductive as it can inhibit the initiative and activities of others. Nevertheless, an unexplained inflight vibration is a serious matter, with serious safety implications. Supervisors should arrange their organisational procedures to ensure that recurrent abnormalities such as this are brought to their attention; and they also need to become personally involved, as their experience could make the difference in diagnosing the problem.

Finally, it is easy to appreciate the pilot's wish not to disappoint his passenger. The pilot also was highly experienced and this doubtless influenced his initial decision to press on and to attempt to isolate the cause of the vibration. Nevertheless, the fact remains that he was flying in a single-engine aircraft which was subject to frequent periods of apparently severe engine vibration. When you have a choice, there is only one place from which to analyse engine problems — on the ground! A prompt return to the airfield via a precautionary forced landing pattern — not via an immediate descent and a normal circuit — would have been the most prudent course of action as soon as an engine malfunction was suspected. The declaration of an emergency might also have been considered.

Summary

Abnormal inflight vibration is a serious matter, and any time it occurs a pilot has grounds for considerable concern. It is a situation which demands prompt inflight action based on safety-first criteria, while it also requires the serious attention of supervisors, engineers and operators to resolve the problem ●

Flying with unserviceabilities

Approaching a general aviation aerodrome, the pilot of a PA 32-260 advised the Tower that he was very low on fuel and expressed concern that he might not reach the airport. The Senior Operations Controller immediately declared an Alert Phase emergency, which was cancelled when the aircraft eventually landed safely.

It later transpired that the pilot had experienced difficulties with the aircraft's mixture control on the previous flight. The control apparently felt 'odd' inflight, while after landing he had been unable to shutdown the engine using the mixture lever, and had instead turned off the magnetos to stop the engine. Fuel usage during the flight had also been high, but the pilot did not associate this with the problems he was experiencing with the mixture control.

During flight planning for the next trip the pilot had indicated to the briefing officer that he was not entirely happy with the mixture control; nevertheless, he proceeded with the flight.

Once the Cherokee Six was established in the cruise the pilot noticed that the fuel gauges were moving towards empty at a faster than normal rate. Although suitable diversion aerodromes were available, he elected to 'press on'. Just before the destination was reached the gauges indicated that the fuel tanks were empty, and this resulted in the pilot advising ATC of his predicament.

A technical investigation revealed that the mixture control clamp nut had cracked, allowing the outer mixture cable to slide freely without affecting the mixture control valve. This rendered the mixture control ineffective, and was the reason for the pilot's inability to shutdown the engine with the mixture lever and the excessive fuel consumption.

Discussion

It would be unrealistic to state categorically that pilots should never fly aircraft which have an unserviceability of some kind. Obviously, in certain conditions, and depending on the nature of the defect and the type of operation planned, it can be perfectly safe to do so, e.g. unserviceable navigation aids for a VFR flight. It should be noted, however, that such assessments are often more complex than may seem apparent on the surface; therefore, the advice of a flying supervisor and a LAME should be sought.

It *can* be stated unequivocally that there are certain types of defects which should never be accepted, and those affecting engines and airframes, for example, unquestionably fall into that category. In this instance the pilot not only placed himself and his aircraft at risk, but also came perilously close to involvement in the potentially tragic consequences of an engine failure over a densely populated area ●

Reader contribution

Spontaneous combustion

Some years ago as passenger baggage was being loaded into a Regular Public Transport jet, one of the ground staff noticed that a bag was smouldering. The bag was retrieved and the cause found to be a book of matches which had ignited spontaneously. Had ignition occurred only minutes later, after the bag had been loaded into the baggage hold, and the fire spread after takeoff, the probable consequences are only too obvious. The following article, submitted by a reader, recounts his experience with the dangerous phenomenon of spontaneous combustion.

* * *

Having been a licensed pilot for nearly 25 years I would like to think that I have learned to value objective air safety investigation, criticism from my mentors and self-criticism, including the material published as 'reader contributions' in the *Aviation Safety Digest*. Perhaps my contribution might benefit someone's learning curve.

I am a pipe smoker so I always need a plentiful supply of matches to keep my much-loved furnace alight. On an overnight stopover some months ago I took the usual book of matches from my hotel room. Later that evening, having not used the matches for an hour or so, I returned to the hotel and stepped into the lift. When I put my hand into the jacket pocket where the matches were I immediately became aware of two vital problems, namely, that my hand became very hot very quickly, and also that something was burning . . . I was on fire, left-hand side! Not wishing to emulate a dissident Buddhist monk, I baled out of my jacket and smothered the fire. The unfortunate passengers in the lift showed mixed reactions of humour at my immediate reactions (Phase 1 — Emergency Procedures) and then horror at my follow-up verbal comments (Phase 2).

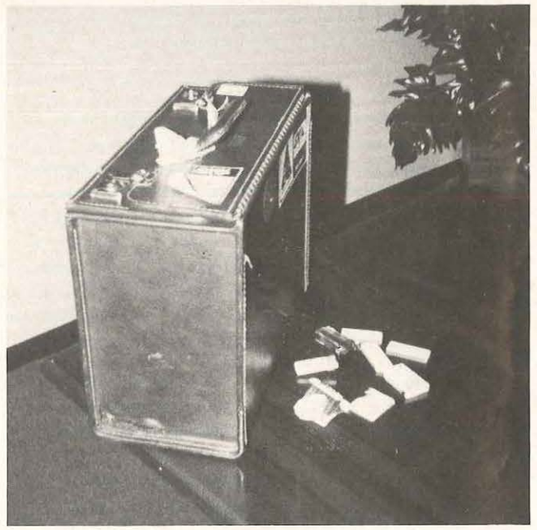
Subsequent investigation of the incident revealed that the pilot ceased forthwith the practice of collecting books of matches to sustain his addiction. For the first time in years I cleaned out my overnight bag, dispatching a pile of the wretched matches to the wastebin, and thinking how fortunate it was that the problem had never occurred in flight with, perhaps, the offending baggage being located in an inaccessible baggage compartment.

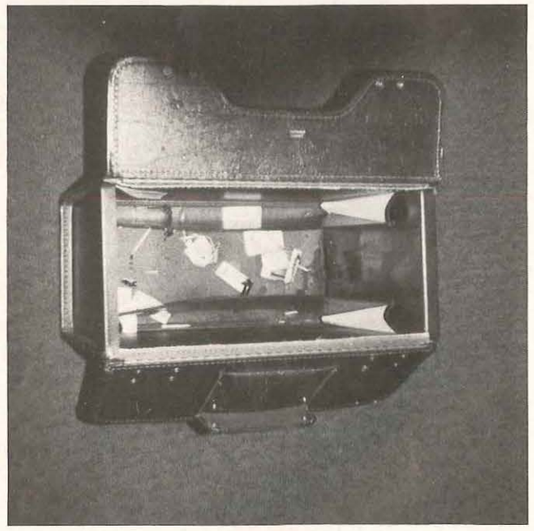
While I never forgot the experience I did not speak much about it until I recently heard that a similar incident occurred during the loading of baggage into an RPT jet aircraft.

I wonder if a serious aircraft accident will ever be caused by and traced to a book of matches which the owner would have considered innocuous.

* * *

Readers should note that, while passengers and crew are permitted to carry matches on their persons, they are not allowed to carry them in luggage unless the matches have been packed and declared in accordance with Dangerous Cargo Regulations. While book matches are the most dangerous, these regulations apply to all matches, including those in boxes and labelled as 'safety matches' ●





During loading of a B727, portering staff discovered that a briefcase in the forward locker of the aircraft was smouldering. A book of matches was subsequently found to have ignited spontaneously.

Aircraft accident information reports

THIRD QUARTER 1983

Prepared by the Bureau of Air Safety Investigation

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
F = Fatal S = Serious M = Minor N = Nil

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*
02 Jul 1240	Cessna U206 F VH-TIR Forsythe Is., Qld.	Non-commercial—pleasure Mornington Is., Qld./Forsythe Is., Qld.	C1N, P3N 8311041

The pilot reported that while conducting a low pass a gust of wind affected the aircraft. He applied power but the engine did not respond and the aircraft landed heavily on a salt pan. Directional control could not be maintained during the subsequent landing roll and the nose gear collapsed.

03 Jul 1410	Rutan Vari EZE VH-EZM Lake Cataract, NSW	Non-commercial—pleasure Albion Park, NSW/Bankstown, NSW	C1F, P1F 8321053

Following receipt of advice that the aircraft had failed to return from a NOSAR, no details flight, searchers found the wreckage washed up on the edge of a lake. A power line 65 ft above the lake surface and about 1.5 km from the wreckage had been debraided over a two-metre length, and initial investigation suggests that the aircraft had collided with this line.

03 Jul 1300	Piper 28 R180 VH-CHC Port Macquarie	Non-commercial—pleasure Port Macquarie/Port Macquarie	C1N, P3N 8321054

The pilot was taking part in a spot-landing competition. The aircraft landed heavily but no damage was detected. On subsequent flights, the gear in-transit warning light remained illuminated when the gear was selected up. A further inspection carried out by a LAME revealed damage to the left wing and gear housing.

04 Jul 1410	Beech V35 VH-CFK Maroochydore, Qld.	Non-commercial—pleasure Maroochydore, Qld./Maroochydore, Qld.	C1N, P2N 8311042

During the landing roll the pilot operated the gear selector in mistake for the flap lever. Although he immediately realised his error and re-selected gear down, the gear up cycle had been initiated and the gear continued to collapse.

05 Jul 0700	Cessna 172 M VH-SYO Emmet Downs, Qld.	Non-commercial—business Isis Downs, Qld./Emmet Downs, Qld.	C1N, P2N 8311046

Towards the end of the landing roll the pilot positioned the aircraft to the left side of the strip. The left wing struck and rode over a bush and the left main wheel passed over a windrow. As the left wing lifted, the right wing struck the ground.

06 Jul 1113	Cessna 402 VH-ENO Archerfield, Qld.	Charter—passenger Archerfield, Qld./Jimbour, Qld.	C1N, P8N 8311043

Shortly after liftoff the pilot believed that the left engine had failed. He was unable to maintain adequate airspeed and elected to abandon the takeoff. Directional control was lost and the aircraft ran off the side of the strip into an area of excavation.

PRELIMINARY REPORTS (The following accidents are still under investigation)

Date / Time	Aircraft type & registration / Location	Kind of flying / Departure point/Destination	Injuries / Record number
13 Jul 1857	Piper PA32-R301 VH-AOP Batchelor, NT	Ferry Batchelor, NT/Darwin, NT	C1N 8341021

The engine upper cowl was being replaced following a periodic inspection. The LAME was fastening the left side and was being assisted by the pilot who was working on the right side. Prior to completing the installation, the LAME left to answer the phone and while he was away the pilot completed fastening the right side of the cowl, carried out a hurried pre-flight inspection, and took off 2 minutes before last light. Shortly after takeoff, the cowl detached and struck the tail plane.

17 Jul 1505	Rockwell 685 VH-WJC Bass Strait, Vic.	Non-commercial—pleasure Hobart, Tas./Moorabbin, Vic.	C1F, P1F 8331017

While cruising at FL120 the pilot reported low fuel quantity indications. Two minutes later the pilot transmitted a Mayday call, advising that he was leaving FL120 and that he would be making a controlled ditching. Radio contact was lost 7 mins after Mayday call. An F27 aircraft was diverted to the area and reported sighting a survivor in the water. However, contact was lost shortly before the arrival of a rescue helicopter.

17 Jul 1240	Bell 206-B VH-KMX Lake Burragorang	Non-commercial—pleasure Bankstown, NSW/Bankstown, NSW	C1F, P1M 8321055

The helicopter was being flown along a watercourse at a height of about 10 ft and an airspeed of about 85 kt. As the pilot rotated the aircraft to commence a climb, the rear of the landing skids struck the water. The helicopter pitched forward, overturned and sank.

18 Jul 0930	Beech 58 VH-EZE Swan Hill, Vic.	Charter—passenger Essendon, Vic./Swan Hill, Vic.	C1N, P5N 8331018

During the landing run, at about 60 kt, the pilot inadvertently selected the undercarriage up instead of the flaps. All three undercarriage legs retracted and the aircraft slewed right, through 180 degrees, before coming to rest off the side of the runway.

20 Jul 1049	Cessna 150 E VH-KMJ Three Hummock Is.	Non-commercial/pleasure Devonport, Tas./King Island, Tas.	C1N 8331019

The pilot elected to carry out a precautionary landing on a 900 m strip because of a rough-running engine. As he flared the aircraft for touchdown, a wind gust was encountered and the aircraft ballooned. The subsequent touchdown was on the nosewheel and the aircraft bounced twice. On the third touchdown, the nose gear collapsed and the aircraft slid to a halt.

20 Jul 1640	Cessna 172-P VH-WRX Wiluna, WA 2S	Non-commercial—pleasure Wiluna, WA/Lake Way Station, WA	C1F 8351020

Immediately after takeoff the aircraft was seen to enter a steep climbing turn to the left. After turning through about 135 degrees, and at an estimated height of 100 to 150 ft agl, the aircraft suddenly pitched nose down and lost height. The aircraft collided with a tree prior to impacting the ground in a nose-low, left wing down attitude.

24 Jul 1940	Cessna 210 M VH-MDG Sydney, NSW	Non-commercial—pleasure Sydney, NSW/Aero Pelican, NSW	C1N, P1S, P4N 8321056

When two passengers had not arrived at the aircraft by a pre-arranged time, the pilot commenced to taxi for departure. After the aircraft had travelled a short distance, one of the missing passengers approached the right hand door. The pilot stopped the aircraft, and shortly afterwards the other passenger was seen moving along the left side of the aircraft towards the nose. The pilot shouted a warning and moved to shut down the engine, but the passenger was struck by the propeller.

26 Jul 1505	Airparts 24 A4 VH-BBM Tenterfield 2S	Commercial—aerial agriculture/baiting Tenterfield (Agstrip)/Tenterfield (Agstrip)	C1N 8321057

On takeoff the left main wheel and inner oleo leg fell from the aircraft. The pilot notified emergency services and carried out a landing at a lower than normal touchdown speed. The trailing edge of the left wing contacted the strip during the landing roll.

27 Jul 1610	Cessna 182 H VH-KMM Nevertire 15SE	Non-commercial—pleasure Cobar, NSW/Mudgee, NSW	C1N 8321058

During cruise the engine began to run roughly. Full rich mixture and carburettor heat were applied and the flight continued to the next landing point. About 15 minutes after departure from that point the engine again ran roughly, the pilot applied full rich mixture and carburettor heat and continued. An hour later the engine lost all power and a landing was carried out in a paddock. During the landing roll, the aircraft struck five sheep. Both fuel tanks were found to be empty.

27 Jul 2005	Beech 76 VH-HFS Toowoomba, Qld.	Ferry Archerfield, Qld./Toowoomba, Qld.	C2N 8311045

The aircraft was being positioned at night for a flight the next day. On arrival at the destination an instrument approach was carried out with the aircraft becoming visual at the minima. After joining the circuit the pilot had to manoeuvre the aircraft around cloud on the downwind leg. When turning onto the base leg the pilot lost sight of the runway and initiated a missed approach. The aircraft struck power lines and slid to a halt on a roadway.

29 Jul 1550	Bell 206 B VH-CEC Wickham Heliport	Non-commercial—corporate/executive Wickham Heliport/Maitland, NSW	C1N, P1N 8321059

The helicopter had been parked adjacent to a raised refuelling platform, 60 mm high. As the pilot was bringing the helicopter to a hover, the right skid contacted the platform. The pilot attempted to correct with cyclic but the helicopter rolled to the right coming to rest on its right side on the platform.

01 Aug 1715	Evans VP2 VH-ITA Wedderburn, NSW 1 NW	Non-commercial—pleasure Wedderburn, NSW/Wedderburn, NSW	C1S 8321060

Following a series of taxi trials the pilot elected to carry out a circuit. Shortly after becoming airborne the aircraft struck the ground in an almost vertical nose-down attitude.

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 Aug 1515	Cessna A150 L VH-IER Mardathuna, WA	Non-commercial—aerial mustering Mardathuna, WA/Mardathuna, WA	C1M 8351021

The pilot had been mustering for most of the day. Because the wind strength was increasing, he elected to terminate operations for the day after completing the task at hand. Towards the completion of a turn at about 200 ft agl the aircraft pitched sharply nose down and commenced to descend rapidly. The pilot took recovery action but was unable to prevent the aircraft colliding with the ground. The aircraft then overturned and slid 15 m before stopping.

04 Aug 1200	De Hav 114 2D/A1 VH-CLY Launceston, Tas.	Scheduled passenger service—commute Wynyard, Tas./Launceston, Tas.	C2N, P1M, P4N 8331020

The aircraft was being flown by the first officer. On late final approach the aircraft was not aligned with the runway and the captain applied full power as he called for a go-around. The captain then took control but the left wing dropped and struck a fence. The other fences were struck as the aircraft yawed through 270 degrees before coming to rest on its belly 125 m past the first fence.

05 Aug 1405	Cessna A188B-A1 VH-KZC Mitta Mitta, Vic. 5N	Commercial—assoc. agriculture/baiting Mitta Mitta, Vic./Mitta Mitta, Vic.	C1M 8331021

The pilot initiated a 180 deg positioning turn to commence a superphosphate spreading run. About halfway through the turn the pilot felt the aircraft sink slightly. He levelled the wings and applied slight back pressure on the control column, but did not increase power. The aircraft stalled, mushed into tree tops and impacted the ground in a near-vertical attitude before coming to rest inverted. The pilot evacuated just before the aircraft caught fire.

10 Aug 1116	Cessna A185 F VH-IVG Cairns, Qld.	Non-commercial—practice Cairns, Qld./Cairns, Qld.	C1N, P4N 8311050

The pilot had considerable aeronautical experience but was not familiar with the Cessna 185 type. He intended to use the aircraft to fly to an island tourist resort, and was carrying out a series of practice circuits prior to departure. Wind conditions were gusty and on the final landing roll directional control was lost at a speed of about 30 kt. The right wing and the propeller struck the ground and the aircraft then fell back heavily onto the tailwheel.

11 Aug 1130	Cessna 150 M VH-RZA Amburla, NT 7S	Non-commercial—business Amburla Station, NT/Valley Bore, NT	C1S 8341026

The aircraft was flown back and forth above a quarantine paddock in order to ensure that no cattle remained. The search pattern was flown at about 200 ft agl. Ground marks and broken trees indicate that the aircraft struck the ground in a spin to the right. The pilot does not recall the sequence of events immediately prior to the accident.

12 Aug 1550	Cessna A188 A1 VH-KQE Scone, NSW 24W	Commercial—aerial agriculture/baiting Scone, NSW/Scone, NSW	C1S 8321061

On the sixth 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 upper 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 m after the wire strike.

16 Aug 1100	Amer Air 5 A VH-IFI Maryborough 50S	Non-commercial—pleasure Archerfield, Qld./Callide, Qld.	C1N, P1N 8311051

The pilot decided to land the aircraft on a road because of deteriorating weather. During the landing roll the left wing struck a road sign.

23 Aug 1510	Cessna 210 L VH-SRJ Gunnedah, NSW	Non-commercial—pleasure Albury, NSW/Gunnedah, NSW	C1N, P3N 8321063

As the aircraft was taxied clear of the runway the pilot inadvertently selected the landing gear up. The nose gear retracted and the propeller and forward fuselage contacted the ground.

26 Aug 1510	Beech 58 VH-ADB Markdale, NSW	Non-commercial—pleasure Cooma, NSW/Markdale, NSW	C1N, P4N 8321064

The pilot was making an approach, in light rain, to a 747 m-long grass strip. The aircraft touched down 85 m beyond the approach end and bounced. After the second touchdown the pilot retracted the flaps and commenced braking. The aircraft skidded on the wet grass, overran the strip and collided with a wire fence.

27 Aug 1600	Bellanca 8 KCAB VH-VOO Hoxton Park, NSW	Instructional—solo—supervised Hoxton Park, NSW/Hoxton Park, NSW	C1N 8321065

The pilot had recently completed his tailwheel aircraft endorsement and was carrying out solo practice. On the first circuit the aircraft touched down before the runway threshold and ground looped to the right. The left main gear leg collapsed and the aircraft tipped onto the left wing and nose before coming to rest.

28 Aug 2200	Beech 200 VH-KTE Adavale, Qld. 5S	Charter—passenger Windorah, Qld./Toowoomba, Qld.	C1F, P11F 8311053

The aircraft was on the return leg of a flight begun earlier in the evening. The pilot made a normal departure report and subsequently acknowledged an ATC clearance to cruise at flight level 270. No further communications were received and the wreckage of the aircraft was later discovered about 210 km from the departure aerodrome. It was apparent that the aircraft had broken up in flight at a relatively low altitude as a result of aerodynamic overloading of the structure.

PRELIMINARY REPORTS (The following accidents are still under investigation)

Date / Time	Aircraft type & registration / Location	Kind of flying / Departure point/Destination	Injuries / Record number
28 Aug 1130	Cessna 182 C VH-BXW Branxton, NSW 5N	Parachute jump—air show Enderslie, NSW/Enderslie, NSW	C1N, P4N 8321066

The aircraft was carrying parachutists who were engaged in a competition skydiving event. As the aircraft climbed through 1500 ft, the engine emitted a loud bang, then stopped. The parachutists abandoned the aircraft and the pilot carried out a forced landing into a nearby paddock. After a ground roll of about 50 m the engine fell from the aircraft. Inspection revealed that one propeller blade had detached in flight and the engine mounts had broken.

28 Aug 1015	Piper 28 161 VH-BZA Lilydale, Vic.	Non-commercial—pleasure Lilydale, Vic./Lilydale, Vic.	C1N, P1N 8331022

After completing a touch and go landing on the longer of the two grass strips available, the pilot decided to make a flapless full stop landing on the shorter strip. The approach was high, the aircraft floated and touched down 319 metres before the end of the strip. Despite heavy braking, the aircraft slid over the end of the strip and struck an earth bank 60 metres beyond.

01 Sep 1400	Hughes 269 C VH-THV Mary Kathleen, Qld.	Commercial—aerial mustering Mary Kathleen, Qld./Mary Kathleen, Qld.	C1N, P1N 8311054

The pilot was mustering in a valley and was hovering at a low height behind a small mob of cattle. He reported that the aircraft suddenly encountered sink, which continued despite his application of full power. A turn towards more suitable terrain was attempted but the helicopter failed to respond. Touchdown occurred on sloping ground and the aircraft rolled onto its side.

01 Sep 1530	Victa 100 VH-BWG Peterborough 9NW	Non-commercial—pleasure Peterborough 9NW/Peterborough 9NW	C1N, P1N 8331023

The owner-pilot had limited experience on the type and intended to carry out practice circuits and landings. The first takeoff was normal and the pilot then flew the aircraft close to the ground in order to accelerate to a higher speed prior to initiating a climb. Sink was encountered and the aircraft struck rising terrain beyond the end of the strip. The pilot closed the throttle and applied braking but was unable to prevent the aircraft colliding with a fence.

01 Sep 1600	Hughes 269-C VH-TIH Powell Creek, NT 3S	Commercial—aerial mustering Four Mile Bore, NT/Four Mile Bore, NT	C1N, P1N 8341027

Cattle mustering operations had commenced early in the day with breaks for refuelling and a meal. On departure after refuelling the aircraft entered a right turn, and at about 40 feet above the ground the engine lost power. There was neither adequate speed nor height available for a controlled landing but the pilot was able to level the aircraft before it crashed through small saplings and tree stumps.

05 Sep 1400	Cessna 182 P VH-DKL Kyneton, Vic.	Non-commercial—pleasure Broken Hill, NSW/Essendon, Vic.	C1N, P1M, P2N 8331025

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 beyond 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.

05 Sep 1130	Gulfstream 695 A VH-LTJ Launceston, Tas.	Non-commercial—D.O.T. survey Launceston, Tas./Launceston, Tas.	C2N, P5N 8331026

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.

07 Sep 1430	Cessna A188B A1 VH-EJV Caroona, NSW 11NW	Commercial—aerial agriculture/baiting Caroona, NSW 8N/Caroona, NSW 8N	C1S 8321068

The pilot was engaged in spraying a wheat crop situated in a paddock, which was bounded on the south by a power line and on the west by a spur line. The aircraft had completed several runs, crossing over the spur line at right angles. As the aircraft commenced what was to be the second last swath run, the main landing gear struck the spur line and the aircraft pitched nose down into the ground.

09 Sep 1655	Cessna A188B A1 VH-PGO Hillston, NSW 10NW	Commercial—aerial agriculture/baiting Hillston, NSW/Hillston, NSW	C1S 8321069

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 m beyond the wires. The aircraft cartwheeled and came to rest inverted.

10 Sep 1200	Cessna A188B A1 VH-EVV Binnaway, NSW 7SE	Commercial—aerial agriculture/baiting Binnaway, NSW 7SE/Binnaway, NSW 7SE	C1N 8321071

The aircraft was descending over a line of trees prior to commencing a spray run when the left wing collided with the branch of a tree. The pilot was able to maintain control of the aircraft and land at a nearby strip.

10 Sep 1400	Burkhart ASTIR CS VH-WQJ Tirroan, Qld. 2N	Non-commercial—pleasure Elliot Field, Qld./Elliot Field, Qld.	C1N 8311056

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 rough ground, the glider ground looped to the right and the landing gear collapsed.

PRELIMINARY REPORTS (The following accidents are still under investigation)

Date / Time	Aircraft type & registration / Location	Kind of flying / Departure point/Destination	Injuries / Record number
11 Sep 1100	Cessna 172 M VH-IQG Bairnsdale, Vic.	Non-commercial—pleasure Bairnsdale, Vic./Lakes Entrance, Vic.	C1N, P1N 8331027

On departure the pilot observed a cold front lying across the intended track and approaching rapidly. He doubted that VFR flight could be maintained and turned back to land on runway 32. The wind was from the northwest gusting to 30 kt. On the landing roll as the aircraft slowed to fast taxi speed, the wind swung strongly to the southwest. The pilot reported that he was unable to retain control of the aircraft, which overturned and came to rest inverted.

18 Sep 1610	Piel 100 VH-FWB Gunnedah, NSW	Non-commercial—pleasure Gunnedah, NSW/Gunnedah, NSW	C1F, P1F 8321074

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 nose-down attitude whilst rotating to the right.

18 Sep 1500	Piper 32 R300 VH-RHT Kieta, PNG 64N	Non-commercial—pleasure Kieta, PNG 64N/unknown	C1N, P3N 8391002

The pilot was conducting a pleasure flight from Australia to the Solomon Islands via various aerodromes in Papua New Guinea. He reported that shortly after takeoff the engine lost power and he was forced to ditch the aircraft, which subsequently sank in 100 m of water. Investigation of this accident is the responsibility of the PNG authorities.

18 Sep Unknown	De Hav DH 82-A VH-KBX Narromine, NSW	Non-commercial—pleasure Narromine, NSW/Narromine, NSW	C1N 8321073

The pilot was practising a touch and go landing on a grass field. As the pilot re-applied power and moved the control column forward to raise the aircraft tail, the propeller struck the ground. The tail of the aircraft continued to rise, and at a low forward speed the aircraft nosed over and came to rest inverted.

21 Sep 1000	Cessna 182-Q VH-KFS Mt. Newman, WA 259N	Non-commercial—pleasure Jigalong Station, WA/Jigalong Station, WA	C1N, P3N 8351023

During the latter part of the landing roll on an apparently dry lake bed, the aircraft entered an area of soft ground. The pilot was able to keep the aircraft moving until the firmer surface was regained. He then taxied the aircraft across the soft area again in order to achieve an into-wind takeoff. During the takeoff roll the aircraft decelerated as it traversed the soft area. The pilot elected to abandon the takeoff and ground looped the aircraft to avoid rough terrain.

25 Sep 1307	Piper 32 260 VH-IRT Ewan Racecourse	Non-commercial—pleasure Donnington Air Park/Ewan Racecourse	C1N, P2N 8311061

The pilot was conducting a short field approach into a 525 m strip. He reported that thermal activity was encountered and the aircraft touched down a short distance beyond the target point. As soon as full brakes were applied, the aircraft commenced to veer to the left, and despite corrective action the pilot was unable to prevent the aircraft running off the side of the strip.

26 Sep 1648	Cessna 182 Q VH-KDW Asquith, NSW	Non-commercial—pleasure Eildon Weir, Vic./Aero Pelican, NSW	C1N, P3N 8321075

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.

27 Sep 1400	Hughes 269 C VH-GHV Black Gin Yard 5S	Commercial—aerial mustering Koolatah, Qld./Koolatah, Qld.	C1N 8311064

The pilot reported that as he brought the aircraft to hover it began to rotate to the right. Corrective action was ineffective and the rate of rotation began to increase. While the pilot was attempting to look for a suitable landing area, a tail rotor strike was felt and control was lost. The helicopter finally came to rest on its right-hand side.

27 Sep 1700	Piper 25 235 VH-PPP Gwabegar, NSW 9SE	Commercial—assoc. agriculture/baiting 'Merebene' Property/Tamworth, NSW	C1N 8321076

A power line crossed the south-eastern end of the strip, and while carrying out spraying operations the pilot had made all takeoffs into the northwest. At the end of the task, the pilot refuelled the aircraft, and because his home base was to the southeast he elected to take off in that direction. He reported that he had temporarily forgotten about the power line. Shortly after liftoff the left wing struck the wire and the aircraft landed heavily in an adjoining paddock.

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
02 Jul	Piper 32 R300 VH-UAM		Non-commercial—pleasure				C1N, P4N
1056	Bankstown, NSW		Bankstown, NSW/Bankstown, NSW				8321052
Private		30		107	Unknown	None	

The pilot was conducting a series of circuits when loud static noise developed in the VHF radio. Attempts to rectify the problem were unsuccessful and the pilot then turned the radio off and prepared to land. He subsequently reported that he had selected the gear down, however the aircraft landed with the gear retracted.

Hydraulic and electrical defects were discovered which, in combination, rendered the gear-unsafe warning horn and the normal gear extension system unserviceable. The pilot who had limited experience on the aircraft type had left the gear manual lever in the override position which precluded automatic free-fall of the landing gear. The gear override warning light was also found to be unserviceable.

10 Jul	Schneider ES-60B VH-GGO		Instructional—solo—supervised				C1M
1450	Beaudesert, Qld.		Hardie Field, Qld./Hardie Field, Qld.				8311044
Private		50		162	92	Glider Rating	

The pilot was returning to land after attempting to carry out some handling practice in conditions of deteriorating thermal activity. He became established on final approach and selected dive brakes out but the glider continued to float. Unable to land on the strip, the pilot planned an outlanding in an adjoining paddock but the glider overflew this area and finally landed in another paddock.

The pilot was not in current flying practice and had limited experience on the type. On an earlier flight, he had had difficulty in maintaining the desired airspeed, and reported that in an effort to correct this fault he had been concentrating on the airspeed indicator. He was continuing to monitor this instrument as he moved to deploy the dive brakes, and did not realise until after the aircraft had stopped that he had been manipulating the tow cable release lever.

02 Aug	Piper 28 R201 VH-EHK		Non-commercial—pleasure				C1N
1420	Surfers Gardens, Qld.		Goondiwindi, Qld./Surfers Gardens, Qld.				8311047
Commercial		68		16200	1934	None	

During the flight the aircraft alternator failed. The pilot switched off all electrics but left the master switch on. On arrival at his destination, the pilot selected the landing gear down and noticed that the gear position lights remained unlit. The circuit was continued and the aircraft landed with the gear retracted.

The alternator failed to operate as a result of a broken drive belt. The pilot did not check that the gear was down, and the emergency system was rendered inoperative because of the pilot's habit of placing the appropriate lever in the override position. The pilot had experienced several electrical failures in the aircraft in the preceding months, but on each occasion the gear had lowered after the normal selector had been used.

03 Aug	Hughes 269 C VH-ARG		Commercial—aerial mustering				C2N
1400	Bollon, Qld. 37NW		Shirlo Station, Qld./Bollon, Qld. 37NW				8311048
Commercial helicopter		37		3000	750	None	

The pilot was preparing to take off from a paddock in order to check that cattle had been mustered clear of the area. Almost immediately after becoming airborne the helicopter moved forward and the left skid became caught under a fallen tree stump. The helicopter pitched forward and the rotor blades struck the ground, resulting in separation of the blades. The tail boom was also severed.

The pilot commenced the takeoff from a two-foot hover and misjudged the horizontal and vertical distance of the helicopter from the fallen tree.

07 Aug	Hiller UH12-E VH-MKZ		Commercial—aerial agriculture/baiting				C1N
1400	Brisbane, Qld. 65N		Coochin Creek, Qld./Coochin Creek, Qld.				8311049
Commercial helicopter		48		17050	1050	Agricultural Class 1	

During the day the wind direction had changed through 90 degrees. To optimise takeoff performance, the pilot, after the helicopter was brought to a hover, initiated a turn around the axis of the rotor mast for an into wind takeoff. After commencing the turn the pilot lost sight of a fuel drum which was alongside the landing area and the tail rotor struck the drum. The helicopter was landed without further damage.

07 Aug	Cessna 172 N VH-MCJ		Instructional—dual				C2N
1225	Inman Valley, SA		Wentworth, NSW/Adelaide, SA				8341024
Commercial		38		2844	568	Instrument Rating Class 4 and Flight Instructor	

After observing rapidly deteriorating conditions ahead, both pilots studied their maps to choose the best way to turn in order to retrace their flight path while avoiding the surrounding high ground. While neither pilot was monitoring the progress of the flight, the aircraft entered fog. A rapid pull-up was initiated as trees were sighted directly ahead of the aircraft, however the starboard wing and the tailplane were damaged as they passed through the treetops.

07 Aug	Cessna 180 D VH-SLT		Sport parachute jump				C1N, P5N
0930	Lower Light, SA		Lower Light, SA/Lower Light, SA				8341023
Private		33		211	34	Instrument Rating Class 4	

Shortly after the takeoff run was commenced in moderate cross-wind conditions, the aircraft veered to the left. Corrective action was taken but the pilot could not maintain directional control and elected to abandon the takeoff. The aircraft ground looped and the left landing gear strut was torn off.

The pilot was relatively inexperienced on the aircraft type. The directional difficulties experienced by the pilot during the takeoff run were exacerbated by a centre of gravity at or very close to the rear limit. Additionally, the pilot chose to conduct his operation from a narrow strip.

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
08 Aug	Cessna 182 P VH-FYP		Non-commercial—aerial mustering				C1S
1600	Riveren Station, NT 28NE		Riveren Station, NT/Riveren Station, NT				8341025
Private		42		5021	4708	None	

The pilot was attempting to move a small mob of cattle through a gate into an adjoining paddock. He subsequently stated that he had been operating at about 50 ft agl, but while manoeuvring with about 20 deg of bank the left wing struck the ground. The aircraft cartwheeled, its back was broken and the pilot was rendered unconscious for more than 2 hours. There was no eye-witness to the accident and the pilot had not lodged flight details. Rescue was effected the next day.

Sufficient airspeed had not been maintained while manoeuvring at low level, and a stall had developed which the pilot had been unable to correct in the limited height available.

20 Aug	Cessna A188B A1 VH-TZS		Commercial—aerial agriculture/baiting				C1N
1100	Trundle, NSW		Trundle, NSW/Trundle, NSW				8321062
Commercial		47		10000	Unknown	Agricultural Class 1	

As the aircraft was flown along a fence line during a spraying operation, the right wing struck a branch of a dead tree. The pilot flew the aircraft back to the strip and carried out a normal landing.

The pilot subsequently reported that the branch struck was part of a tree which had fallen across the fence line. The branch merged into the background of other trees and had not been sighted. Forward visibility had also been affected by spray on the windscreen.

26 Aug	Robinson R22 VH-UXI		Charter—passenger				C1N
1225	Mareeba, Qld.		Mareeba (Rotary Park)/Mareeba (Rodeo Park)				8311052
Commercial helicopter		46		9650	60	Instrument Rating 1st or Class 1	

After landing on a pre-selected area adjoining a main road, the pilot considered that the area was too confined to permit a safe departure with two persons on board. Arrangements were therefore made to uplift the passenger from a nearby alternate site. While the helicopter was being hover taxied for takeoff, the pilot was distracted by a vehicle on the main road. He then realised he was approaching power lines and while turning away from the lines the tail rotor hit a tree.

01 Sep	Hiller UH12-E VH-MKZ		Commercial—aerial agriculture/baiting				C1N
1415	Wondai, Qld. 28NW		Mondure, Qld./Mondure, Qld.				8311055
Commercial helicopter		48		17020	1020	Agricultural Class 1	

Spraying runs were being flown under a two-cable power line. On the final turn of the third load, the pilot's attention was distracted and the main rotors struck one of the cables. Considerable vibration occurred and the pilot elected to land straight ahead. As cyclic was applied to slow the aircraft, tail rotor effect was lost and the fuselage commenced to rotate. The pilot was able to land the aircraft without further substantial damage.

The pilot was distracted by the person acting as a marker who was slow to reposition for the next swath run. As the pilot turned the aircraft to avoid the marker, the rotor blades struck the cable. The pilot considered that he may have been further distracted by the need to monitor the spray pressure gauge, as he was expecting the chemical supply to become exhausted.

02 Sep	Glasflugel Club Libelle VH-GJM		Non-commercial—pleasure				C1N
1130	Cooma, NSW 15WNW		Bunyan, NSW/Bunyan, NSW				8321067
Glider		32		670	200	Glider Rating	

The pilot was engaged in a wave soaring exercise. After about one and a half hours of flight adequate altitude could no longer be maintained and the pilot was committed to an outlanding. During the final stages of the approach the pilot manoeuvred the glider to avoid a paddock boundary fence. The right wing struck the ground and the glider landed heavily.

When planning the approach, the pilot miscalculated the wind direction and as a result did not select a landing path into wind.

02 Sep	Cessna 150 G VH-KUR		Non-commercial—pleasure				C1N
1545	Yarra Glen 4ENE		Yarra Glen 4 ENE/Lilydale, Vic				8331024
Private		55		812	119	Instrument Rating Class 4	

Due to deteriorating weather the pilot elected to cancel his proposed flight. While taxiing the aircraft back to the hangar, a strong wind gust lifted the left wing. The pilot applied power, left aileron and rudder but the aircraft became airborne. The throttle was closed and the aircraft landed heavily on the nosewheel and left wingtip.

The flight manual for the aircraft recommends that the elevator be in the neutral position when taxiing into wind. On this occasion, the pilot taxied the aircraft with full up elevator into the wind of 25 kt which was gusting to 50 kt.

03 Sep	Piper 28 R180 VH-KIE		Non-commercial—pleasure				C1N, P3N
0700	Wubin, WA 3N		Wubin, WA/Wubin, WA				8351022
Private		20		105	45	None	

After a short flight, the pilot made a down-wind approach to land at the strip. A go-around was made due to the high ground speed and a second approach carried out into the wind. During the round-out the left wing struck a bush. The pilot attempted a go-around again but the aircraft struck a windsock post, separating the right wing. The aircraft came to rest on an adjacent road.

The pilot had had little sleep prior to undertaking the flight. The second approach was made without flap and the pilot misjudged the landing flare during which directional control of the aircraft was lost.

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
10 Sep	Amer Air 5 B VH-FXO		Non-commercial—pleasure			C1N, P3N	
1600	Goulburn, NSW		Goulburn, NSW/Goulburn, NSW				8321070
Private restricted		34	95	3	None		

The flight in the local area was terminated because of deteriorating weather conditions. The pilot reported that he was aware that windshear was common on approach to the selected strip and he therefore carried out a steeper than normal approach. The aircraft porpoised on landing and the nose gear strut was torn off after fracturing as a result of a heavy touchdown. The aircraft slid to a halt three-quarters of the way along the strip.

The pilot had only limited experience on the aircraft type. Some turbulence had been experienced during the final approach and the aircraft touched down heavily before the pilot was able to adopt the correct attitude for the landing flare. Go-around power was not applied until after the aircraft touched down following the second bounce, but the nose gear strut had already failed. The propeller struck the ground with full power still applied.

14 Sep	Cessna 172 M VH-WYK		Non-commercial—business			C1N, P1S, P1N	
1840	Cloncurry, 159N		Wurung Stn. No. 2 Bore/Wurung Stn. H'stead				8311057
Private		21	903	830	None		

The aircraft had landed at a bore site and was to transport the crew of a helicopter to a nearby homestead. The engine had been left running and almost immediately after boarding the aircraft the passengers realised they had not brought their water flasks from the helicopter. After leaving through the right side door, the helicopter pilot walked behind the aircraft but the spotter moved forward, ducked under the wing strut and saw the propeller disc too late to avoid it completely.

The spotter was familiar with fixed wing aircraft and helicopters but had been flying continually in helicopters for several days and was in the habit of going ahead of the helicopter to avoid the tail rotor. He was tired and in a hurry so as not to delay the Cessna 172 which had little time to spare for the return flight before last light.

15 Sep	Cessna 172-P VH-ESO		Non-commercial—pleasure			C1N	
1500	Bundaberg, Qld. 18SW		Bronte (N Gayndah)/The Cedars ALA, Qld.				8311058
Private		59	8486	8200	None		

The pilot was carrying out a flight of about 100 km. On arrival at the destination, turbulence, heavy rain and hail were encountered. As similar conditions were also present at the diversion airfield orbits were carried out until conditions improved. During the subsequent landing on wet grass the aircraft was affected by a tailwind gust, and to avoid an overrun the pilot attempted to ground loop the aircraft which struck a fence post during the manoeuvre.

Before departure the pilot did not obtain a weather forecast for either the destination or the diversion airfield.

16 Sep	Cessna A188B A1 VH-IEV		Commercial—aerial agriculture/baiting			C1M	
1530	Ayr, Qld.		Ayr, Qld./Ayr, Qld.				8311059
Commercial		38	11874	11600	Agricultural Class 1		

Because the alternator was defective, the pilot was attempting to start the engine using jumper leads connected to a pair of batteries. The engine would not turn over and the pilot considered that the starter motor drive had jammed. He attempted to rectify this situation by turning the propeller by hand. After two turns the engine suddenly fired and ran up to full power. The aircraft jumped the wheel chocks and collided with a parked aircraft.

The pilot reported that he was not attempting to hand start the engine and was only trying to free the starter drive. When he left the cockpit to turn the propeller, he had left the magneto switches on and the throttle in the full open position. The park brake had been applied but was not sufficiently strong to restrain the aircraft under full engine power.

16 Sep	Cessna 152 VH-BTF		Instructional—solo—supervised			C1N	
0915	Tocumwal, NSW		Tocumwal, NSW/Tocumwal, NSW				8321072
Student		41	23	23	None		

The student pilot was engaged on a solo training exercise. After takeoff two circuits were carried out in calm wind conditions on runway 09 before the aircraft departed for the training area. On returning to the airfield, the pilot found that a northerly wind was now prevailing; however, he elected to land on runway 09. The aircraft touched down heavily on the nosewheel and after three bounces the nosewheel collapsed.

During the approach the pilot concentrated on keeping the aircraft aligned with the runway centreline and did not initiate a landing flare. He had limited experience in crosswind landing techniques.

20 Sep	Hughes 269-C VH-KKC		Commercial—aerial mustering			C1N	
1600	Adelaide R20 SE		Mount Ringwood, NT/Mount Ringwood, NT				8341028
Commercial helicopter		38	3050	2600	None		

The pilot was mustering buffalo, some of which would not leave a billabong. During attempts to move them the helicopter was operated very low over the water until its tail rotor struck the surface. The helicopter began to rotate to the right, and left pedal was ineffective. It sank in about 1.5 m of water and the pilot swam to shore after a brief inspection of the helicopter.

24 Sep	Cessna 152 VH-WSU		Instructional—solo—supervised			C1N	
1100	Warrnambool, Vic.		Warrnambool, Vic./Warrnambool, Vic.				8331028
Student		51	27	27	None		

Following a period of dual training in light crosswind conditions, the pilot was authorised to carry out his fifth period of solo training. On the third landing, the aircraft touched down on the main wheels initially, and immediately after the nosewheel touched the ground the aircraft veered sharply to the right. The pilot was unable to regain control of the aircraft which ran off the strip and into a ditch.

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
25 Sep	Glasflugel Libelle H201 VH-GGV		Trial—Race—show			C1N	
1330	Donnington Park		Donnington Park/Donnington Park				8311062
Glider		35	300	Unknown	None		

As part of an airshow display, the pilot intended to carry out a high-speed, low-level run. The glider was observed to conduct the manoeuvre downwind but at an apparently low airspeed. A pitch-up and roll to the right followed before the nose was seen to lower and the aircraft struck the ground whilst still turning to the right. The pilot subsequently advised that the aircraft encountered an area of heavy sink halfway through the manoeuvre.

The pilot misjudged the speed and height of the glider at the commencement of the low-level fly past. He then attempted to turn and land in the opposite direction but did not maintain sufficient airspeed for this manouevre.

27 Sep	Cessna 152 VH-BUQ		Instructional—solo—supervised			C1N	
0915	Redcliffe, Qld.		Redcliffe, Qld./Redcliffe, Qld.				8311063
Student		23	25	25	None		

During a pre-solo dual check the student had flared the aircraft slightly high and used insufficient rudder to keep the aircraft straight on the runway after landing. The student was debriefed and commenced solo practice. On the second touch and go landing which was slightly right of centreline, the student set takeoff flap and applied power and the aircraft veered to the left. Right rudder was applied, then the takeoff abandoned. The aircraft left the strip and ran into a ditch.

The instructor authorised an inexperienced student to carry out solo touch and go circuits in a 5 kt crosswind. On approach, the student set the elevator trim nose down. During the subsequent attempted takeoff attention was diverted from the operation of the aircraft when takeoff flap was selected and directional control of the aircraft lost as it turned into wind and left the strip.

29 Sep	Piper PA28-161 VH-RQQ		Instructional—solo—supervised			C1N	
0905	Archerfield, Qld.		Archerfield, Qld./Archerfield, Qld.				8311065
Student		17	29	29	None		

After completing a series of dual circuits and landings, the student was approved to conduct his second solo flight. A normal circuit was flown but the aircraft landed in a flat attitude and bounced. Applicable corrective action was not taken and the aircraft porpoised until the nose gear collapsed. The aircraft came to rest off the side of the flight strip.

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*	*Hours total*	*Hours on type*	*Rating*
03 Jan	8321004			
Private	38	125	18	None

The pilot had limited experience on tailwheel aircraft. There was a crosswind of about 10 kt at the same time and adequate compensation for these conditions was not made.

02 Feb	8321016			
Commercial	33	3600	2800	Agricultural Class 1

The propeller hub had failed as a result of fatigue cracking, allowing one propeller blade to become detached. The hub was of the oil-filled variety, but examination revealed that no oil remained in the hub at the time of failure.

04 Feb	8351004			
Student	33	60	60	None

05 Feb	8321018			
Glider	44	240	40	Glider Rating

The instructor had simulated a tow cable failure and the student had reacted by banking the aircraft more steeply than expected. Neither pilot was subsequently able to recall the accident sequence and recovery actions attempted during the spin could not be determined. Actions required in the event of a cable break had been discussed with the student during previous training but no practical demonstrations had been given.

12 Feb	8311010			
Commercial	35	7000	1500	Agricultural Class 1

The engine had lost power as a result of water ingestion. Despite thorough checking of the fuel drum and pump used and the aircraft fuel system, the source of the water contamination could not be determined. However, the fuel pumped into the aircraft had not been filtered and samples had not been taken from all the drain points at the conclusion of the refuelling operation.

02 Mar	8351007			
Private	38	1108	420	None

The pilot's standard of flying was being informally checked by the passenger who was a flying instructor. The passenger suggested that a practice forced landing be carried out and then closed the throttle. On final approach, the pilot side slipped the aircraft to a low altitude, expecting the passenger to instruct him to go around when the exercise had been satisfactorily demonstrated. The passenger, however, was expecting the pilot to initiate the go-around.

07Mar	8331006			
None (not issued or expired)	39	643	400	None

09 Apr	8351013			
Commercial	37	11000	6600	Instrument Rating 1st or Class 1

A bearing in the landing gear gearbox had failed. This imposed high loads on the electric motor which eventually failed on extension. Debris from the failed bearing had lodged in the emergency handle engaging slot, thus preventing the pilot from lowering the gear manually.

14 Apr	8351014			
Private	20	228	177	None

The investigation established that the aircraft was stalled while in a steep turn in close proximity to the ground.

21 Apr	8341013			
Private	56	1000	600	Instrument Rating Class 4

The collision with the taxiway light resulted in the over-centrelock being broken and the nose gear collapsing. The reason for the disengagement of the over-centre lock could not be determined.

30 Apr	8331013			
Commercial	50	20000	7000	Agricultural Class 1

Although the pilot had operated from the strip many times over nine years, he was unaware of the power lines. He did not see the lines during an aerial inspection or on the first spreading flight. The lines were strung across a valley between a pole hidden by trees at the top of a ridge and a pole lower down on the other side. The span was 900 m and light conditions were dull.

04 Jun	8321045			
Private	33	690	590	None

The investigation revealed that the aircraft was climbed steeply after takeoff. Sufficient airspeed was not maintained and as flap was retracted the aircraft stalled.

06 Jun	8341017			
Commercial	27	321	150	Agricultural Class 2

The pilot was inexperienced in agricultural operations. Although he did not consider the strip to be entirely satisfactory, he knew that other pilots had used it successfully. Directional control was made difficult by the rough surface of the strip and crosswind gusts.

08 Jun	8341018			
Student	36	17	17	None

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*	*Hours total*	*Hours on type*	*Rating*
17 Jun	8321050			
Commercial	36	1650	650	Instrument Rating 1st or Class 1 and Flight Instructor

20 Jun	8321051			
Senior Commercial	39	14700	500	Instrument Rating 1st or Class 1

Investigation revealed that the cowl clips on the inboard side of the cowl had not been secured correctly, allowing the cowl to open in flight and break the outboard clips.

21 June	8331015			
Commercial	19	272	1	Instrument Rating Class 4 and Flight Instructor

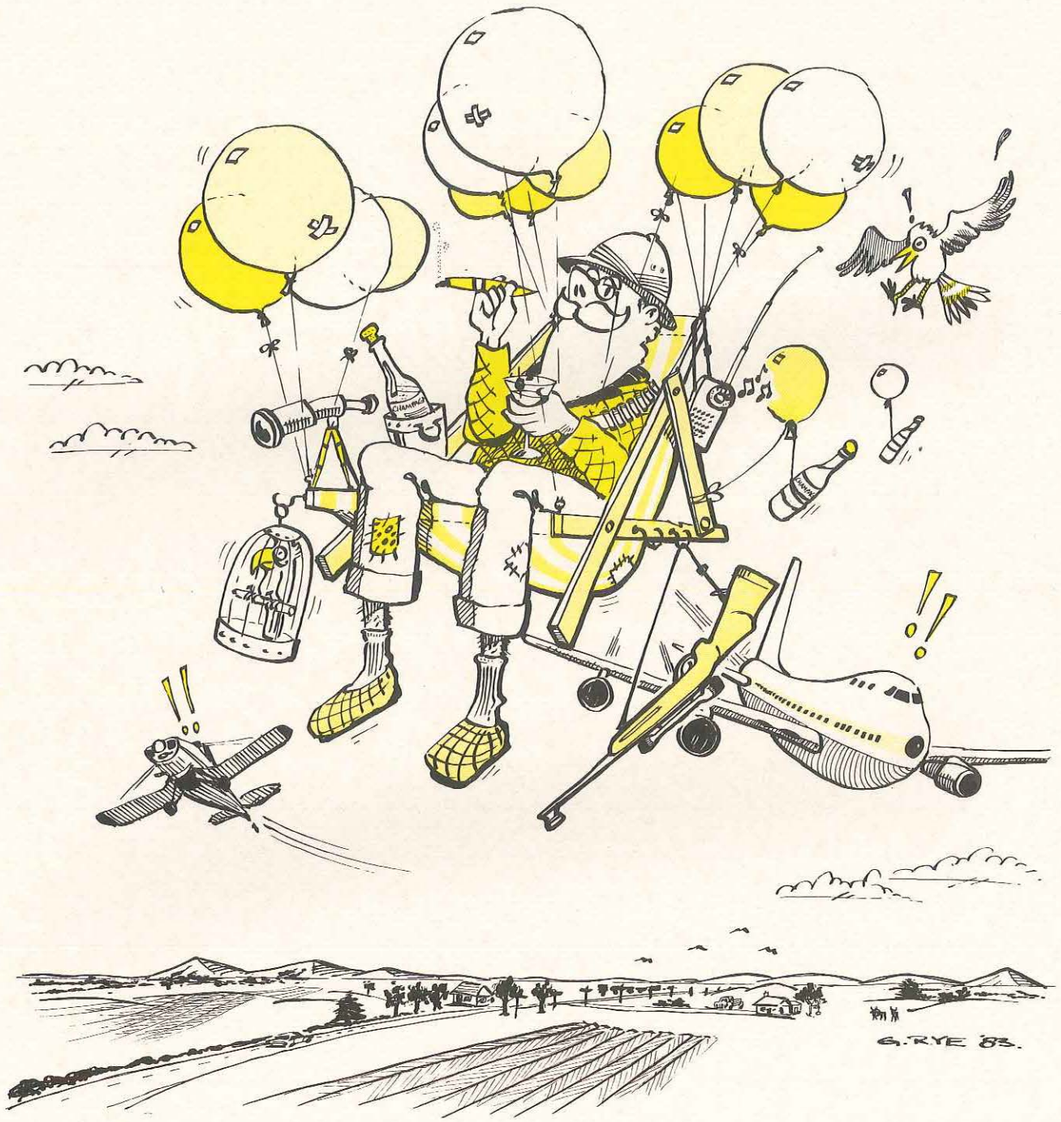
Subsequent examination established that both the landing gear squat switch and landing gear unsafe warning horn were serviceable. It is probable that there was insufficient weight on the landing gear to operate the squat switch.

30 Jun	8311040			
Private	42	1265	4	None

A locking spring in the tailwheel steering assembly was found to have been fitted incorrectly, allowing excessive wear to develop. The steering assembly had failed during the landing and the pilot had been unable to maintain directional control.

30 Jun	8351019			
Private	23	206	37	Instrument Rating Class 4

The pilot who was inexperienced on the aircraft type attempted to land the aircraft in an excessive crosswind. During the landing roll the left main wheel was held off the strip by the application of right aileron. By doing so the pilot denied himself the use of differential braking to keep the aircraft straight during the landing roll.



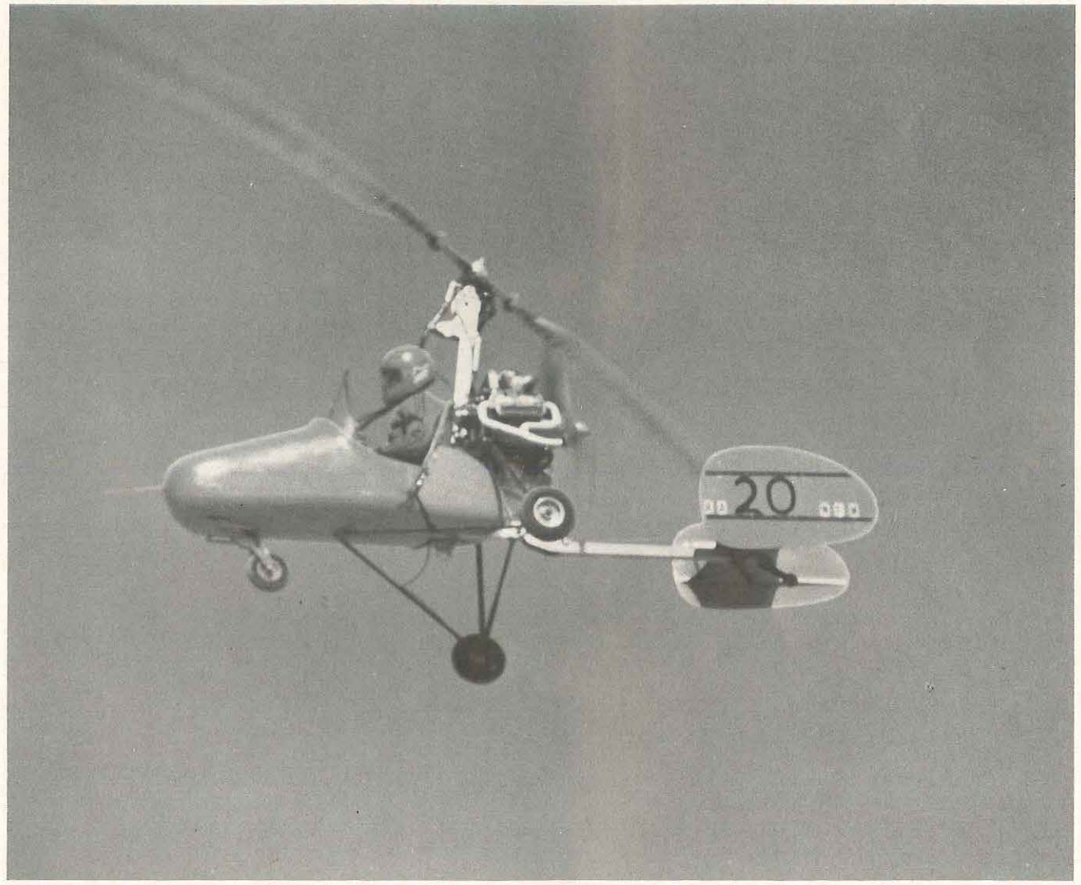
Flying deck chair

An 'unlicensed operator' of a flying deck chair which soared to an altitude of 16 000 feet in the U.S.A. was fined $1500 for various Air Regulation infringements.

During his 90-minute flight aloft with the aid of 42 helium-filled weather balloons, the budding aerologist 'intruded hazardously into federal airways and was spotted flying near several commercial jet aircraft'.

He finally crashlanded after shooting out some of the balloons with an airgun ●

Flying your homebuilt



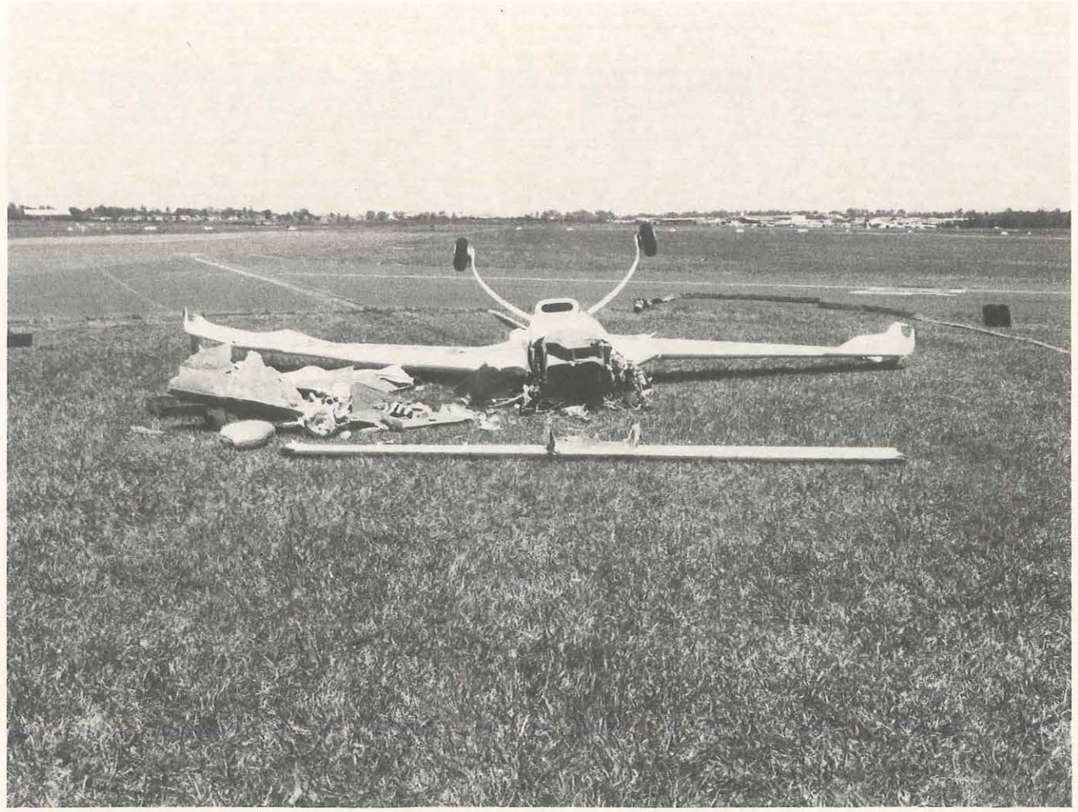
Flying is a pursuit which attracts devotees and generates enthusiasm as does no other. Of those who fly there is probably none more enthusiastic than the pilot who builds his own aircraft. Homebuilts have become tremendously popular in Australia in recent years, with the number of pilots building ultralights and minimum aircraft steadily increasing. It is a highlight in any pilot's career when, after what in most cases has been many years of hard work, a homebuilt is ready for its first flight.

There is an understandable inclination for the builder to wish to fly his aircraft as soon as possible. Depending on circumstances — the aircraft type, the pilot's experience etc. — this may not be a problem. On the other hand, flying a homebuilt can be demanding in the early stages when adjustments may still need to be made to such aspects as the aircraft's rigging, or the pilot is still becoming familiar with the machine. As the following distressing accident review illustrates, inexperienced builder/pilots should temper with caution their natural enthusiasm to fly their aircraft at the earliest opportunity, ensuring first that they are thoroughly conversant with all aspects of the machine's performance and characteristics.

The accident

A pilot with around 240 hours experience had spent about eighteen months constructing a Vari-Eze, assisted by two engineers. The initial test flying was conducted by an experienced pilot, approved by the Department of Aviation under the terms of a Permit to Fly. After five hours had been flown all of the airworthiness aspects of the test schedule had been completed, so the builder, understandably eager to fly his aircraft, arranged his first flight.

In the week before the accident he flew two sorties in



a Grumman AA1-B and one sortie in the rear seat of a friend's Vari-Eze. Prior to his flight in his own Vari-Eze he was given a briefing on the aircraft by the pilot who had carried out the initial test flying.

Witnesses saw the aircraft lift off into a normal climb attitude. It had been airborne for a distance of about 50 metres and had climbed to a height of 15 or 20 feet when it descended and struck the runway heavily in a tail-down attitude. The main landing gear spring legs were splayed outwards considerably, and the pusher propeller contacted the runway and was shattered.

The aircraft rotated rapidly into a steep nose-up attitude of about 60 degrees and climbed to a height of about 50 feet. It rolled quickly, became inverted and then crashed back onto the runway in a relatively wings level but upside down attitude. The aircraft slid off the runway and came to rest inverted after a ground slide of 55 metres. The pilot was killed.

Analysis

Notwithstanding his three flights in the past week, the pilot's recent and on-type experience were minimal, and this was assessed as being a major causal factor in the accident. His single flight in the rear seat of a Vari-Eze, while satisfactory for familiarisation purposes, was of little value in terms of manipulative experience.

As far as actual flying technique was concerned, the Vari-Eze's Owner's Manual advises pilots that because of the canard wing, on takeoff pilots who are unfamiliar with the aircraft sometimes visually misjudge the nose attitude, believing that they have over-rotated to a nose-high attitude. This false impression may lead the pilot to level off or even descend soon after lifting off.

In this instance the aircraft became airborne and then, still at flying speed, contacted the runway in a tail-down attitude. This sequence was consistent with the warning contained in the Owner's Manual. Having hit the runway, it seems probable that the pilot over-corrected by rapidly rotating his machine to an extreme nose-high attitude, and in so doing changed a relatively minor accident into a catastrophe. As a result of the extreme nose-high attitude the aircraft became airborne again, 'mushed' through the air more or less horizontally until, because of the excessive angle of attack, it stalled, flicked onto its back, and crashed.

Summary

The illusion of over-rotation on takeoff, and the correct technique to use, were adequately covered in the Owner's Manual. Unfortunately, through a combination of inexperience, lack of recency and, perhaps, over-enthusiasm to fly the aircraft he had built, this pilot fell into the trap. Those pilots who achieve the demanding and admirable goal of constructing their own aircraft must remember that, before conducting their first flight, a careful study of guidance material, dual training whenever possible, and thorough discussions and briefings with pilots who are experienced on type are essential ●

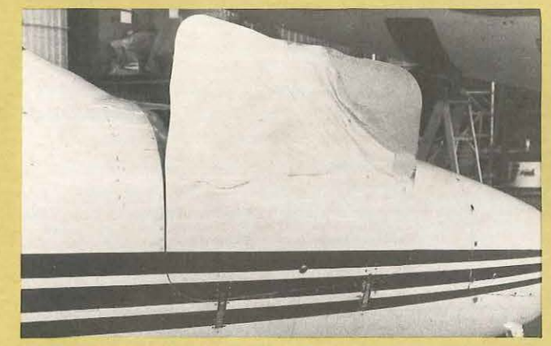
Use your warning systems

Just after lift-off the co-pilot of a Cessna Citation noticed that the right-hand nose locker door was open. The captain throttled back on the right engine and reduced speed as much as practicable. However, the door separated from the aircraft shortly afterwards and landed near a Primary School. It had also struck the leading edge of the Citation's right mainplane and the lower right engine cowl, causing minor damage. The captain returned for an immediate landing and while he was turning on to left base over a built-up area a 3-kilogram bag fell from the nose locker. The aircraft was landed without further mishap.

The nose locker doors

These doors are fastened on the Citation by two toggle hook latches (see photograph). The door is then locked by using the key-operated lock between the two latches. While the key lock assists in securing the door in flight, note that the latches are the prime device for this function. The front latch also operates a microswitch which illuminates a 'door unlocked' warning light in the cockpit when the latch is not closed.

During the technical investigation it was determined that the door and all latches were fully serviceable. If the door had been correctly latched it would not have been possible for it to have come open and separate in flight.



View of right nose locker door in position. Notice damage to door and that it can still be latched.

Analysis

The procedure used by the Company to close the nose locker doors consisted of fastening the latches and then securing the key-operated lock. To check that the key lock had in fact operated, the forward latch was then re-opened and the locker door pulled slightly, after which the forward latch was refastened.

According to the Company's Chief Pilot, problems had been experienced with the microswitches on the front latch which on occasions resulted in the 'door unlocked' warning light illuminating even though the doors were securely latched. Accordingly, crews had been briefed that if during the pre-start checks the warning light illuminated and the crew were certain the doors had been properly closed, then the light could be ignored; the microswitch was to be adjusted before the next flight.

In this instance the co-pilot closed the right locker door in the manner described above. He felt certain that he refastened the forward latch after checking the security of the key lock. When electrical power was connected during the prestart checks he noticed the 'door unlocked' warning light had illuminated and told the captain. The captain asked the co-pilot if he had secured all the doors and, on receiving an affirmative response, deselected the warning light. The matter was then forgotten until the door came open in flight.

Comment

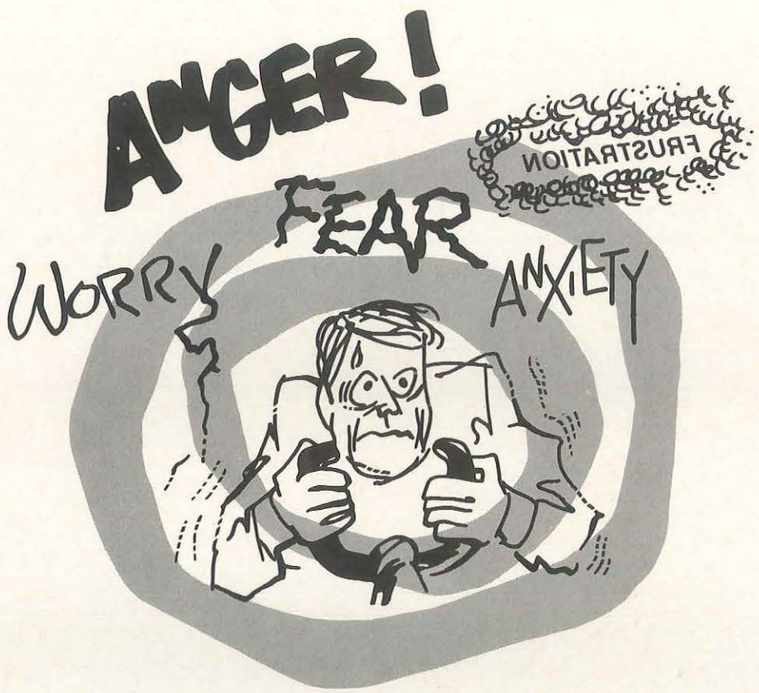
From the findings of the technical investigation it seems probable that the co-pilot did not close the front latch properly after checking the security of the key lock. Clearly it was largely to guard against this possibility that the warning light was fitted and, as the pilots subsequently reported, the light did indeed serve that purpose.

By deciding to ignore the warning light because they believed the 'door unlocked' warning system to be defective, the pilots were depriving themselves of the last safety check they had on the security of the nose locker door.

While the microswitch for the light had a history of giving erroneous indications the practice of ignoring it seems questionable. The Bureau of Air Safety Investigation's files contain many incidents and accidents which can be partly attributed to pilots either de-activating or ignoring warning devices. Stall warning horns and undercarriage warning systems are two which feature regularly in such occurrences: pilots sometimes turn them off because they find them distracting or believe they do not need them. The same rationale applied in this incident.

An intermittently reliable warning device is unquestionably irritating and distracting, but if you choose to ignore it you run the considerable risk, as this incident proved, of doing so when the device is in fact doing the job for which it was designed. The only sure course of action in these circumstances is to write up the unserviceability in the maintenance release to ensure it is rectified. It is significant to note that, while with this aircraft pilots were briefed to accept the illumination of the 'door unlocked' light if they were certain the door had been secured, and write up the faulty microswitch before the next flight, there were no reported defects in the maintenance release. Probably an element of complacency had crept in regarding the light.

A comment on the procedure used to check the security of the nose door is also warranted. The prime devices for keeping the nose door secure in flight are the two latches, not the key lock. Therefore, to open the front latch to check the key lock would seem to serve little purpose. Indeed, it only increases the possibility of leaving the front latch unlocked and, if that happens, the key lock will not necessarily prevent the nose door from 'peeling' when subjected to airflow and eventually separating from the aircraft ●



Human factors

Worldwide statistics indicate that between 70 to 80 per cent of aircraft accidents involve human performance failure as a significant causal factor. The trend towards an increasing proportion of human failures compared with technical failures has been going on for some 15 years and is continuing. Human performance failure can be manifest in a range of activities: pilots, flight engineers, air traffic controllers, aircraft designers and maintenance personnel, for example, constitute some of the groups who at times contribute to an aircraft accident.

Any readers who doubt the high percentage of human factors in Australian aviation accidents are invited to review the past few editions of the *Aviation Safety Digest*. The articles presented, like most of those contained in the *Digest* since its inception, are representative of Australian accidents. It will be noted that the great majority involve some element of human performance failure. These failures cover the full range of human involvement in aviation, such as aircraft design, maintenance procedures, cockpit drills and piloting skills.

This article addresses two air safety occurrences in which the pilot in each case was, to a large extent, the victim of self-imposed stresses.

Because of their insidious nature, self-imposed stresses constitute one of the greatest dangers a pilot can face. Often, pressures build up gradually and in a cumulative fashion, but because they may not be immediately apparent, the pilot may not appreciate the situation in which he has been placing himself until he suddenly finds himself faced with an alarming problem. There is often an irony in that, had he realised the pressures he was gradually imposing on himself, the pilot could have relaxed those pressures and thus avoided his self-generated problems.

VFR flight into IMC . . .

The first occurrence deals with one of the most dangerous situations in General Aviation: that of a pilot trained only for VMC (Visual Meteorological Conditions) flight attempting to fly in IMC (Instrument Meteorological Conditions).

The pilot had planned a trip away with a group of friends. There seems to have been an element of complacency in the flight planning as no allowance was made in the flight plan for the effect of the forecast wind velocity on the aircraft's heading and groundspeed. The forecast wind speed at the planned cruising height of 5000 feet was 15 knots which, given the aircraft's TAS of 140 knots, could have significantly affected navigation.

Following takeoff from a General Aviation aerodrome, the pilot was cleared to climb to 5000 feet. On contacting Departures, he was given a series of radar vectors because of conflicting traffic. This disconcerted him as he felt some pressure from the instructions and also believed — incorrectly — that his flight was proving to be a nuisance to the air traffic controllers. Thus, he had quickly placed himself under pressure. At this stage weather conditions took a hand, for on reaching 5000 feet the pilot found himself in cloud. It seems probable that, flustered by inflight procedures and under the subtle but powerful self-imposed pressure not to disappoint his passengers, the pilot either failed to assess the weather conditions adequately and in time; or he decided he should 'press on' in the hope that he would soon be clear of the cloud.

In the event, matters quickly got out of hand. Flying the radar vectors would have been a simple matter in VMC, but in cloud the unrated pilot simply could not cope. He also found that he had to divert his attention to try to reassure his passengers, who were rapidly becoming alarmed by the fairly obvious inability of the pilot to manage. Overloaded and unable to deal with the situation which he had allowed to develop, the pilot temporarily lost control of the aircraft. While he was making a radio call the aircraft went into an uncontrolled left-hand turn. A complete orbit was made while the pilot tried to sort things out. The orbit was observed by ATC, who immediately contacted the pilot and facilitated his descent back into visual conditions. Even this exercise, however, provided some trauma: untrained in instrument flying techniques, the pilot found the descent difficult to effect because of his uncoordinated control inputs and coarse adjustments of engine power. Indeed, he initially inadvertently put the aircraft into a climb, going above his assigned altitude by a significant margin.

However, unlike many pilots who have placed themselves in this fearful predicament, this pilot, aided by ATC, the thin cloud layer — and a considerable amount of luck — finally broke clear into VMC below the cloud while still in control of his machine.

Hopefully, the account of this pilot's experience will help others to avoid similar potentially disastrous occurrences. The key to this lies in being able to recognise when self-imposed pressures are building up, and acting quickly and calmly to relax and remove those pressures.

Before discussing the second incident, a comment is warranted on the pilot's action of climbing to his assigned altitude of 5000 feet into IMC, without advising ATC. The pilot later stated that he felt he had to comply with his clearance. This is not the case: any pilot who is given a clearance which is operationally unacceptable or inconvenient may request a different clearance; while a pilot faced with an emergency may act without a clearance, but must inform ATC as soon as possible. In this instance the pilot possibly became confused about his responsibilities and prerogatives because of the pressure under which he had placed himself.

Fatigue and stress

A twin-engine commuter aircraft was destroyed when it crashed immediately after a night takeoff. The investigation revealed that the pilot had become distracted during the takeoff roll, and also had not used the artificial horizon positively to establish a precise takeoff attitude. Further, it became clear that a large number of stresses had gradually been building up on this pilot, and while human factors are generally of an intangible nature, there is little doubt that these played a significant part in the eventual loss of control of the aircraft.

The flight was scheduled to transport freight between two busy regional centres. This freight was to be transferred from another of the Company's aircraft which, however, was diverted because of weather. There was some minor confusion while the Company management rearranged schedules, with the inevitable delay and the buildup of the subtle pressure to catch up that delay.

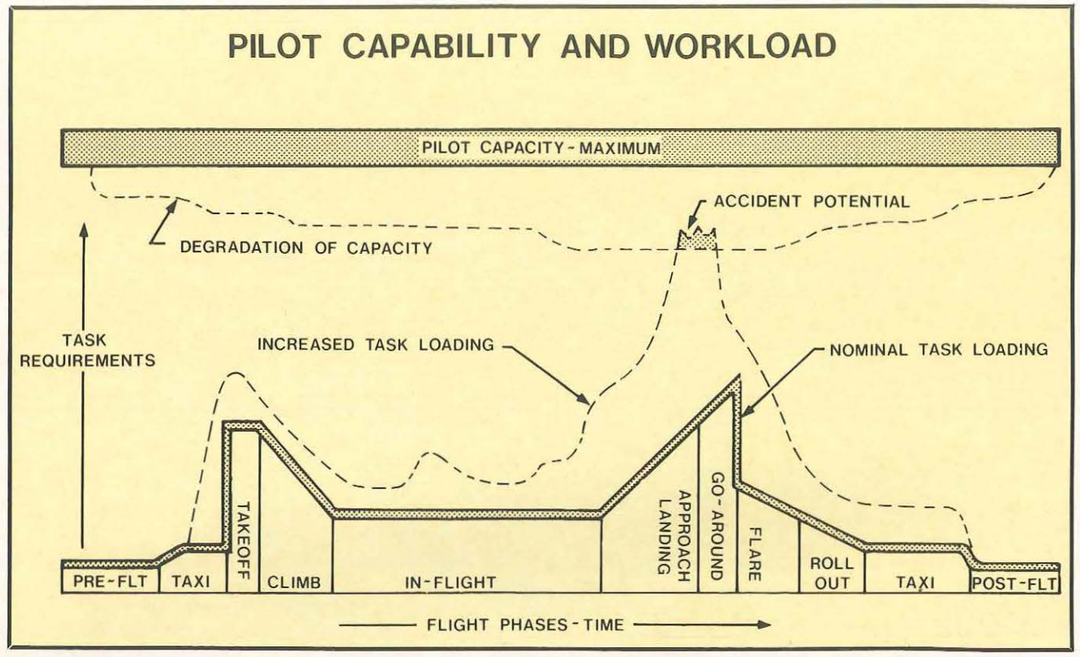
Because of the reorganised schedule, the precalculated load documentation was no longer appropriate. Caught up in the replanning of a number of matters, the pilot forgot to prepare a new load sheet. He did not realise his omission until, during the pre-takeoff checks, he came to the calculation of takeoff speeds (which are weight related).

Lining the aircraft up on the runway, the pilot applied the park brake while he completed his calculations. It seems that subsequently he did not fully release the park brake, which caused the aircraft to accelerate slowly during the takeoff roll. It was the need to check the position of the handbrake, as the aircraft passed through about 85 knots, that distracted the pilot at a critical stage of the takeoff. At the same time as he was checking the handbrake position, he also decided to select continuous water/methanol injection to ensure the takeoff could be made.

Despite the initial slow acceleration, investigation later confirmed that there was no reason why a safe takeoff still could not have been effected. However, with his routine interrupted, the pilot — whose concentration appears to have been adversely affected — failed to follow normal after-takeoff procedures in establishing a positive rate of climb, with the result that he flew the aircraft into the ground about 440 metres from the end of the runway.

Apart from the preflight frustrations to which this pilot had been exposed, it also turned out that he had been the subject of other external stresses for some period. He was resettling his family in a new city and was living in a partly-furnished home. He had also only recently completed the demanding conversion course on to the aircraft type; while at the same time he had been studying for exams to upgrade his pilot licence. Finally, he had already flown on the day of the accident and, while he had been given the correct amount of crew rest, he had only been able to sleep for three hours.

It is not unreasonable to suggest that, from the picture which emerges, a range of pressures and stresses — the insidious 'human factors' — had built up on this pilot, and as his tour of duty progressed their



The information-processing relationships between pilot capability and workload at the various phases of flight. Miller, C.O., 1979. 'Human Factors in Accident Investigation', paper presented at Dutch Airline Pilots Association symposium Safety and Efficiency: the next 50 years. A Symposium on Human Factors in Civil Aviation. *The Hague.*

cumulative effect began to act on him, to the extent that eventually, his performance was seriously derogated.

Comment

The two occurrences reviewed in this article were not due to deliberate misbehaviour by the individuals involved, but rather were the by-product of a series of circumstances — some of which admittedly were self-induced — which put the pilots in a position where the probability of their making an error was high.

If occurrences like these are to be avoided, pilots must develop a keen and responsible appreciation of their capabilities and be able to identify at an early stage the first signs that they are either being exposed, or are submitting themselves, to excessive pressure. They must then not hesitate to take remedial action, even if that means terminating or cancelling flights. A similar awareness, and a readiness to act sooner rather than later, should also be demonstrated by all flying supervisors, ranging from the instructor authorising a student pilot to the operations manager despatching professional aircrew ●

Who is in control ?

The smooth teamwork which is generally characteristic of airline aircrews does not happen by chance. It is a result of comprehensive and disciplined training and the thorough understanding by each individual of his precise responsibilities, and of where those responsibilities start and end. Airline managers appreciate fully that uncertainty over one's role in the cockpit can lead to a dangerous degree of confusion: thus, great emphasis is placed on crew co-operation during training.

Light aircraft pilots, on the other hand, almost always operate as single pilots and rarely receive any formal training in crew co-operation. In most cases it is not necessary. However, when two such pilots do fly together in a light aircraft and start 'helping' each other on an informal basis, then the potential for confusion — and perhaps an accident — is very real.

The accident recounted in this article is a 'classic' case of confusion arising in the cockpit because of uncertainty over who was doing what. The accident itself is reported primarily in the words used by the two pilots as this most graphically highlights the important lesson it contains.

The accident

A Cessna 172RG had been hired by a reasonably experienced private pilot to take away on an extended trip. Before the trip, this pilot decided to take the aircraft for a local flight to check its cruise performance against that quoted by the manufacturer. He was accompanied by a flying instructor who was also going on the extended trip, but only as navigator: the private pilot and another friend were going to share the piloting duties. For this particular aircraft performance check flight, the private pilot was the pilot-in-command. It was not intended as an instructional flight.

The performance phase of the check flight was completed satisfactorily. On the way back to the home base the private pilot, who was relatively unfamiliar with the Cessna, decided to carry out some circuits at a satellite airfield in order to become more familiar with the aircraft. His description of these circuits follows:

On the way back we did four touch and go's. My approaches were high and the aircraft was floating a lot. I was flying the approaches and the instructor was flying the circuits. He was doing low-level circuits and putting me on to final to save time.

During the landings, on the first three, he was retracting the flaps. I did everything else. On the rollout I would apply full power and on each occasion when I started to lean over to retract flaps he would have already taken them up.

At this stage some comment on the private pilot's background is necessary. He had a fair amount of experience in the Beech Baron but, as was mentioned above, very little on the Cessna 172RG. The gear and flap selector locations are reversed in the 172RG compared with the Baron. To return to the pilot's account . . .

On the last touch and go instead of leaning across (to retract the flaps) I selected the lever straight in front of me, i.e. the landing gear lever. As soon as I had done it I realised my mistake and I tried to put the lever down again.

This then was a major causal factor in the accident: the reverse positioning of landing gear and flap levers on the different aircraft types, and the pilot's inexperience on the Cessna, contributed to his action of inadvertently raising the gear lever while his aircraft was on the ground. Obviously, pilots changing between aircraft types *must* be continually aware of such significant differences, and must develop a disciplined system of cockpit drills to guard against erroneous 'conditioned' actions. That is one lesson arising from this accident. Of equal interest is the confusion which arose in the cockpit once the initial mistake had been made. Once again, the lesson is best illustrated by the private pilot's own words — remembering that he was the pilot-in-command.

The propeller started hitting the runway. I think I tried to take off again. At that stage the other pilot may have taken over. We were both aware that the aircraft would not fly. One of us pulled off the power and shut the engine down. I was aware of the aircraft sliding and of the possibility of fire. I immediately turned off the switches and fuel. After the aircraft came to a halt both men exited rapidly.

The significant point in the pilot's description of the accident is his uncertainty over who completed the various actions taken in the attempt to avert the crash, particularly his confusion over who was actually in control of the aircraft.

The instructor in his comments acknowledged that the private pilot, who was occupying the left-hand seat, was the pilot-in-command. However, because the private pilot had in his initial circuits been landing 'too far down the runway', the instructor had of his own initiative been retracting the flaps to assist in the takeoff. Thus, any routine the private pilot might have developed for his touch and go checks was disrupted. Because the final landing was satisfactory, the instructor left all of the touch-and-go actions to the private pilot. When the propeller started to strike the runway the instructor, in his own words, 'immediately took over control' of the aircraft, although not realising initially that the gear had been inadvertently selected up. Whether or not he was hindered in his attempt to retrieve the situation, or he in fact hindered the pilot-in-command, is uncertain. Clearly, the pilot-in-command was not aware that the instructor believed that he (the instructor) had taken control.

Comment

The pilot's inexperience on type and the reverse positioning of the gear and flap levers were major contributory factors in this accident. This pilot was not the first to be caught out when changing from a Beechcraft to another type (or vice versa) in which certain controls are in reversed positions. Pilots in this situation need to take extra care in their operation of systems.

However, perhaps the most useful lesson to come out of this accident for pilots who normally operate single-pilot aircraft — that is, the great majority of Australian licence-holders — is the way in which two fairly

(continued on page 21)

Become a weather-wise pilot

Australian accident investigation statistics continue to reveal 'flight into adverse weather conditions' as a major cause of General Aviation VFR fatal accidents.

Articles in *Aviation Safety Digests* 105, 106, 109, 114 and 117 have in recent years highlighted the dangers faced by those pilots without instrument ratings who try to maintain visual flight in instrument meteorological conditions. On the credit side of the ledger, over the same period there have been many instances of pilots either cancelling trips or making timely inflight diversions because they assessed that weather conditions were, or had become, unsuitable.

The weather-wise pilot

The basis of safe flying operations is preflight planning, and here, the assessment of the weather forecast is one of the most important aspects.

By assessing a forecast thoroughly on the ground, possible courses of action can be considered before takeoff should that forecast indicate that conditions may be marginal for VFR flight. Too often, however, it seems that some pilots either do not know what their forecast means in terms of expected weather conditions or allow external pressures, such as the 'get-home-itis' or 'it-can't-happen-to-me' syndromes, to influence sound judgement. The evidence of this can be seen in the disastrous experiences of those Australian pilots who have had accidents while attempting VFR flight in conditions which clearly did not meet VFR criteria. In other words, it *can* happen to you . . . so read on!

Reduced to the basics, assessing the weather involves two main components. The first is that of being able to understand *all* of the data, terminology, symbology, abbreviations etc. which are used in meteorological forecasts. Additionally, all of the forecast relevant to a flight must be considered so that a comprehensive understanding of prevailing conditions is achieved: a forecast is not something from which selected items can be read in isolation. Once an assessment of the forecast has been made, it must then be related to the circumstances of the planned flight — terrain, aircraft performance, en route facilities, etc. The point here is that it is not enough simply to collect a forecast and look at it: pilots must be able to translate the data it presents into an informed appreciation of its likely effect on their flight.

Pilots who feel that they are not assimilating fully the valuable information contained in flight forecasts are advised to refer to the sections on meteorology in either the VFG or AIP, and to approved texts, particularly the Manual of Meteorology.

The second component of becoming a 'weather-wise' pilot is that of being able to recognise inflight weather signposts and their warnings. Listed below are some of the most common weather phenomena together with their possible associated effects. No pilot can consider himself a safe and competent operator unless he can read, and appreciate the possible consequences of, these signs:

- **a gradual lowering and thickening of the ceiling:** inadequate terrain clearance, possible widespread precipitation, fog
- **a line of heavy, dark clouds:** severe turbulence, dust and poor visibility, hazardous landing conditions, precipitation, hail
- **roll-type clouds:** dangerous turbulence, dust and poor visibility, subsequent precipitation, hazardous landing conditions
- **ragged cloud base:** turbulence, variations in visibility, possible precipitation
- **bulbous cloud base:** turbulence, possible precipitation
- **an opening in a wall of dark clouds:** this is sometimes referred to as a 'sucker hole', as dangerous turbulence, precipitation and poor visibility may be encountered as the hole is entered
- **temperature near freezing:** poor visibility in precipitation, with icing possible on the windscreen and airframe
- **low layer of haze:** possible fog or stratus cloud in the early morning or late evening; and poor visibility, especially when looking into the sun
- **blowing dust:** turbulence; and poor visibility, particularly when looking into the sun

* * *

In addition to the hazards listed above, there are other common dangers in Australia which may not always be so clearly 'signposted', but which also can pose a serious threat to aircraft:

- **Mountain effects.** These are associated with strong winds *across* the crest of a range. Lenticular-type cloud above the mountain and turbulent (broken) cloud on the leeward side of the mountain *may* be present. These phenomena indicate the wind structure known as 'standing waves' which will generate areas of turbulence and vertical motion downwards at various intervals downstream from the range, especially on leeward slopes.
- **Low atmospheric pressure.** Pilots should also be aware of the occurrence of relatively low atmospheric surface pressure downstream from a mountain range. A pressure altimeter not correctly adjusted will tend to over-read in such areas.
- **Low-level wind shear.** This is often experienced in the early morning during winter over inland Australia after a calm clear night which is accompanied by a surface temperature inversion. In some instances low-level 'jetstreams' may be present, in which case the wind strength may change from calm on the runway during takeoff to 50 knots or more at an altitude of only 2000 to 3000 feet AGL.
- **Thunderstorm effects.** It is well known that violent conditions will be encountered inside thunderstorms. However, there are associated phenomena which can occur outside the buildup, such as severe turbulence *beneath* the cloud; while the strong surge of cold air which comes down from the base in the mature stage of the storm and extends outwards from the cell over the surface can cause wind shifts many kilometres from the thunderstorm.

The above photograph depicts a unique example of a roll cloud over Spencer Gulf, South Australia. The picture was taken at 1.15 pm, 27 November 1977 by the co-pilot of an Airlines of South Australia aircraft while on approach to land. He estimated the length of the cloud to be 5 kilometres. The camera was pointing west and a further faint roll is just visible to the west of the main one.

The ship near the centre of the picture was the Danny F, which was 230 metres long. This puts the thickness of the roll and the height of its base around that figure.

A north-easterly airstream had resulted in humid sultry conditions over most of South Australia, with isolated thunderstorms a day or so before the event. An interaction of this air mass with a cooler south-easterly anti-cyclonic flow towards the South Australian coast undoubtedly contributed to the formation of this well-defined roll.

* * *

As a final thought, the weather-wise pilot is also aware that, when inflight weather conditions do deteriorate below VFR minima, the 180-degree turn is one of aviation's best safety devices — as long as it is made *before* the aircraft is enveloped by bad weather. Pushing on into worsening conditions is a recipe for disaster ●

Who is in control? *(continued from page 19)*

experienced pilots allowed an element of vagueness to creep into their operations such that, eventually, uncertainty existed over who was in control of the aircraft. The key factor in this was the 'informal' assistance given by the instructor when he positioned the aircraft on finals for the pilot-in-command and then retracted the flaps during the touch and go's.

There is nothing wrong, of course, with a qualified pilot pointing out to a pilot-in-command items that he believes need attention, but this is a different matter from actually completing vital actions, such as flap retraction, unannounced.

Preferably the pilot-in-command should operate a single-pilot aircraft as its manufacturer intended: by himself. In this instance the pilot-in-command would have been better off flying the whole circuit himself and going around from unsatisfactory approaches rather than landing long and finding himself rushed; or, if he felt he needed guidance on his circuits, he should have concluded the sortie and organised a formal instructional ride for himself. As it was, both pilots allowed the line of responsibility to become blurred to the extent that when an emergency occurred, the uncertainty over who was in control placed their aircraft and themselves at risk ●

In brief . . . local and overseas

During a night flight, the nav/com equipment in a Boeing 727 failed at 25 000 feet. The crew traced the problem to a passenger using an electronic poker game. Apparently the device caused a loud buzzing, interfering with the onboard navigational aids.

* * *

During the takeoff run, the right front passenger door of a Cessna 310 became unlatched. The pilot attempted to reach across the passenger to secure the door but was unsuccessful and decided to abort the takeoff. The aircraft skidded off the end of the runway and down an embankment.

* * *

The pilot of a Piper PA-28R relaxed too soon after apparently coping with a total electrical failure. Following the failure, he had attempted to lower the landing gear using the emergency method. He was uncertain as to whether all three wheels had fully extended because the trim changes during the lowering were not as expected, and, because of the electrical failure, there were no visual indications that the gear was down and locked. His radio, of course, was also inoperative. After overcoming some difficult air traffic control problems, the pilot attempted a landing and, in his words: 'A great sense of relief came over me when the aircraft touched down smoothly on the main wheels.' Unfortunately, inadequate lubrication had prevented the nose gear from lowering. Returning again to the pilot: 'I just was not prepared for the nose to drop as I thought everything was okay after touchdown.' The aircraft veered off the runway and was substantially damaged.

* * *

On takeoff from an oil rig, a Bell-206 pitched nose down to the left and struck the water. Initial investigation indicated that the refuelling hose had hooked on the left skid.

* * *

A student helicopter pilot's foot slipped off the rudder pedal while the helicopter was in the hover. The helicopter began to turn and a skid hit the ground: the aircraft then rolled over onto its side. The pilot later stated that he thought his foot slipped off the pedal because the soles of his shoes were wet.

* * *

One engine of a Piper PA-31 lost power after takeoff and the pilot made a forced landing on a city street. The aircraft, with its gear up, slid for almost a block and a half, hitting two cars and then burning. The investigation disclosed that the aircraft had been refuelled with AVTUR prior to the flight ●

Fuel metering systems for reciprocating engines

Do you fly a piston-engine aircraft? If so, what type of fuel metering system does it have?

Is it a float-type carburettor, an injection-type carburettor, or perhaps direct fuel injection?

So what, you may say. What good is it to you to know what type of system it has?

That some pilots unfortunately do not adequately understand the basics of the power plants they operate is apparent in the number of aircraft accidents or incidents associated with faulty engine handling. Engine handling is a fundamental aspect of piloting powered aircraft and correct engine handling is essential for safe operations. Implicit in the often-used term 'good engine handling' is the assumption that a pilot has a sound knowledge of the components and mechanical operation of aircraft engines.

An understanding of the fuel metering system of your aircraft's engine/s is an important part of engine handling, for the characteristics of the system play a large part in determining the way in which an engine will perform in varying circumstances.

To assist pilots in understanding the characteristics of fuel metering systems, tables comparing the characteristics of the three types of systems appear opposite.

One of the most persistent engine mishandling occurrences in Australian general aviation is that associated with carburettor icing. From the tables it is obvious that the system most susceptible to carburettor icing is the float-type carburettor. However, pilots flying aircraft with fuel-injected engines would be wrong to assume that they are not susceptible to engine icing hazards.

Articles in past *Aviation Safety Digests,* in particular the lift-out chart in No. 108/1979, detail the conditions under which carburettor icing may occur. All pilots who operate reciprocating engines must know those conditions.

Too often reports quote 'lack of familiarity with aircraft' as a factor in accidents and incidents. Get to know your aircraft better by referring to the various handbooks available and discussing its characteristics with your flying instructor or a LAME ●

1. FLOAT-TYPE CARBURETTORS

Advantages	*Disadvantages*
Simplicity of design.	Severe icing hazards.
Ease of overhaul.	Poor fuel atomisation.
Cheapness of replacement parts.	Unequal fuel distribution and sensitivity to fuel volatility (where supercharging is not employed). Note: This is mainly due to the type of induction system used with this type of carburettor.
	Sensitivity to aircraft attitude.
	Sensitivity to air density (necessity for monitoring manual mixture controls with changes in air densities and temperatures).

2. INJECTION-TYPE CARBURETTORS

Advantages	*Disadvantages*
Automatic fuel regulation (pre-selected mixture ratios can be maintained under all operating conditions).	Complexity of design.
Reduced throttle icing (fuel is sprayed downstream of the throttle valve; thus, reduced temperatures due to fuel evaporation are not imposed on the throttle valve).	Large number of working parts.
Not affected by aircraft attitude.	Costly overhaul.
Good fuel atomisation.	Icing hazards, although slightly reduced, are still present (particularly in unsupercharged engines).
	Unequal fuel distribution and sensitivity to fuel volatility (where supercharging is not employed). Note: As in the case of float-type carburettors, this is mainly due to the type of induction system used with this type of carburettor.

3. DIRECT FUEL INJECTION

Advantages	*Disadvantages*
More even fuel distribution, and less sensitive to fuel volatility.	Complexity of design and manufacture (large number of working parts, close tolerances in pump, complex nozzle design).
Reduced fire risk (only a small volume of the induction system contains explosive mixture).	Nozzles generally sensitive to fuel cleanliness.
Reduced icing hazards. Note: throttle icing and impact ice are still possible.	In some systems manual mixture control monitoring is necessary for changes in air densities and pressures.
Not affected by aircraft attitude.	
Increased mass air flow (has a cleaner induction system — space normally occupied by fuel vapour is available for air).	