# 'DO THE RIGHT THING'

# Aviation Safety Digest

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## LANDING

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# Contents



# Editorial

IT'S SPRING at last. The birds are singing and it's time for us to get back into the air after the winter lay-off.

Most of us have just been through our leanest period of aviating for the year and we may be more than a little rusty. Our familiarity with the aircraft and its systems, with procedures and checks is at its lowest ebb. Our handling techniques — the visual judgments and control inputs — are less automatic and may need greater conscious effort.

It may be a wise precaution to have a dual ride with the CFI before we let ourselves loose on the world. Some study would be good value and so would some 'air conditioning'.

In the southern States, Spring weather can be changeable, with frontal passages and gusty winds. The weather can turn fairly quickly from sunny to heavy downpours. Thermal activity is increasing and there can be significant mechanical turbulence. Spring can ge a time of crosswinds, windshear and perhaps wet runways.

As we trundle the faithful craft out of the hangar, it is worth reflecting on these conditions and our limitations and making sure we are as prepared as the aircraft for the coming flights.

A major portion of this issue is devoted to the subject of the approach and landing. Landing an aircraft safely, consistently and well is the greatest challenge that we have to face. That is not to say that all landings are poor.

The vast majority of the thousands of landings carried out each year are safe and those that result in an accident or incident usually do not result in death or injury. Nevertheless, there are a significant number of landing accidents and incidents (more than during all other phases of flight combined) and most of them are caused by you and me (the pilots of the aircraft) and most of them are avoidable — if we pay attention to three aspects:

- **decisions,**
- **application,**
- **technique.**

Some of you may have seen the new video, The Gentle Touch, produced by the Department. It has been circulated to all flying training organisations in Australia free of charge and may be shown and copied without restriction. I urge you to see it and please let me know what you think of it. It is designed to promote discussion — as are the articles in this issue. Please talk about them with your colleagues and only experiment when you have an instructor with you and when you have previously briefed what you are going to try.

*David Robson*

DAVID ROBSON
Editor

## Covers

*Front. When the going gets tough . . . the tough get going. A major element in landing accidents is a late decision to go around. He who floats and flies away, lives to float another day?*
Photograph by Brenton Hollitt
Pentax SP 1000 — Kodacolor

*Back. In every walk of life, we have to fit in, to accommodate each other — there must be some give-and-take and there is usually some unwritten code of behaviour. Aviation is no different. 'Do the right thing' unto others and they will 'do the right thing' unto you. ['Do the right thing' unto the aeroplane also.]*
My thanks to the N.S.W. State Pollution Control Commission for permission to use material from their highly successful campaign.

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# Spring is in the air

Garry Leach is a former GA pilot who also had some gliding and hang-gliding experience before becoming an ultralight aircraft pilot. He has logged about 350 flying hours.

His main flying interests include cross-country trips and trying to catch thermals. One cross-country trip included crossing Bass Strait both ways by ultralight.

Garry has been the AUF Vice-President for two years and is an active member of the AUF committee for proposed airworthiness standards. He would like to see the development of ultralight competitions.

I CAN ONLY touch briefly on the topics in this short article. If you wish to have a better understanding of this area, then you should read some of the relevant books. One book on these subjects, which I have found to be comprehensive and reasonably easy to follow, is 'Micro-meteorology' by Dennis Pagen.

It is likely that you have not been flying in the past three or four months, due to wintry weather. It is quite possible that your last flight was in the ideal conditions of an Autumn high-pressure system. This article is intended to remind you that spring weather is usually quite different from autumn weather in southern Australia.

Plants like to grow in spring because they get plenty of what they need for growing — rain and sun. So spring is characterised by rapidly alternating periods of sun and rain (often both in the same day) and fast-moving pressure systems and fronts.

A certain amount of turbulence could mean a slight bump in an airliner. However, the same amount could have a quite severe effect on an ultralight, due to its very low size, mass and wing-loading. The effect on GA aircraft also varies with wing-loading and would be somewhere between the above two extremes. The danger is not so much the likelihood of structural damage from the thrashing of the air, but rather the loss of control authority. Loss of control at altitude could be recoverable or it could lead to manoeuvres outside the aircraft's envelope. Unfortunately, there have been a number of reported accidents, particularly overseas, from structural damage due to loss of control.

Structural damage should not occur if the aircraft is flown below its turbulence penetration speed. If this speed is not provided by the manufacturer, it can be calculated as the stall speed multiplied by the square root of the aircraft's design load. Since the limit load for ultralight aircraft is supposed to be + 4 g and − 2 g, then the manoeuvring speed should be stall speed times two for normal flight and less for downward gusts. If properly designed, constructed and maintained, your structure should not fail if you keep within these speeds, because the wing stalls before becoming overloaded. (It is essential that the accuracy of your ASI be known when you operate close to your aircraft's limits.) However, the factor for negative loads is quite low and this is where some aircraft have failed — there have been two Australian examples in the past 15 months. The other aspect, though, is what degree of control you have after the aircraft has stalled due to excessive 'g' loading.

Flying in turbulence is an acquired taste, like eating blue vein cheese. Because of this, some pilots never fly in turbulence. The ability to operate in turbulence depends on the severity of the turbulence, the skill of the pilot and the behaviour of the aircraft (reaction to turbulence and controllability), more or less in that order (for lightly loaded ultralight aircraft). Pilot skills need to be developed gradually, by starting with mild turbulence and slowly progressing to more severe conditions.

There are four main types of turbulence — mechanical, shear, thermal and wingtip vortices. In our allowed airspace (below 500 feet agl), we can expect to find all of these types of turbulence, at various times.

Wingtip vortices are more likely to be found near airfields, particularly joint-use GA/UL fields. The vortex from an aircraft of equal wing-loading is quite noticeable; from a heavier aircraft, it can be uncontrollable. Even a Cessna 150 produces vortices which may severely affect ultralight aircraft. Since wingtip vortices flow rearward and downward from an aircraft, avoid flying below and behind another aircraft. Take off shorter than a preceding aircraft and land further down the runway than a preceding aircraft. Better still, wait for a couple of minutes — and stay well clear of helicopters.

Shear turbulence often occurs at the meeting of cold and warm air masses. Air masses with different temperatures tend to move with different velocities, due to their different origins or response to a pressure system. A cold or warm front, a sea breeze or simply an inversion will often present shear turbulence. Shear turbulence can occur at the top of a 'pool' of cooler air that fills a valley in the morning or evening, when the ambient wind blows over the top of the valley from the plains or hills surrounding the valley. The shear may be either at a horizontal or vertical surface.

Mechanical turbulence results from the wind encountering an object such as a building, tree or hill. The resulting disturbance to the airflow is felt as turbulence. The amount of turbulence depends on the velocity of the wind and the size of the object. If there are many objects, then the airflow is disturbed in a much more complex way and results in even more turbulence. If you were to fly close to an object of the size of a VW micro-bus in a 15-knot wind, you would expect to find the turbulence quite noticeable, and it may extend for a considerable distance downwind, depending on many meteorological factors.

The airflow on the lee side of a hill or ridge will most likely include a downdraft, which can be quite strong in a moderate wind as well as being quite turbulent, and may even include occasional reversals of the surface wind direction.

Large objects, such as a row of tall trees or buildings can cause a wind 'shadow' as well as mechanical turbulence. The wind shadow forms a wedge with its triangular profile sloping from the top of the obstruction out to the ground. Within this wedge, the wind speed can be virtually zero. However, the turbulence is more hazardous than the calm air is beneficial, so such obstructions should be treated with respect.

A wind gradient means that there is a graded change, which is often sharp and pronounced (almost always an increase) in the wind velocity with height. The basic reason for this situation is friction of the air with the earth's surface. A wind gradient is usually more severe during stable conditions. Unstable conditions (usually caused by thermal activity) result in vertical air movement which mixes the air and evens-out the velocity at heights close to the ground. The main times in which wind gradients can affect us are during a descent or turn within 100 feet of the ground (although it can be a problem even higher).

Turns in a wind gradient may also cause difficulty because the wingtips are in air moving at different speeds, so aileron response will be different — and in an ultralight the wind velocity represents a significant proportion of cruise airspeed. If you are turning downwind the lower wing will have more airspeed (hence more lift) so bank tends to decrease (or more control is needed): if you are turning into wind the situation is the opposite and bank tends to increase — if the lower wing stalls you are in serious trouble, so either don't turn low down in strong winds, or else fly faster near the ground.

Thermals are rising parcels of air which are warmer than the surrounding air. Typically, the air has been warmed by contact with a patch of ground which, due to its nature or colour (ploughed field, burnt grass, asphalt, rocks, water), has been absorbing heat from the sun at a faster rate than nearby areas.

The airflows in a thermal are not usually even, since some parts are warmer than others and some other parts are cooled by mixing with non-rising air. In addition, there is often strong sinking air nearby, in part moving to replace the rising air of the thermal. This 'mixture' of fast-rising, slow-rising and sinking air can push an ultralight aircraft in all directions.

A parcel of air which is still sitting on the ground, becoming warmer by the minute, can be disturbed by a passing vehicle or low-flying aircraft or, eventually, by its own buoyancy. The release of the thermal usually triggers an inflow of air, from all directions, to take its place. This can create a temporary tailwind. It could also create a whirlwind, which could cause control difficulties, and may be less noticeable in spring than the typical 'dust-devil' of summer.

Another weather-related factor which can cause difficulties close to the ground is a microburst. A microburst is triggered by an increase in moisture (such as rain falling), which cools the air and causes it to sink, sometimes at speeds of thousands of feet per minute. The sinking air can cause under-shooting, a heavy landing or worse. As the downdraft approaches the ground, it spreads outwards in all directions, often raising dust and producing increasing headwinds, crosswinds or tailwinds, so an expanding ring of dust is to be avoided. The difference in speeds of the wind at either side of a microburst (i.e. the headwind on one side and the tailwind on the other side) can be in excess of 50 knots. Fortunately, microbursts do not last for long (five to 15 minutes) and are quite localised (one to three km diameter). One indication of the possibility of a microburst is 'virga', the mid-level rain which stops before hitting the ground — it appears as a veil hanging below the cloud.

If thunderstorms or heavy showers are in the area, they may affect the surface wind for a distance of tens of kilometres, and ultralights (and GA pilots) should be alert for sudden changes, or should avoid flying in these conditions altogether.

Flying in rain is not recommended, due to the marked reduction in visibility and the changed flying characteristics of wet wings. In particular the stall speed is increased significantly and the stall characteristics may be very different. Also, the raindrops play havoc with wooden propellers.

If you are taking off through a wind-gradient your airspeed and rate of climb will increase quickly as you climb through it. The reverse happens on descending into the slower moving air on landing, causing a loss of airspeed and an apparent undershoot. If you do not carry enough excess speed to overcome this, the loss of airspeed may even cause a stall, despite a low nose attitude. This is why, in an ultralight, you add an additional ⅓ of the wind speed to the normal nil-wind approach speed of 1½ times the stalling speed. As you descend through the wind gradient you will need to lower the nose to maintain speed, and possibly add power to slow your descent rate and help you accelerate. Because your ground speed is higher now, the landing roll will probably be longer than you expected.

In light winds a temporary tailwind will also produce problems on approach and landing. The ground speed will be high, giving a false impression that the airspeed also is high, and the approach path will be flatter than usual. As well as increasing the ground run there is a risk of overshooting your intended touchdown point, and a loss of directional control as you run out of airspeed while still rolling. It may be safer to go around rather than persevere with a landing which is going wrong in these circumstances. Remember the wind may be different where you are landing from that at the windsock, 200 metres away.

What I have described here is not something that only happens to the other guy. I have either experienced these phenomena or have been flying with other pilots when they experienced them. Remember to keep your upper limit of turbulence well below your level of controllability and you will enjoy flying for many springs to come □

# Afterthoughts?

*A habit that I acquired from an old hand has that touch of aeronautical wisdom that may have been lost in recent times. The Airlines do it and so do the Armed Services but their good habits and practices aren't always filtering through to we pilots of wee aeroplanes.*

THE BENEFITS of a thorough pre-flight are obvious, although I am embarrassed to say that some pilots are only cursory examiners and some pilots have been known to skip a pre-flight altogether. But enough of that hobby horse.

The tip I have to pass on is the value of a *post*-flight inspection. The commercial operators use trained ground staff to inspect the aircraft after each flight. We have to do our own.

The benefits are fairly clear-cut:

- you can detect an unserviceability earlier and get it fixed before your planned departure or the next scheduled sortie, (I'm sure that's why the Airlines do it — they have tight schedules. The Services of course need to know that the aircraft is ready to go at any time.)
- you can warn the next pilot that something is amiss,
- you can pick a trend towards a possible failure, earlier.

## What to look for

If you do your pre-flight with a rag in your hand and clean any smears, drips or pools of oil, grease, hydraulic fluid or fuel, then the important part of the post-flight inspection is to look for leaks. Any fresh smears or runs are immediately evident, as is any damage from stones, gravel, hail or whatever.

The combination of a pre-flight and post-flight inspection immediately shows any deterioration. Seeing both the 'before' and the 'after' gives an immediate comparison or trend, like the ads on TV. Any suspect leaks can be confirmed or watched. Any nicks in the prop can be relieved before the next flight and without the urgency of a late-discovered discrepancy in the pre-flight.

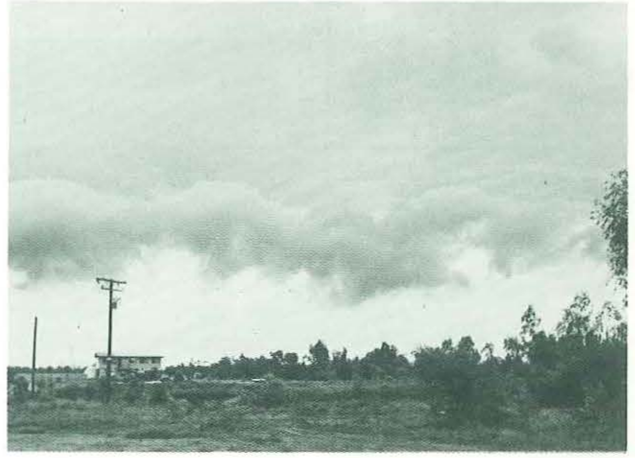
## Method

My post-flight checklist is simple. I double check that the ignition and the Master switches are off and I do a slow walk around concentrating on the underside of the aircraft and looking for leaks, smears, drips, stone damage, chips to the prop, tyre scuffs and loose 'bits'.

Then I lock the controls and tie the aircraft down.

As an afterthought, it has saved me much stress and avoided many delays. It has repaid the time it takes, many times over □





# The power of nature

*Someone once told me that there was more energy in a large thunderstorm than there was in a nuclear explosion. Now I believe her.*

THE PILOT was conducting a charter flight, carrying freight from Brisbane to Emerald. The flight was conducted with numerous thunderstorms around. Although the planned cruise altitude was 4500 ft, the pilot had climbed to 8500 ft approaching Emerald in order to remain clear of cloud and maintain visual contact with the storm cells. During the flight, he observed that Thangool and Rockhampton had storms in the area and that Blackwater was clear, although there were storms around. There were also storms in the Emerald area.

He conducted a DME arrival into Emerald until forced to abandon the approach at 10 DME. The extent of the line of storms running north/south through that area was such that he could not divert to Clermont or make any other attempts to position himself on their western side. The pilot initiated a climb to 8500 ft and diverted to Blackwater at 0310 hours local time. A short time later, Brisbane Flight Service asked the pilot if he had arranged for lights at Blackwater, which he affirmed.

After climbing to 8500 ft, the pilot reported that he could see the lights of the mines to the south of Blackwater. He tracked to that area, and subsequently to Blackwater town, where he set himself up in a racetrack pattern at 2400 ft AMSL between 35 and 40 DME from Emerald on the Blackwater-Emerald track. There were storms to the north and west of the area. After some time without success at arranging the lights, the pilot asked Flight Service to ring his company at Emerald and ask them to arrange for lights to be displayed. The pilot reported that he also changed the engine speed over the town in order to stir someone into deploying the lights.

During his second racetrack pattern when approaching 35 DME, the pilot entered cloud for the first time. Shortly after entering the cloud, severe turbulence was encountered, his headset was thrown off and his hand accidentally knocked the gear down.

*The pilot reported that he made no further control inputs and found himself about ten seconds later able to vacate the aircraft which was now on the ground.*

When he determined that the aircraft would not burn he returned to it in order to activate the ELB. All the lights and radios came on when the master switch was turned on and he was able to check that the ELB was operating. Shortly after this he noticed vehicles moving past not too far away, so he turned everything off and went to the road to flag down a car. The driver was a woman going to the airport to deploy the lights for him. He asked for the nearest phone so he could notify his company.

Evidence indicates that an aircraft had flown around the South Blackwater mine area at about 0320 at about 400 ft agl. Around 0330, an aircraft flew low over the town on a number of occasions and some witnesses reported that the engines were varying in speed. Light rain was falling over most of the area. Some areas had wind gusts and heavy rain. No witnesses saw the aircraft near the airport, but it appears that there may have been a storm cell in the vicinity of the airport at the time. No significant wind or rain was observed at the airport for a considerable time after the accident.

The aircraft struck the low scrub heading SSE with 40 degrees of bank to the right and a shallow descent angle, about 250 metres to the east of the runway. After the right wingtip contacted the ground, the aircraft rotated clockwise so that its nose was scraping the soft ground and the tail was in the air. The fuselage was moving sideways as it contacted the ground. The main gear legs were broken off and the aircraft slid to a halt while moving backwards. The aircraft travelled 150 metres from the first ground strike to rest □

# Arrival — the best part of the journey?

THE LANDING phase can be a problem area for many pilots. Statistics show that a significant percentage of accidents occur during the approach and landing and that a major proportion of these are avoidable — that is to say they are our fault, the pilot's fault — faults in decision-making, in judgment, in procedures, in checks or in control of the aircraft.

Let's keep it in perspective, though. There are thousands of landings each year and the vast majority of these are safely completed. Having said that, we still should try to reduce the accidents that do occur — particularly as they appear to be easily avoided.

To ensure that the thrust of the Department's safety promotion activities was in the right direction, the Bureau of Air Safety Investigation was asked to examine the overall accident statistics for a ten-year period. This study confirmed that the landing phase was a significant problem area. The Bureau then looked more closely at a one-year period to see if this could pin down the cause of landing difficulties.

This study gave us a close-up view of the problems and the contributory factors but still did not answer the real question — *why* did the accident occur? What really *caused* the accident? Why was the approach speed excessive? Why did the pilot, who was presumably taught correctly, mishandle the bounced landing? Why didn't he go around? Why did he misjudge the flare? Why didn't he anticipate the windshear? Why did he press on when a safe landing was doubtful?

Why? Why? Why? Why? Why? Why? Why?

Let's look at a few typical landing accidents:

**1.** The aircraft flew from Port Macquarie to Aeropelican near Newcastle. The pilot joined the circuit and examined the windsocks. His estimate was that the wind was from the south-east at 8-10 knots and so he made a standard right-hand circuit for runway 07.




Normal checks were carried out on downwind and he turned Base and Final normally. He had decided to use an approach speed of 70-75 knots instead of his usual 65 knots due to the AUW of the aircraft and the crosswind conditions and possible turbulence.

The aircraft was seen to fly through the centreline and S-turned to regain the correct approach path. It first touched down about half way into the field and then bounced several times.

The pilot thought he could still land successfully but then realised that the end of the runway was getting quite close. He decided to go around and applied full power.

The pilot said that he deliberately left full flap selected to avoid any sink.

The aircraft just became airborne some 150 metres before the boundary fence and seemed to hang in the air. The stall warning was blaring. The pilot turned the aircraft slightly left to avoid some heavy steel cables that he knew were at the end of the runway. The aircraft struck the boundary fence and skidded to a halt. The pilot and passenger escaped unhurt.

**2.** The student pilot had been conducting practice forced landings in the local training area.

During the overshoot from one of these approaches, he noticed that the flap on his Cessna 152 would not retract beyond the two-stages-down position.

He advised the flying club of the problem, discussed it with his instructor and returned for a landing.

The pilot later explained his concern or preoccupation with the flaps and that he wanted to land as soon as possible and to avoid a go-around with the flaps stuck in this position.

He flew, what was in his own words, too tight a circuit and had to S-turn on final to regain the centreline. This was partly due to the distraction caused by an aircraft taxiing for takeoff.

The surface wind was 330°/10 kt — a 5-6 knot crosswind. His approach speed was 70-75 knots.

The approach appeared to be a little steep but the flare looked normal.

The aircraft bounced on touchdown but with his mental attitude, the pilot was determined to keep the aircraft on the ground and so he persevered with the landing.

From outside it appeared that the aircraft was pushed onto the runway (back pressure released). The nosewheel struck the ground, bounced, struck the ground again and collapsed. The aircraft left the runway at about 30-40 knots and overturned.

From the cockpit the bounce didn't seem all that bad. It was when all the wheels were on the ground and the pilot couldn't control the aircraft that he became concerned.

He had not previously made a go-around from after touch-down. The initial touch-down wasn't dramatic and he thought it had only bounced a foot or two. He could feel that the aircraft was rocking fore and aft. Everything happened so quickly.

**3.** The Grumman Tiger appeared to make a normal approach for runway 23 at Birdsville except to some it appeared hot or high. Initial touchdown was well into the strip, about half-way along.

Surface wind was 300°/10 kt — all crosswind.

The aircraft touched down in a fairly level attitude and bounced. The next touchdown appeared level if not slightly nose low and the aircraft bounced again. At this point an observer called out in the Australian idiom that something was amiss.

The aircraft impacted the runway in a markedly nose low attitude and skidded to a halt resting on its mainwheels and nose.

There was no fire nor injury.

**4.** The pilot of the Cessna 182 overflew the 610 metre long ALA and checked the windsock. He assessed a crosswind of 10 knots.

As he turned Base he experienced moderate turbulence and decided to make his approach at 80 knots with 20 degrees of flap selected. He crossed the threshold and closed the throttle.

The aircraft floated until finally touching down half way along the strip at 68-70 knots. The pilot started braking heavily but the aircraft didn't seem to be decelerating significantly. The aircraft veered off the strip, bounced through three drains and crossed a road.

To try to understand the steps or pitfalls associated with landing an aircraft safely, I tried to break down the approach and landing into its functional elements. I concluded that there were three primary elements involved:

- **Decisions** — what decisions, whether and when.
- **Application** — a combination of procedures, checks and standards.
- **Technique** — the visual references used, the control inputs made and escape manoeuvres.

## Decision

The essential first step in any phase of flight is the decision. At this point an accident can be caused or avoided.

Some pilots didn't actually make a conscious decision but appeared to press on until something forced them to change their plans. This often occurred too late for a safe alternative to be chosen.

Many pilots deferred the decision until the probability of a safe alternative course of action was seriously reduced.

Some pilots made a decision that was less than optimum or not the safest or wisest option. The decision-making process may seem to be second nature but it is worth considering what is involved.

Many of us pride ourselves on being able to make a positive decision — a quick decision on the spur of the moment — an 'operational' decision. We are captains of our aircraft and we therefore make all the necessary decisions — we don't shirk our responsibility. We make a decision and get on with it.

But it isn't always necessary to make such an urgent decision. There is usually time to consider all the factors and options carefully and to make a reasoned judgment — and then to test the wisdom of that decision. If there doesn't appear to be sufficient time we can usually *make* time — by anticipating the need for a decision, or by going around for another approach.

Certainly there are occasions when a decision has to be made then and there and we do the best we can. It is better to make a decision than to defer until it is made for us, but better still, we should use the time available to make a quality decision — a wise decision.

The first step in the decision-making process is to gather information — to collect data that is relevant to the decision. In the case of the approach and landing, it includes information relating to either the risk or the probability of success of the landing — such as the runways available, the condition of the surface, the direction in relation to the wind, the surface wind, the slope, the temperature, the approaches, the overruns, the retention of a safe escape route and the lighting conditions.

It is obviously important to ensure that we have gathered *all* the relevant data or otherwise the decision may be invalidated — perhaps seriously.

The next step is to compare the data against some form of yardstick. In the case of the landing there are two 'machines' which have to be able to successfully cope with the conditions — one is the aircraft and the other is the pilot — and that means that particular aircraft and that particular pilot in that particular state and at that time — FOR BETTER OR WORSE.

So there are two yardsticks:

- The capabilities of the aircraft.
- The capabilities of the pilot.

It is important to realise that we are talking about *that* aircraft's capabilities at *that* weight and in *that* condition — and we are talking about *that* pilot's capabilities at *that* time, in *that* aircraft, with *that* degree of training, currency, experience, familiarity, confidence, fatigue and well-being.

The first decision is fairly clear-cut. We can compare the conditions that exist with the published and tested capability of the aircraft such as runway length required, crosswind limits, weight limits and threshold speeds — all black-and-white, documented criteria. Only in dire circumstances would a pilot deliberately take the aircraft beyond those limits.

The first decision then is an easy one — if we are honest about it and if we know the limits and capabilities of our aircraft.

The second decision is the hard one. We have to admit to ourselves that we may not be as current in crosswind conditions as we should be, that we are a little tired and hungry, that we are a bit eager to get onto the ground, that we are not so familiar with this particular aircraft in this environment, that we are not so sure that we can cope safely with the conditions or with an approach into this particular strip at this time of day . . .

This is where our 'second self' comes in handy. If we cannot admit to our limitations then our alter-ego will cast doubts in our mind and we should be receptive to those doubts. By all means we can continue the approach to fully explore the conditions but do so with the intention of going around — keeping that escape route open and planning on using it.

So there are two decisions, two yardsticks. Our decisions aren't necessarily good by being quick. They are good decisions by ensuring a high probability of success while retaining an alternative course of action for the safe survival of ourselves, our passengers and our aircraft.

## Application — the second step

We have made our decision to continue with the approach. We have considered the wisdom of that decision and we are now ready to do something about it. Application is the *way* we put the decision into effect.

While looking at the factors that would lead to a successful landing I came to the conclusion that there were considerable advantages to be gained by adopting a sequential and logical approach to landing an aircraft.



We go through a certain procedure to position the aircraft for a landing. We go through a series of checks to prepare the aircraft for landing and we set certain targets for ourselves in establishing the approach. These may not be conscious steps but nevertheless they're there in one form or another. It seemed valuable to try to integrate them in some way.

So 'Application' includes:

- procedures;
- checks, and
- standards.

### procedures

We follow a procedure to enter the circuit and position for a landing. There are set patterns that we fly and they are not just for traffic separation purposes. They are the basis for consistency in the approach and they are to give us time and cues to initiate checks, to weigh up the conditions and to make decisions.

The square circuit is not just a relic of pre-war aero clubs. It is a sensible way of entering the circuit so that we can look for other aircraft and know where to look and so that other aircraft can look for us and know where to look. We can stabilise the aircraft and take time to examine the windsock, assess the drift at circuit height and assess the strip, the approaches and the overruns. It gives us time to look at the effect of the conditions on other aircraft in the pattern and to adjust ours accordingly — all because we use a common and consistent procedure for joining the circuit.

### checks

Checks are the formal way of preparing the aircraft *and the pilot*, for landing. They also serve to *double*-check the critical, life-preserving items before we are committed to concentrating on the approach. Much has been argued for and against written checklists versus memorised checks. As long as they are complete, done in a thorough and consistent manner, done in the same place each time and always repeated if interrupted, then I don't think it matters too much whether they are written or not.

The accidents show that there are sufficient distractions to warrant both a downwind (pre-landing) check and a *final* check of critical items.

Remember . . . PUF, PUF, PUF, PUF, PUF.

### standards

Consciously or otherwise, we each accept a certain degree of accuracy or a certain degree of control when we fly. Perhaps it's a compromise between the workload necessary to achieve a certain accuracy and the acceptability of slacker tolerances — and whether or not someone is watching. The end result is that each of us has standards that we are prepared to accept. Perhaps we tell ourselves that we could achieve greater accuracy if we wanted to, but if it isn't necessary, why bother? Perhaps we save our concentration for those difficult occasions — so that we have something in reserve. Perhaps we just accept the standards that our instructor, chief pilot or our colleagues set for themselves and they become good enough for us. Perhaps we kid ourselves.

More importantly, there are standards that the aircraft demands — tolerances that the aircraft can accept in regard to minimum speeds at that weight and configuration, maximum speeds beyond which it is difficult to control near the ground or beyond which the nosewheel may contact the runway before the mainwheels. There is a maximum height that the aircraft can accept over the threshold and still be able to stop in the available runway. There is a minimum height that the aircraft needs over the threshold so that it can respond to longitudinal control inputs and be able to flare safely. There is a maximum sink rate that the aircraft can accept before the undercarriage and structure will be damaged. There is a maximum side-load or drift angle that the aircraft can tolerate on touchdown before the gear will fail laterally.

Don't be concerned. These tolerances are easily achieved. Aircraft are designed, tested are certificated to ensure that the tolerances are achievable by average pilots in normal circumstances. Furthermore, our training and flight tests are designed to ensure that we are able to achieve tolerances well within those needed for the aircraft to perform safely. All it takes is application.

Of all the factors associated with landing problems excessive speed is a significant, recurrent problem. Yet it is fairly easy to control — if we have consciously set ourselves a target.

The tolerances aren't there to show our passengers that we are the world's greatest pilots but to tell *ourselves* whether we are maintaining the degree of control that we should have for the conditions that exist and the runway available.

## Technique is what you look at and what you do about it

I deliberately risk opening this Pandora's Box because of recent developments that have come to light.

Let's assume that we have done the right thing and made a conscious decision — two in fact. We have used standard procedures, thorough checks and we have set the appropriate standards. We have considered the conditions and we are mentally prepared for a go-around while setting ourselves up for the approach. We are on late downwind and we need to know the optimum technique for controlling the approach and landing and we need to know what references to use in judging the approach and flare.

So how should we fly?

There is no right way or so I am told. There are pet theories, secret techniques and much folklore. But the fact remains that the most critical phase of flight is apparently the least understood and the least conclusive as far as technique is concerned.

How do you safely and consistently land an aircraft? I think this is where I came in!

For what it's worth I will describe my way of doing things and why I do it this way. I will later introduce you to some other ideas on the subject. Please discuss them with your instructor, your colleagues and local Examiners.

For me the essence of a good approach and landing starts with the circuit. Above all else I aim to minimise the variables — I aim for constancy. I fly a comfortably wide and long downwind leg so that I have plenty of time to assess the conditions and complete the checks well before I have to think about flying the approach. In this way I can devote all my attention to flying the aircraft and reading the signs. I am not vulnerable to distractions or they are at least minimised because I know I have set things up and I know I have completed all the checks.

On downwind I pay particular attention to selecting my threshold speed and my touchdown point. These give me my two approach goals — the aircraft attitude for the approach and the aim-point on the runway. I turn Base in the same position and in the same way each time — just like entering a descent — Power, Attitude, Trim, only in this case I lower part flap. I reduce the power as I enter the Base turn, hold the attitude until the airspeed decays to the flap limit and I lower the flap as I adjust the attitude for my approach speed.

Next I take care in trimming the aircraft accurately. In this way, the aircraft's natural stability will help maintain my approach attitude (angle of attack) and hence approach airspeed. It's like riding a horse — if the aircraft is in trim, it will go where I point it — if not, it will resist going where I want it to.

On Base I have another careful look at the windsock and I look at both ends of the runway to help me to imagine an extension of the centreline that I can use as a reference for judging the turn into Final. I turn as if I was turning into my driveway. I turn early rather than late — particularly in conditions where there is a tailwind on Base — and I am ready to increase bank in the early part of the turn so that I don't find myself having to tighten the last part of the turn.

As I line up on Final I complete my *final* check — PUF — make my *final* decision and if that decision is to continue, I lower full flap, adjust the attitude and *re-trim* the aircraft.

From here, I aim to fly my eyes on a constant path to the aim-point. I make continuous small corrections and fly my eyes down the sight-line almost irrespective of where the nose of the aircraft is pointing. It's like pushing a shopping trolley down the aisle at the local supermarket — it doesn't matter so much where it's *pointing* — it matters where it is *going*.

My primary references on Final are:

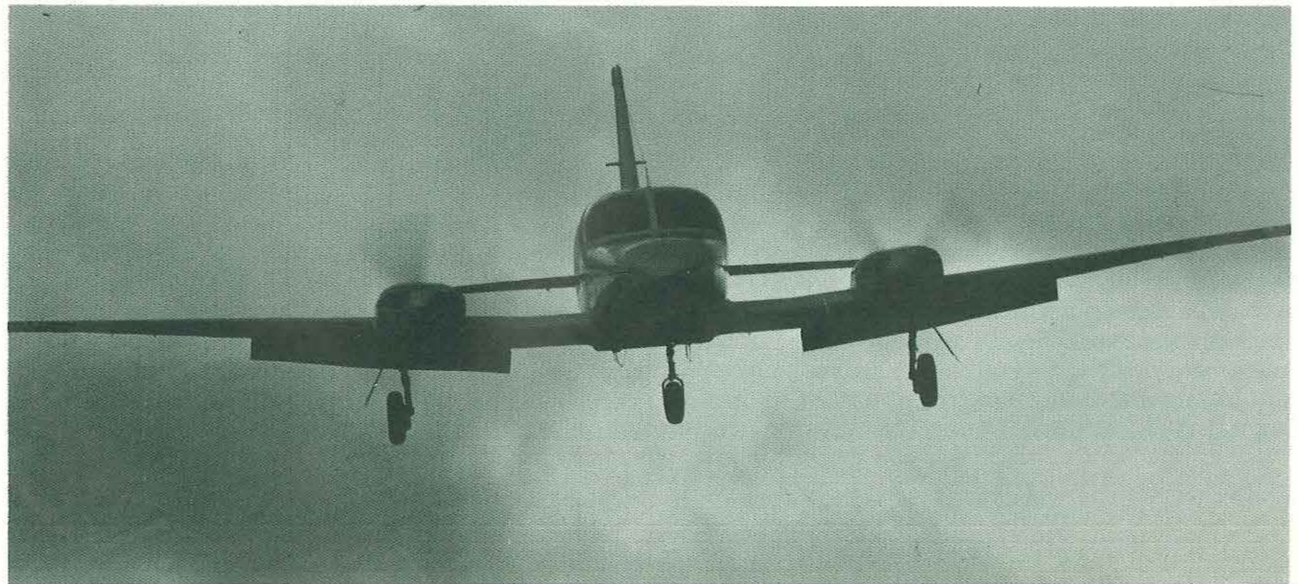
- the *aim-point* on the runway — that is whether it is maintaining a constant position in the windscreen,
- the *attitude* of the aircraft — that is the nose in relation to the horizon, and
- the *airspeed* — which of course tells me if I have the correct attitude.

My continuous scan is — aim-point — attitude — airspeed — aim-point — attitude — airspeed. This constant approach technique enables me to arrive over the threshold at a constant height, at a constant airspeed, in a constant attitude and in a constant configuration each time. All the variables are stabilised and this gives me a constant basis for starting the flare.

But hold off! Before we discuss the flare let's digress a little and let a couple of pilots talk about their approach — and let's recall how we got here in the first place:

- DECISION
- APPLICATION
- TECHNIQUE

The ingredients of a safe landing ☐





# AIRFLOW

## Feeling a little query?

The AIRFLOW column is intended to promote discussion on topics relating to aviation safety. Input from student pilots and flying instructors is particularly welcome.

Anonymity will be respected if requested. 'Immunity' applies with respect to any self-confessed infringements that are highlighted for the benefit of others.

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*Details to be published?* ☐ *No name* ☐ *Initials okay* ☐ *Full name okay*



# Nikon

# AVIATION PHOTOGRAPHIC COMPETITION

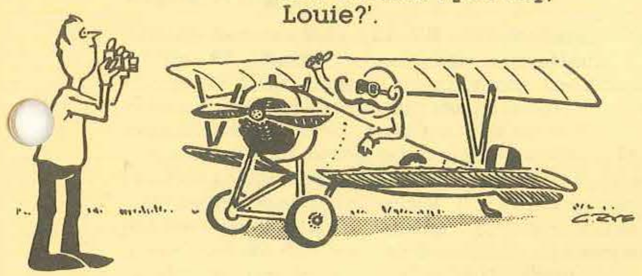
## AND THE WINNER IS . . .

The Digest photographic competition was a great success and I would like to thank all who participated. There were over five hundred entries and the standard was high. Judging is complete and the winners are:

**Category One** — the open category for the best overall photograph was won by **Ron Israel** with his print titled **'Scottish Pioneer'.**

**Category Two** — the category for a photograph on a safety theme was won by **Bill Young** with **'What's in these drums?'.**

**Category Three** — for the best black-and-white photograph was won by **P. Crowe** with **'A little low wouldn't you say, Louie?'.**



Three categories were judged:

**Category 1** — For the best print or transparency on the general subject of Australian civil aviation or Australian civil aircraft. The judges' emphasis in this field was photographic and artistic quality.

**Category 2** — For the best picture illustrating a safety aspect or an unsafe aspect of Australian civil aviation. A clue in this field was that the primary contributory factor in aviation accidents was the 'human factor'. The judges' emphasis was the 'message' and how well the photographic design conveys that message.

**Category 3** — There was a specific prize for the best monochrome print. Black-and- white photographs in particular are a valuable contribution to the Digest. The judges looked for photographic skill and artistic composition which best exploited the unique quality of the black-and-white photograph.

Three prizes will be awarded as follows:


**Category 1** — A Nikon F-301 Program/Motor-Drive Camera with a 50 mm f1.8 lens.
Retail Value: A$1,035.00. This is a state-of-the-art automatic camera with manual reversion and integral film-wind.

**Category 2** — A Nikon FG-20 Auto/Manual Camera with a 50 mm f1.8 lens.
Retail Value: A$725.00.
The FG-20 is a 35 mm single-lens reflex with aperture priority exposure and manual over-ride.


**Category 3** — A Nikon L35 AWAF Auto-Focus camera with built-in flash.
Retail Value: A$595.
This is the rugged, waterproof, fully automatic Nikon with built-in motor-drive.

You may recall that **Ron** also won our last competition but I should add that he only just scraped in. The final selection was very close and took serious deliberation. The judges were myself, Mr Kevin Ginnane — very experienced aviation photographer — and Mr Harvey Ritchie — a previous editor of the Digest and a very experienced pilot and accident investigator.

Congratulations to the winners and my thanks to all participants. I will be publishing several entries in future issues of the Digest and the winners will appear in the next issue.

# Aircraft accident reports

*Second quarter 1987*

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 way is it intended to imply blame or liability.

Preliminary data indicate aircraft type and registration, location of accident, date, category of flying, pilot licence and rating, and total hours.

## Preliminary reports

*The following accidents are still under investigation*

### Fixed Wing

**Britten Norman BN2-A21, VH-SBH, Mabuiag Island Qld., 02 Apr. 87, Charter — passenger operations.**
During the later stages of the approach, the aircraft developed a higher rate of descent than desired. The right maingear subsequently struck a sand-filled drum which was located about 20 metres prior to the threshold. The impact resulted in the right wing being buckled and one of the right engine mounts fracturing. The pilot reported that he did not believe that the landing was heavy and as a consequence did not discover the damage on a subsequent superficial inspection before continuing the flight.

**Cessna T337-B, VH-DPX, Maer Island Qld., 07 Apr. 87, Charter — passenger operations.**
The pilot reported that he had difficulty obtaining effective braking during the landing roll due to a grassed, wet strip surface. He initiated a groundloop but the aircraft drifted sideways off the side of the strip prior to the upwind threshold.

**Cessna 337, VH-RDY, Maer Island Qld., 09 Apr. 87, Charter — passenger operations.**
The takeoff was apparently normal up until the aircraft encountered two areas of standing water at about the midpoint of the strip. The aircraft was slowed considerably and subsequently overran the strip before encountering thick vegetation.

**Cessna 182-K, VH-DQR, Mt Isa Qld., 13 Apr. 87, Non-commercial — pleasure.**
Shortly after touchdown the nosewheel fork failed. This allowed the nosegear strut to dig into the strip surface and resulted in the aircraft overturning.

**Rollason Beta Standard, VH-IWA, Kooralbyn Qld., 07 Apr. 87, Non-commercial — pleasure.**
It was reported by a witness that the aircraft bounced several times on landing and ran off the strip, collapsing the maingear.

The accident was not reported by the pilot and attempts to locate the pilot and wreckage have so far been unsuccessful.

**Cessna 152-M, VH-UFU, Bribie Island Qld., 04 May 87, Instructional — dual.**
During a flying training sortie, the instructor simulated an engine failure by moving the mixture control to the idle cut-off position. The student closed the throttle and pulled the carburettor heat on, the instructor then moved the mixture control to rich. During the descent the throttle was opened twice. Prior to commencing a go-around, at about 100 feet above ground level, the student moved the carburettor heat control to cold. At about 200 feet, on climb, the instructor simulated another engine failure by again moving the mixture control to idle cut-off. As soon as the student lowered the nose of the aircraft, the instructor moved the mixture control to rich, with the throttle open. However, there was no response from the engine and the aircraft was subsequently landed in swampy terrain.

**Jodel D11, VH-DRJ, Archerfield Qld., 06 Jun. 87, Non-commercial — pleasure.**
Just after the aircraft became airborne, the pilot heard several loud bangs and noticed pieces of fibreglass from the cowls fly past the canopy. Believing that the cowls may come adrift, he decided to land the aircraft in a small paddock just outside the airfield perimeter fence. The aircraft touched down heavily on the soft, wet ground and after travelling only five metres, the propeller struck the ground. The aircraft came to rest after a total ground roll of 34 metres.

An inspection of the aircraft revealed that the upper and lower sections of the cowls had come apart following the failure of the fibreglass at the screw-holes where they are connected.

**Cessna 402-C, VH-WBQ, Bundaberg Qld., 21 Jun. 87, Non-commercial — aerial ambulance.**
The flight had been arranged to transport a critically injured patient to hospital in Brisbane. The pilot advised the Brisbane Flight Service Unit (FSU) that the aircraft was taxiing at Bundaberg and two minutes later advised that takeoff was being commenced from runway 14. No further transmissions were received from the aircraft and witnesses reported hearing the sound of an impact shortly after the aircraft took off.

The investigation revealed that the aircraft had struck trees 800 metres beyond the airfield boundary. It then continued through medium-density timber for 177 metres before impacting the ground. The wreckage had been almost totally burnt out.

**Cessna 206, VH-ESM, Tilpa N.S.W., 12 Apr. 87, Non-commercial — business.**
Enroute to the destination aerodrome, the aircraft suffered an electrical system failure. The pilot selected the gear down in the circuit area and then used the emergency low-

ering handle. However, he believed this handle jammed before the gear was fully extended. He then attempted to re-cycle the gear electrically and mechanically several times. When all efforts to positively lower the gear had failed, he carried out a safe wheels-up landing. Initial investigation revealed that the emergency lowering system was serviceable and the jamming reported by the pilot was probably the resistance felt when the gear was in the down-and-locked position.

**Cessna 210-K, VH-CHL, Dubbo N.S.W., 14 Apr. 87, Non-commercial — pleasure.**
The pilot intended to conduct a series of night circuits and landings in order to maintain currency. On the second circuit, the gear was selected down but failed to fully extend. All attempts to lower the gear were unsuccessful and the pilot considered that the symptoms indicated a complete loss of hydraulic fluid. The aircraft subsequently touched down on the partially extended gear which collapsed as the aircraft slid to a halt about 250 metres from the initial touchdown point.

**Piper 34-200, VH-SEN, Trundle N.S.W., 20 Apr. 87, Non-commercial — pleasure.**
When the pilot arrived at his destination, it was after last light and there was no strip lighting available. The pilot, nevertheless, decided to land and although he believed he had aligned the aircraft with the strip correctly, it was in fact lined-up to the left of the strip. After touchdown, the aircraft ran through a washout and the nosegear and left maingear collapsed.

**De Havilland 82-A, VH-PFL, Camden N.S.W., 26 Apr. 87, Charter — passenger operations.**
The pilot reported that after commencing the takeoff run, when he applied forward pressure on the control column to raise the tail, the tail rose more rapidly than normal. He was unable to correct the situation and the propeller struck the ground several times before the aircraft overturned.

**Cessna 172-M, VH-MWS, Port Macquarie N.S.W., 23 Apr. 87, Non-commercial — pleasure.**
Prior to commencing the flight, the pilot received a briefing on the meteorological situation. This briefing indicated that the flight under Visual Flight Rules (VFR) would not be possible over the route and that the conditions were unlikely to improve during the day. The pilot apparently decided to check the weather situation for himself and submitted a flight plan for a flight to Port Macquarie. The plan indicated that the flight would comply with the Visual Flight Rules. The aircraft departed Tamworth but failed to arrive at the destination before the expiry of the nominated SARTIME.

A land and air search was commenced but no trace of the aircraft was found and the search was suspended after five days. Two days later the wreckage was located by an aircraft conducting a private air search.

The aircraft had flown into tall trees on the top of a 3500 feet high ridge line. It had been torn apart by the impact forces and the wreckage was spread over a distance of some 90 metres beyond the initial impact point.

**Auster J5/190, VH-SCO, Luskintyre N.S.W., 16 May 87, Non-commercial — pleasure.**
The aircraft was one of a group attending a fly-in and the pilot had been conducting a photographic sortie in company with another vintage aircraft. After the completion of the exercise, the aircraft was observed to descend to a low level. It then collided with a set of power lines some 1.5 kilometres from the strip and subsequently struck trees before falling to the ground.

**Piper 28, VH-UZT, Bankstown N.S.W., 27 May 87, Non-commercial — pleasure.**
The pilot intended to conduct a short flight using Night VMC procedures. The aircraft had reached a height of about 250 feet above the ground when the engine commenced to run roughly, with an associated loss of power. The pilot applied carburettor heat but was unable to regain climbing power. A skidding turn was made and the pilot positioned the aircraft for a downwind landing on the aerodrome. Touchdown occurred on an unlit area and the aircraft bounced, before stalling at a low height and landing heavily on a taxiway.

**Bede 4, VH-ECW, Hoxton Park N.S.W., 07 Jun. 87, Non-commercial — pleasure.**
At a height of about 350 feet after a normal takeoff, the engine commenced to run roughly. The pilot considered that the problem may have been caused by part of a propeller blade becoming detached. Power was reduced and the pilot commenced to turn back towards the aerodrome. A substantial amount of height was lost during this turn and the aircraft was seen to make a number of lateral oscillations. It then struck the ground in a tail-low, wings-level attitude at relatively low-forward speed.

**Smith 600, VH-BKS, Cooma N.S.W., 08 Jun. 87, Non-commercial — business.**
About 200 metres from the start of the takeoff roll, the aircraft made a smooth turn to the left through some 15 degrees and departed the side of the runway. Shortly after leaving the runway, the nose of the aircraft rose steeply and the aircraft became airborne briefly before settling back onto the ground. It then continued over an embankment and collided with a fence. The pilot later indicated that he had been unable to maintain directional control of the aircraft and he had attempted to force the aircraft into the air in order to avoid a collision with T-Vasis equipment on the side of the runway.

**Cessna A188B A1, VH-EUU, Dubbo N.S.W., 11 Jun. 87, Aerial agriculture.**
On touchdown following a superphosphate spreading operation, the pilot heard a loud cracking noise from the left side of the aircraft. Shortly afterwards, the left mainwheel detached, the aircraft swung sharply and tipped onto its nose, before coming to rest in an upright attitude. The left mainwheel axle was found to have fractured.

**Beech D55, VH-MKE, Bankstown N.S.W., 19 Jun. 87, Charter — cargo operations.**
Following a normal approach for a night landing, touchdown was made on the main landing gear. The pilot then noticed that the nose was lowering by an excessive amount and he carried out a successful go-around. Examinations from the ground and from a helicopter equipped with a searchlight revealed that the nosegear was inclined at about 30 degrees to the vertical. The position of the nosegear did not alter when the gear was cycled and the pilot subsequently carried out a safe landing with the maingear retracted.

**Beech 58, VH-PBU, Bankstown N.S.W., 23 Jun. 87, Non-commercial — practice.**
After having completed an endorsement on the aircraft type, the pilot was instructed to carry out a period of solo circuit consolidation. Two days later the pilot, using the same aircraft, commenced a period of circuits. While on the final approach for the first landing, he realised that his aircraft was gaining on the preceding aircraft and requested a touch-and-go on a parallel runway. During the subsequent landing roll, the pilot inadvertently retracted the landing gear when he was attempting to select the flap-up prior to carrying out the next takeoff.

**Jodel D9, VH-PBW, Cooma N.S.W., 27 Jun. 87, Non-commercial — pleasure.**
The pilot reported that the takeoff and initial climb were normal but a substantial loss of engine power had occurred when the aircraft had reached a height of about 400 feet. The engine regained power briefly but then failed completely. The pilot considered that the terrain ahead of the aircraft was unsuitable for a forced landing and he elected to attempt to return to the strip. During the turn, the aircraft descended rapidly and struck the ground about 56 metres short of the runway threshold.

**Cessna A188B A1, VH-ESB, Sunbury Vic., 02 Apr. 87, Aerial agriculture.**
The pilot had been engaged in superphosphate spreading operations on the particular property since the previous day. During a break for a meal, the pilot discussed the presence of a power line which crossed a creek on the property. Immediately following the break, the pilot spread a portion of the load before turning and following the line of the creek. Witnesses believed he was proceeding towards an area which required clean-up runs. The right wing of the aircraft struck and became entangled in the single-wire power line and the aircraft crashed into the creek bed. A fire broke out on impact and consumed the wreckage. The particular power line was suspended from poles on either side of a gully, with the span between the poles estimated to be some 700 metres.

**Pitts S1-E, VH-XII, Bendigo Vic., 18 Apr. 87, Non-commercial — pleasure.**
At the conclusion of an aerobatic sequence, the pilot positioned the aircraft for a landing on the grass flight strip. At the time, there was a crosswind of about eight knots with occasional gusts. Towards the end of the landing roll the aircraft groundlooped and the left maingear collapsed.

**Piper 28-161, VH-TRV, Morrabbin Vic., 21 Apr. 87, Instructional — solo (supervised).**
The pilot was carrying out a session of solo circuits. The aircraft rounded out high and subsequently landed heavily causing damage to the nosegear.

**Beech C24-R, VH-EDN, Moorabbin Vic., 10 Jun. 87, Non-commercial — pleasure.**
The pilot was conducting a practice flight in the training area when he noted that the radio had failed. He was concerned because of approaching last light and made a no-radio entry return to the aerodrome. A flypast of the Control Tower resulted in a red light being displayed towards the aircraft and a go-around was conducted. The pilot selected the landing gear down but there was no cockpit indication of the position of the gear. Because he was of the opinion that the aircraft problem was related solely to communications, he did not consider using the emergency gear system. The aircraft subsequently touched down with the gear retracted.

Investigation revealed that the aircraft battery was discharged. The pilot, who was unfamiliar with the aircraft type, had not turned on the alternator field switch during the pre-start or pre-taxi checks.

**Auster J5-P, VH-BYW, Balliang Vic., 14 Jun. 87, Non-commercial — pleasure.**
The observer was also the owner of the aircraft and he intended to check the performance of the pilot-in-command on the type. Landings were being made into wind. On the first touchdown, the aircraft bounced and the pilot carried out a go-around. On the next approach, the aircraft bounced again on touchdown, to a height of about 10 feet above the ground. The pilot held the elevator control back and opened the throttle rapidly, intending to go-around. The engine failed to respond and the aicraft landed heavily, collapsing the left maingear.

**Cessna 182-F, VH-RYT, Beaconsfield Tas., 02 Jun. 87, Non-commercial — pleasure.**
The pilot was approaching to land on a one-way agricultural strip. He was aware that the owner of the strip had placed a fence across the approach end but was not aware that there was a second fence some 15 metres in from the first. This fence was not easy to see from the air. The aircraft cleared the first fence but collided with the second.

**Transavia PL12, VH-MLJ, Gretna Tas., 29 Jun. 87, Aerial agriculture.**
The pilot took off from Cambridge, transitted to the agricultural strip, and commenced spreading on the property with the fuel selector positioned to the left tank. Shortly after becoming airborne on about the fifth or sixth takeoff, the engine failed due to fuel starvation. The pilot immediately changed tanks and placed the fuel pump switch in the high/prime position; however, the engine did not respond. The pilot dumped the load and carried out a forced landing which resulted in the aircraft nosing-over. Prior to departing Cambridge, the left tank capacity was reduced by a small quantity but the right tank was full.

Preliminary investigation revealed that the fuel pump switch was not working in the high/prime position.

**Cessna 172-N, VH-TST, Tyabb Vic., 28 Jun. 87, Non-commercial — pleasure.**
A taxiway for the particular strip is a continuation of the gravel centre section of the strip. The taxiway then makes a right-angled turn. After a normal landing, the pilot proceeded along the taxiway but failed to negotiate the turn. The aircraft entered a ditch and the left wing struck the ground.

**American Air 5-A, VH-SYF, Parafield S.A., 23 Apr. 37, Non-commercial — pleasure.**
The pilot was taking a group of mentally retarded children for a flight. On the first flight, one of the children became distressed and the flight was terminated. On final for the first landing of the second flight, the child seated behind the pilot became hysterical and grabbed the pilot around the throat. A missed approach was carried out and another circuit completed. As the aircraft approached for landing, the child again became agitated. The pilot reported that he was concerned about the situation and lost concentration during the approach. The aircraft ballooned and landed heavily.

**Cessna 182-G, VH-DIY, Groote Eylandt N.T., 25 Apr. 87, Charter — passenger operations.**
The pilot reported that when the aircraft was cruising at 1000 feet above mean sea level, shortly after takeoff, the engine note changed. He immediately turned the aircraft back towards the strip and by this time the engine had begun to run roughly. Attempts to rectify the problem were unsuccessful and the pilot stated that engine power gradually reduced to nil and a ditching became inevitable.

The aircraft was ditched at low speed and floated in a 60-degree nose-down attitude. Water began to enter the cabin through the broken windscreen. The four passengers exited through the right door and the pilot opened and swam out through the left-side window. After clinging to the aircraft for a short time, they all decided to swim to shore, a distance of about two kilometres. They were subsequently picked up by a rescue boat. The aircraft sank after about 15 minutes.

**Piper 28-180, VH-DMB, Mataranka N.T., 26 Apr. 87, Non-commercial — pleasure.**
Just after the aircraft reached the top of climb, at 1000 feet above the ground, the engine failed. The pilot was unable to rectify the problem and decided to land the aircraft on a road. During the landing roll, the left wing struck a roadsign and the aircraft ran off the road, then travelled a further 100 metres before colliding with a tree.

**Piper 25-235, VH-BCP, Port Lincoln S.A., 19 May 87, Aerial agriculture.**
Nearing the completion of the task the aircraft struck a single power line. The aircraft remained airborne but the pilot decided to land in a paddock and assess the damage. He found that the top 30 centimetres of the rudder had been torn off.

**Cessna 210-L, VH-TIZ, Leigh Creek S.A., 31 May 87, Non-commercial — pleasure.**
The aircraft landed heavily and bounced three times. On the third contact with the ground, the rim of the nosewheel apparently broke, resulting in the complete oleo leg assembly separating from the aircraft. The aircraft slid to a halt on the lower section of the engine cowl.

**Beech 76, VH-RVS, Parafield S.A., 05 Jun. 87, Instructional — dual.**
When the pilot selected the gear lever to the down position, only the maingear responded. Attempts to lower the nosegear were unsuccessful and the aircraft was landed with the nosegear retracted. After touchdown, both propellers were feathered; however, the right propeller did not stop in the horizontal position and as the nose of the aircraft was lowered, the propeller dug into the runway. The right engine was torn from the aircraft and the aircraft slewed to the right, damaging the left wing and propeller.

**Cessna 182-G, VH-DGI, Boyup Brook W.A., 23 May 87, Sport parachuting (not associated with an airshow).**
The pilot was conducting a parachute drop from 9000 feet. She reported that the cloud base was broken at about 4500 feet and that she climbed the aircraft through a break in the cloud cover to reach the drop altitude. After the parachutist had exited the aircraft, the pilot found a break in the cloud cover and descended. However, she was then unable to locate the strip and spent some time flying in various directions until she decided to land and ascertain her location. A paddock was selected and after aerial inspection a landing approach was conducted. The aircraft touched down about 150 metres into the paddock in tailwind conditions. It then ran through a fence, across a road and struck another fence before the nosegear leg collapsed. The aircraft then nosed over and came to rest inverted.

The accident site is located about 47 kilometres south-west of the Hillman Farm strip.

**Cessna 421-C, VH-URT, Bagga W.A., 16 Jun. 87, Charter — passenger operations.**
On arrival in the circuit area, the pilot elected to land on runway 27. During the final approach to that runway, he considered that the wind velocity favoured the opposite landing direction and carried out an overshoot, retracting both the gear and flap. The pilot does not recall lowering the gear at any stage during the subsequent circuit. Neither he nor any of the passengers recall hearing the gear warning horn when the second stage of the flap was extended on the base leg. The aircraft was subsequently landed with the gear retracted.

## Rotary Wing

**Hughes 269-C, VH-HFC, Cairns Qld., 11 Apr. 87, Aerial mustering.**
The pilot was attempting to bring the helicopter to a hover in the lee of a hill but found that there was insufficient power to arrest the rate of descent. The aircraft struck the ground and rolled over. The pilot reported that the conditions were very windy and believes that he overpitched the rotors during the manoeuvre.

**Hughes 269-C, VH-CHM, Coolangatta Qld., 13 May 87, Non-commercial — pleasure.**
The helicopter was on late final approach when the pilot attempted to open the throttle. The engine did not respond to the throttle movement and the helicopter was entered into an autorotational descent. However, the rate of descent was not arrested and the aircraft landed heavily.

An inspection of the aircraft found that the bolt attaching the throttle cable to the collective/throttle linkage was missing. The bolt and nut were later found on the floor of the aircraft between the seats.

**Bell 206-B, VH-BLI, Coen Qld., 23 May 87, See circumstances below.**
The helicopter was engaged to transport two hydrographers to various remote sites on the Cape York Pensinsula.

About 20 minutes after departing Coen, the Engine Chip Warning Light illuminated. This was immediately followed by a sharp mechanical noise from the engine area and other signs of an engine failure. The pilot is reported to have commenced an autorotational descent from an altitude of about 600 feet above ground level and to have headed the aircraft towards a cleared area. One of the passengers stated that the aircraft struck trees, then impacted the ground in a tail-down attitude. The aircraft was torn apart by the impact forces but both passengers were able to get clear of the wreckage before it was destroyed by fire.

An on-site inspection of the wreckage revealed that the Power Turbine Rotor Assembly had disintergrated and was missing from the area of the wreckage. The aircraft had been on fire prior to impact with the ground. When the engine was inspected, it was found that the number four bearing had failed.

**Hiller UH12-E, VH-FFX, Pomona Qld., 23 May 87, Commercial.**
The pilot stated that the helicopter was cruising at an altitude of 2000 feet when without warning the engine suffered a complete loss of power. The aircraft was subsequently force landed in a tail-down attitude. The tail boom was bent and the tail rotor gearbox separated from the aircraft.

Initial investigation revealed that the engine-accessory drive had failed, causing both magnetos to cease operation.

**Hughes 269-C, VH-KLQ, Scartwater Qld., 22 Jun. 87, Non-commercial — Aerial mustering.**
The helicopter had been engaged to spot cattle for a ground muster party. During what had apparently been the first sweep of the muster area, just inside the property boundary fence, the aircraft struck a single power line. There were no witnesses to the accident and the wreckage was not located until about eleven hours after the wire strike.

**Bell 47 G3B1, VH-SJI, Mountain Valley N.T., 31 May 87, Aerial mustering.**
The pilot was approaching the rear of a mob of cattle when he attempted to climb the aircraft. As he raised the collective control, the engine rpm started to decrease. There was no suitable landing site below the helicopter, so the pilot was forced to manoeuvre the aircraft around several trees to get to a suitable landing area. As he flared the aircraft for a landing, the tail rotor contacted the ground and the main rotor severed the trunks of a tree and two saplings. The helicopter yawed to the left and slid sideways collapsing the left landing skid.

**Hiller UH12-E, VH-HKJ, Perth W.A., 13 Apr. 87, Construction work.**
The pilot intended to position a beacon on the roof of the Perth Control Tower. The task was to be accomplished by sling-loading the beacon, which weighted 199 kilograms, below the helicopter. The aircraft was positioned about 40 metres to the north and about 25 feet above the tower. The pilot carried out an approach to the roof and deposited the load. The load was then released from the rope which was attached to the helicopter. The aircraft was then manoeuvred across the roof with the rope being dragged over the surface. The hook on the rope became snagged on the guard rail and the helicopter pitched nose-down and rolled rapidly to the right. It fell to the ground at the base of the tower, caught fire, and was burnt out.

**Aerospatiale SA330J, VH-WOF, North Rankin A Rig W.A., 07 May 87, Charter — passenger operations.**
The pilot reported that when the aircraft was in the cruise at 3500 feet, he heard a noise, followed by severe vertical and less severe lateral vibration. The aircraft was descended and checks carried out in an attempt to ascertain the cause of the vibration. The cause of the vibration was not determined and the pilot decided to hover taxi the aircraft back to the platform. The aircraft was subsequently landed on a barge without further incident.

An inspection of the aircraft found that one of the two lugs on a main rotor blade flapping hinge had failed.

## Gliders

**Eiri Avion PIK 20-E, VH-MQN, Lilydale Vic., 02 Apr. 87, Non-commercial — pleasure.**
The particular aircraft is a glider fitted with a retractable engine. Shortly after takeoff for a soaring flight, the pilot noticed that the airspeed indicator appeared to be operating erratically. The flight was continued with the pilot estimating the airspeed, but no thermals were found and the pilot decided to return to the departure point using engine power. The aircraft stalled during the landing flare and the left wing struck the ground. The aircraft slewed to the left and touched down while travelling sideways. The fuselage was fractured during the ensuing ground slide.



## Ultralights

**Maxair Drifter 503, N/R, Hungerford Qld., 03 Jun. 87, See circumstances below.**
The pilot had flown the aircraft to Hungerford to attend a Field Day. The following morning he adjusted the aircraft brakes and apparently decided to take the aircraft for a test flight. After taking off from the local racecourse, the aircraft climbed to about 150 feet above the ground before descending to fly just above the tops of the trees. The flight continued at this altitude until the aircraft struck a single power line and spun to the ground.

**Maxair Drifter, N/R, Macksville N.S.W., 31 May 87, Non-commercial — pleasure.**
The aircraft had completed several successful flights during the day. On this occasion, the engine commenced to run roughly when power was reduced prior to a descending turn. The engine subsequently failed completely and the pilot attempted to carry out a forced landing. During the approach, the aircraft collided with power lines which crossed a gully about 300 feet above the gully floor. One line contacted the pilot's throat, inflicting severe lacerations, and the aircraft descended to the ground out of control.

**Chinook, N/R, Streaky Bay S.A., 07 May 87, Non-commercial — aerial application/survey.**
The pilot had intended to go fish spotting in his aircraft. At about 1730 hours, the aircraft was observed flying at about 100 feet above ground level and heading towards Streaky Bay. No further sightings of the aircraft were reported and when the pilot failed to return home, a search was commenced. The wreckage was subsequently located the following morning. The aircraft had impacted in light mulga scrub in a steep nose-down attitude.

Inspection of the wreckage revealed an apparent fatigue failure of the body tube.

# Final updates

*The investigation of the following accidents has been completed. The information is additional to or replaces that previously printed in the preliminary report*

## Fixed Wing

**De Havilland DHC2, VH-AAY, Walcha N.S.W., 22 Dec. 86, CPL/Ag. Cl. 1, 8950 hrs.**
Superphosphate spreading was being carried out, with the aircraft uplifting one-tonne loads every six minutes. Fuel endurance with both tanks full was approximately two hours. The pilot was conducting his 25th takeoff for the day, about one hour after refuelling. Witnesses observed that the aircraft did not become airborne at the usual point, two-thirds of the way along the 675-metre strip. Liftoff finally occurred at the end of the strip but almost immediately afterwards, the aircraft clipped a fence. It was seen to sink slightly before climbing at a steeper-than-normal angle until some 250 metres beyond the fence. At this point, the nose dropped suddendly and the aircraft dived into rising ground in a steep nose-down altitude. Fire broke out on impact and consumed much of the wreckage. Preliminary investigation revealed that the fuel selector was in the 'off' position.

This had been the first occasion that the pilot had flown this particular aircraft. The fuel selector in this aircraft was different to that in the other Beaver the pilot had operated. In the previous aircraft, rotating the fuel selector through 180 degrees anti-clockwise changed the selection from the rear to the forward fuel tanks. In the accident aircraft, a similar movement of the selector changed the selection from the rear tank to the 'off' position. This difference had not been brought to the pilot's attention and it was possible that he had not thoroughly familiarised himself with the aircraft prior to commencing operations.

It was considered likely that the takeoff had been commenced with the fuel selector positioned to the almost empty rear tank. During the takeoff roll, the fuel low-quanity bell and associated light had activated and the pilot had changed the fuel selector by feel while continuing with the takeoff. With the fuel supply turned off, the engine had failed from fuel starvation and the aircraft had subsequently stalled at too low a height above the ground to permit recovery before impact.

**Piper 32-300, VH-CLF, Melbourne Vic., 09 Dec. 86, CPL/Cl. 4/Flt. Inst., 380 hrs.**
Prior to departure, the pilot had been made aware of a Notam advising pilots to disregard temporary displaced threshold markings for runway 27 at the destination. During the subsequent approach, the pilot noticed red and white lighting and associated this with the displaced threshold. It was his intention to land beyond these lights, which were in fact the approach lights. Very late in the approach, the pilot realised he was too low but before power could be applied, the aircraft struck the lights 180 metres short of the runway. The maingear legs were torn off and the nosegear collapsed before the aircraft slid to a halt on the side of the runway.

The pilot had been confused by the Notam relating to the displaced threshold but had not sought clarification prior to departure. He had limited night-flying experience and was unfamiliar with the presentation of High Intensity Approach Lighting. It was evident that during the approach, he had focused his attention on these lights, to the exclusion of the runway lighting.

**Piper 25-235/A1, VH-FAN, Horsham Vic., 28 Nov. 86, CPL/Ag. Cl. 1, 1500 hrs.**
Spraying runs were being conducted over a paddock which had power lines along one boundary. The pilot had been passing beneath the lines during each run; however, after completing about two-thirds of the task, the wire deflector on the aircraft snagged and broke the power lines. The pilot carried out a precautionary landing and discovered that the rudder of the aircraft had been substantially damaged by the wire strike.

At the point where the wire strike occurred, there was less clearance between the wires and the ground than that available during previous swath runs. The pilot was aware of the situation but had been subject to a visual illusion which had led him to believe that there was sufficient clearance to allow the aircraft to pass beneath the wires. By the time he realised that the clearance was insufficient, he was unable to take avoiding action and had elected to allow the wire to strike the deflector rather than risk the landing gear contacting the ground. The anti-snag deflector plate on top of the rudder had failed, allowing the wire to contact the rudder. The upper portion of this component had been torn from the aircraft.

This accident was not subject to an on-site investigation.

**Cessna A152, VH-BYS, Dry Creek S.A., 07 Jun. 86, PPL/Cl. 4, 287 hrs.**
The pilot had intended to carry out aerobatic practice in the Dry Creek Aerobatic Training Area. After departure, the pilot requested, and was cleared, to operate in the Dry Creek area up to an altitude of 3500 feet. The aircraft was then observed to be spinning and crashed into a salt evaporation pan.

The investigation revealed no pre-existing defects with the aircraft or its systems which may have contributed to the pilot's inability to effect recovery from the spin. However, it was found that at the time of the accident, the weight of the aircraft exceeded the maximum allowable by about 26 kilograms.

The pilot was a member of a local aerobatic club and had accumulated some 30 hours of aerobatic flight. He had been assessed by his instructors and other experienced club members as a competent aerobatic pilot.

The circumstances surrounding the entry to the spin and reasons for the pilot's apparent inability to recover from the manoeuvre could not be determined.

**Cessna 150-K, VH-EIS, Wondagee Stn. W.A., 15 Jun. 86, CPL/Cl. 4, 415 hrs.**
The aircraft was being flown at about 250 feet above ground level in a left turn while the pilot was attempting to locate some sheep. The pilot reported that the aircraft stalled and that during the recovery it struck a bush. This resulted in damage to the right mainplane, right wing strut, right horizontal stabiliser and the brakelines on both mainwheels. The pilot was able to maintain control of the aircraft and land at a nearby airstrip.

The pilot's attention was diverted from the operation of the aircraft whilst he searched for the sheep and directed the ground party. He had been working long hours and was only obtaining about four hours sleep each night and considered that fatigue was a factor in his allowing the airspeed to decay unnoticed.

**Cessna 172-F, VH-DFW, Musgrave Stn. Qld., 13 Mar. 87, PPL/Cl. 4, 630 hrs.**
The pilot was aware that there was an area of soft ground on the strip. The area was marked by a cone marker which was about ten metres in from the edge of the strip. The pilot intended to land some 100 metres beyond the cone; however, turbulence and strong sink was encountered during the latter stages of the approach. As the aircraft touched down, the tailplane struck the cone marker which was made of galvanised iron.

This accident was not subject to an on-site investigation.

## Rotary Wing

**Enstrom F28-C, VH-IYP, Carlingford N.S.W., 20 Sep. 86, CPL-H, 1418 hrs.**
The pilot had been conducting a series of joy flights as part of a school fund-raising program. Refuelling equipment was positioned some 100 metres from the passenger loading area. The pilot had offered to take two boys with him as he air-taxied the aircraft prior to refuelling. After takeoff from the passenger area, the pilot decided to carry out a short local flight, but as he turned back towards the fuel dump, the engine lost power. The pilot was unable to reach a cleared area and attempted to land in a street. The helicopter collided with trees, then stuck the roof of a house before coming to rest on its side in the driveway of the house.

During joy flight operations, the pilot did not rely on the fuel gauge inside the aircraft. He briefed an assistant, who relayed information relating to the fuel remaining by reference to sight gauges on the fuel tanks. There had evidently been a communication breakdown between the assistant and the pilot as to the amount of fuel remaining prior to the last joy flight. The flight had been made on the spur of the moment, in order to give two handicapped children an opportunity to see their school from the air. The engine had failed from fuel exhaustion while the aircraft was over an area which was unsuitable for a forced landing.

**Robinson R22, VH-UXI, Greta N.S.W., 19 Nov. 86, CPL-H/Cl. 4./Flt. Inst., 2089 hrs.**
Following a period of circuit practice, the instructor was demonstrating some enroute emergency procedures. An autorotation was entered from 2000 feet, with the pilot aiming for a paddock on the side of a river. He advised that descent was continued to about 250 feet above the ground. Shortly after power was re-applied, the helicopter collided with a set of power lines and dived to the ground. The pilot had noted two other sets of wires in the area but had not sighted a set of three cables between the others until immediately before the collision.

The helicopter was being operated outside the designated training area. The grey oxidised power lines, which were estimated to be between 80 and 100 feet above ground level, were very difficult to see against the overcast sky conditions. The span between supporting poles was greater than those between the other sets of cables.

**Hughes 269-C, VH-THY, Kalumburu W.A., 01 May 86, CPL-H, 1500 hrs.**
The pilot was engaged in mustering operations and was attempting transition from a low-forward speed to an out-of-ground-effect hover in order to turn a breakaway beast. As it approached the hover, the helicopter experienced a sudden partial power failure. The pilot maintained the aircraft heading, lowered the collective lever and attempted to gain some forward airspeed. In the attempted landing, with partial power, the helicopter struck the ground heavily and its main rotor blades hit a small sapling. The forced landing was made in light downwind conditions.

Investigation revealed that the number two cylinder exhaust valve had failed in fatigue and the valve seat and retaining cap had failed in overload. Further testing indicated that the exhaust valve had been subject to higher-than-normal operation temperatures which would have contributed to the premature failure of the valve.

## Gliders

**Glasflugel H206 Hornet, VH-GSC, Tomingley N.S.W., 24 Oct. 86, Glider.**
The pilot had been carrying out a solo cross-country training flight when deteriorating lift forced him to make an outlanding. The approach to the paddock selected involved passing over a line of high trees. Severe sink was encountered and the pilot realised he would not clear the trees. He therefore applied full spoilers and attempted a landing short of the planned area. During the landing roll, the glider collided with a flock of sheep killing five of the animals on impact.

The pilot was a Japanese national who was visiting the area. Before departure, he had advised the soaring club that he wished to undertake a local flight. As a result, he was not briefed on cross-country procedures and outlandings. When thermals were encountered after takeoff, he had elected to conduct a longer flight. When the outlanding became necessary, the pilot had misjudged the strength of the wind and had continued downwind beyond the point where a successful approach to the selected paddock could be made.

# Final reports

*The investigation of the following accidents has been completed*

## Fixed Wing

**Piper 32-300, VH-TPJ, Sweers Island Qld., 17 May 87, Non-commercial — pleasure, PPL, 1038 hrs.**
The pilot reported that just after touchdown, he felt a bump. As the aircraft slowed, the nose of the aircraft sank slightly allowing the propeller to strike the strip surface several times. An inspection of the aircraft revealed that a wallaby had struck and bent the nosegear strut.

This accident was not subject to an on-site investigation.

**Beech 200, VH-MSZ, Tibooburra N.S.W., 15 Apr. 87, Non-commercial — aerial ambulance, CPL, 4575 hrs.**
The pilot was making a night landing approach. Late in the flare a thump was heard and shortly after touchdown, the nosegear collapsed. The aircraft came to rest on the strip 390 metres further on. It was discovered that a large kangaroo had struck the nosegear and that a number of other kangaroos were in the immediate vicinity.

This accident was not subject to an on-site investigation.



**Cessna 150-F, VH-RWI, Roy Hill Stn. W.A., 16 May 87, Non-commercial — aerial application/survey, PPL, 716 hrs.**
The pilot was carrying out a cattle-spotting operation prior to the commencement of the muster. He descended the aircraft to 500 feet above the ground to get a better view of some animals amongst the trees. The pilot reported that as the aircraft was being returned to level flight, it was affected by severe turbulence and the pilot's door became unlatched. While attempting to close the door, he noticed that the indicated airspeed had reduced and that the aircraft was continuing to sink. A turn to the right, to clear the area of turbulence, was commenced but during the turn the aircraft stalled and entered a spin. Attempts to recover from the spin were unsuccessful and the aircraft struck the ground in a nose-down attitude while turning to the right.

## Ultralights

**Birdman Chinook WT-25, N/R, Maroota N.S.W., 24 May 87, Non-commercial — pleasure, N/A.**
During the takeoff run, the engine developed a maximum of about 5800 rpm, almost 1000 rpm lower than expected. The aircraft became airborne but did not achieve the climb performance necessary to clear trees along the takeoff path. The observer called to the pilot that he was assuming control, closed the throttle and turned off the fuel and ignition system. The aircraft collided with the trees and fell to the ground.

No mechanical defect was subsequently found with the engine or systems of the aircraft. A number of reports have been received concerning induction icing in this type of engine in which there is no provision for directing warm air to the carburettor. It was considered likely that induction icing occurred on this occasion. The pilot had not abandoned the takeoff attempt when the loss of power became apparent.

This accident was not subject to an on-site investigation.

**Thruster Gemini, N/R, The Oaks N.S.W., 03 Jun. 87, Instructional — dual, N/A.**
The student had about 75 hours experience in ultralight aircraft and was undergoing a training program to enable him to become an instructor. At about 100 feet above the ground after takeoff, the instructor closed the throttle to simulate an engine failure. The student was slow to react and the airspeed rapidly decayed. The instructor took control and applied full power but was unable to prevent the aircraft from contacting the ground heavily. This contact resulted in the lower fuselage striking the ground and the throttle control became jammed. The aircraft became airborne again with full power applied and the instructor turned off the ignition system. A second heavy touchdown occurred before the aircraft came to rest.

**Hang Glider Ultratrike, N/R, Holbrook N.S.W., 05 Jun. 87, Non-commercial — pleasure, Hang Glider, 300 hrs.**
Although the pilot was experienced in operating unpowered hang gliders, he had only limited exposure to powered versions. He had been conducting a short local flight and subsequently advised that he had probably misjudged the landing flare. The aircraft struck the ground in a relatively steep nose-down attitude. The landing gear collapsed and the aircraft overturned before coming to rest on the flight strip.

This accident was not subject to an on-site investigation.

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Aviation Regulatory Proposals (ARPs) are an important means by which the Department consults with industry about proposed changes to operational legislation and requirements. Copies of all proposals are circulated to relevant organisations, and occasionally to individuals for information and comment. The comment received provides a valuable source of advice which greatly assists the Department in the development of the completed documentation.

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| Number | Subject | Status |
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| 87/4 | Review of Aircraft Maintenance Engineer licensing system | Issued 21 April 1987<br>Comments due 1 June 1987 |
| 87/9 | Suitability of aerodromes; minimum runway widths, operating criteria | Issued 4 June 1987<br>Comments due 31 August 1987 |
| 87/13 | Medical standards for Flight Crew members of aircraft and Air Traffic Controllers — colour perception standards | Issued 14 May 1987<br>Comments due 19 June 1987 |
| 87/3 | Review of ANO 95.4; Gliding operations | Issued 23 July 1987<br>Comments due 30 September 1987 |
| 87/8 | 'Hot' (engines running) refuelling of helicopters | Issued 9 June 1987<br>Comments due 31 July 1987 |
| 86/18 | Aircraft registration | Issued 24 July 1987<br>Comments due 30 September 1987 |
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# How do I land thee?
# Let me count the ways

THERE HAVE been many arguments about the control of an aircraft on final approach. There is no one right way. The major 'camps' are:

- elevators control airspeed and power controls rate of descent,
- elevators control flight path (therefore rate of descent) and power controls airspeed,
- both control both.

I do not subscribe to these camps because they all use 'second-hand' information. Let me explain.

The aircraft's flight path, angle of attack and power are not directly displayed to the pilot. Instead of having this vital information directly, he has to interpret this data from the performance that results from his control inputs. As we learn with instrument flying, concentrating on the performance instruments usually leads to overcontrolling — higher workload and less accurate and less smooth flying — more 'meandering' than flying.

We can't see our flight path and we can't see the angle of attack but we can use the next best thing. With experience we can come to know the appropriate attitude, configuration and RPM that will result in a certain performance. Attitude represents a combination of angle of attack and flight path and the power will sustain that flight path.

For me there are two types of control:

- instantaneous, and
- sustained.

The control column gives an instantaneous change of flight path but must be accompanied by an appropriate change of power if the new flight path and airspeed are to be sustained.

Adjustments on final approach require sustained changes and so power changes are required. A minor change can be achieved by a small power adjustment alone whereas a major change requires both the attitude and the power to be adjusted.

So my way of flying for visual, instrument and final approach (indeed for all flying) is to set an attitude that I know is close to where I want it, set the power which I know is close to where I want, trim the aircraft and allow it to stabilise in its new flight path direction — and then make a minor adjustment if required.

CHANGE — CHECK — HOLD — ADJUST — TRIM is the way I was taught to fly, 'on the clocks'. The only difference on final is that wind has to be taken into account. This is fairly simple to do. A ground-based aim point is used to assess flight path direction and small power adjustments are made to adjust the flight path towards the aim point.

Too easy — but that's only *my* opinion. What about others?

*When we start to talk about technique, I am very conscious that I am skating on thin ice. I have published the following articles to promote discussion and to solicit your ideas.*

*The techniques described are not necessarily advocated by the Department.*

*Before attempting these techniques, please discuss them fully with an instructor* □

# Choosing the best approach

*Controlling rate of descent with throttle and airspeed with elevator is one way of making a landing approach. The constant attitude approach is another. Here Warren Wilks discusses his development of this latter technique and proposes to remove even the attitude change due to flap extension.*

*Warren is CFI at the Austavia Flying School in Albury, N.S.W. A flying instructor for over 20 years, he has been an advocate of the constant attitude approach for some time. He has even developed an approach aid that is based on this attitude reference technique.*

THE MOST important, and certainly the most unavoidable part of any flight is the landing. And for student pilots in particular, the difficulties in learning to make good landings are often brought about by making poor approaches. It's often been said that it takes a good approach to make a good landing.

The pilot can make a good approach only if he has the correct mental picture of what he and his aircraft are doing [and trying to do], all the way down the approach path.

The traditional method of approach was based on airspeed as the primary reference. The pilot controlled the airspeed using the elevator and the rate of descent using the throttle. However, there are a number of problems and shortfalls associated with this method.

Firstly, because he uses the elevator to control airspeed, the attitude of the aircraft varies continuously as the aircraft moves down the approach path. Thus the aircraft doesn't go where it is pointed — a problem that becomes more obvious and more disconcerting the closer it gets to the ground.

Secondly, for given atmospheric conditions and aircraft weight, the airspeed achieved during the approach is a product of three pilot-controlled variables:

- aircraft attitude,
- aircraft configuration, and
- power setting.

The pilot must juggle these variables in just the right proportions all the way through the approach in order to maintain a desired approach path. The ability to combine these variables correctly is very much a matter of experience.

Thirdly, the best approach airspeed (which is predetermined for each aircraft) changes with varying atmospheric conditions and aircraft weight. The pilot must remember different airspeeds for different occasions.

All other areas of flying are taught as sequential routines: takeoff, turns, climbing, descending — even stall recovery. The student practises the routine until eventually it becomes second nature to him. This is because within the limits of each procedure, the routine never varies.

But with the approach and landing, the routine is not so clearly defined. Because the approach technique varies, individual instructors find it difficult to teach a standard procedure. Beyond a few theoretical facts, the student is often left to his own devices — almost forced to teach himself — to learn by trial and error.

What then is so different about the approach and landing?

All other areas of flying are taught with reference to aircraft attitude — the position of the horizon on the windscreen. Airspeed is just a check, a confirmation that the attitude is correct.

But for this approach, the student is told to ignore aircraft attitude except as it relates to a reference airspeed. This is a complete contradiction of all that he has just learned. And contradictions confuse. Think of it. Except for the approach, she has been told that the safest, easiest, most natural way to fly is by attitude. Now she is asked to change from being an attitude-reliant pilot to being an airspeed-reliant pilot — but only during an approach. Where once the right attitude and throttle setting meant the right airspeed for the prevailing conditions, she must now make corrections to the reference airspeed for extremes of weight, wind and weather.

The only words of encouragement I can offer to the student pilot in this position is that she is in good company. We all find it difficult.

So why do we use airspeed as a reference during the approach? Simply because there didn't seem to be a better way. Airspeed was the cue for angle of attack and we therefore made certain of not going too far above or below a particular airspeed. Airspeed was the critical parameter on final approach.

Over the past few years, we at Austavia have been convinced that attitude reference is a better way.

The ideal approach is one which has a constant and consistent approach angle. If we could guarantee to maintain a constant approach angle each time, we could start each approach from the same point every time and land at the same point on the airstrip every time. And how much safer that would be!

The traditional difficulties associated with learning, teaching and making an approach would be simplified if we could just adopt a constant approach angle — and the simplest way to maintain a constant approach angle is to maintain a constant lift/drag ratio throughout the approach. If the lift/drag ratio remains constant, the approach angle must remain constant.

What affects the lift/drag ratio of the aircraft?

- the aircraft body angle — the attitude of the aircraft as it moves through the air,
- the power setting — thrust, affecting lift and drag,
- the aircraft's configuration — undercarriage position and the setting of flaps or other devices which alter the camber of the wing.

No mention of airspeed — because airspeed is a product of these three. Thus, the lift/drag ratio (and the approach angle) can be maintained by three pilot-controlled variables: attitude, power, and configuration.

Now the object of our endeavours has been to minimise the number of variables the pilot must recognise and manipulate during the approach. Bearing in mind the relationship between attitude, power and flap setting, it becomes obvious that the only two variables that will affect the approach angle, once the attitude has been established, are power and flap.

**During a normal approach we lower flap, so the wing configuration varies. How do we compensate for a variation in wing configuration and thus a change in the approach path? — by simultaneously adjusting the power. As the wing lift/drag ratio decreases, the aircraft begins to move down a steeper approach path. To maintain the initial approach path, we restore the lift/drag ratio by an increase in power. Nothing else is required.**

It's that simple. For a change in flap, we use balancing power and the aircraft continues along the required approach path at a reduced airspeed.

Throughout the approach, the aircraft acts as its own approach computer. By maintaining a constant attitude, any requirement for more or less power (compensating for changes in weight, temperature, pressure, headwind etc.) will become obvious by the movement of the pilot's approach path away from the desired aim point. The pilot makes automatic adjustments for the above variables using one control — the power lever.

What could be simpler and safer? Using this method of approach, any pilot, after a suitable period of training, can make a safe, consistent and confident approach and landing. What more could we ask? □



# A flare for landing

*Captian David Jacobson is a training captain on DC-9s with Australian Airlines and is a Grade 1 instructor at the RAAF Point Cook Flying Club. His system sounds complicated at first but in reality is delightfully simple. It works for little aircraft too.*

OF ALL THE manoeuvres performed in fixed-wing aircraft, the landing flare is an enigma. It is critical to the safe and satisfactory conclusion of flight and yet, despite international research, remains more an art than a science. The way the pilot judges the flare is still not fully understood.

Student pilots and experienced pilots alike find it at times alternatively satisfying and frustrating, simple and complex, safe and hazardous.

In *Digest 129* the Bureau of Air Safety Investigation identified improper landing flare as the third most significant of thirteen factors in instances where pilot factors were assigned to accidents involving private pilots.

In an age of technical precision, this critical manoeuvre remains imprecise.

This proposal discusses a practical technique for establishing a consistant flare point which does not rely on the pilot's perception of vertical height. It embraces the physical principle of motion parallax to provide a simple cue for commencement of the flare. No device or modification is required and therefore no costs are incurred. Safety is enhanced and the technique is 'pilot-portable'.

## Current practice

The landing flare is one of the last critical phases of flight to which the term 'seat-of-the-pants' may still be applied. The vast majority of landings, worldwide, are practised by pilots utilising highly developed qualities of judgment, co-ordination, experience and skill.

Existing flare techniques involve a critical estimation of height above the landing surface. This is very difficult to achieve because the estimation of height and the particular height are subject to many variables, such as:

- Aircraft type.
- Aircraft size.
- Aircraft configuration.
- Glide path angle.
- Pilot total experience.
- Pilot recent experience.
- Pilot experience on type.
- Pilot seating position.
- Pilot performance or skill.
- Landing surface.
- Day versus night.
- Visibility.
- Wind and turbulence.

Historically, instruction in determining a suitable and consistent flare point has been inadequate to say the least. We are attempting to recognise and extract one flare point from a range of acceptable flare circumstances. Generally, the best that instructors have been able to manage is to demonstrate a suitable flare point for a particular aircraft as being 'about here'.

The student pilot has no proper model except in his memory, and that in itself is inconsistent. Trial and error are the arbiters in determining the soundness of his developing judgment. Unfortunately, even after the basic skills are mastered, the problem still exists because every aircraft type requires a different flare height. As a pilot converts to successive aircraft types, he faces the same problem over and over. He has no proper model at the very time he needs one most, and there lies a clue.

Just as the student pilot consolidates his flare-height judgment, so does the experienced pilot after conversion to another aircraft type. After a time, he becomes comfortable with his aircraft (if he consolidates and flies regularly), and can land it as well as any flown previously. Probably, this is a subconscious recognition of something visible to the pilot through his windshield that is providing a useable cue for flare. Obviously, to achieve consistency some recognition and quantification is necessary.

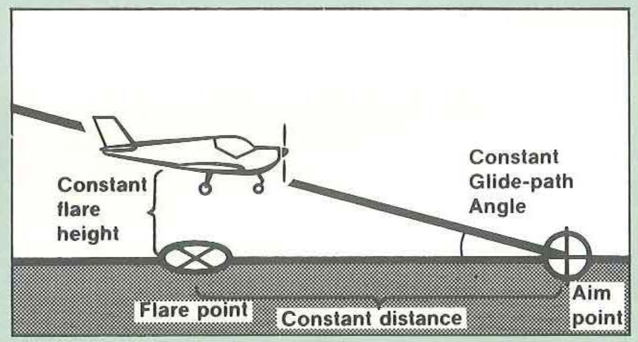
Vague terms such as the height of a double-decker bus, 20 feet, when the individual blades of grass are discernible, when the ground starts to 'rush', when you feel that your feet are just about to reach the threshold or 'about here' are too imprecise or inconsistent. And for a student they are almost incomprehensible.

We need to bring this 'something' out into the open so that we know exactly what we are looking for, what works for us, and what to use in the future.

## Another way

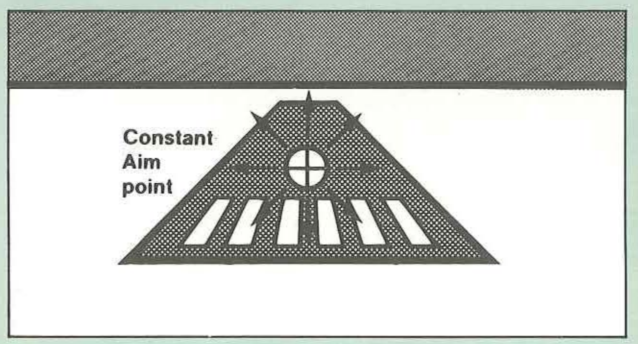
When properly taught, pilots have little difficulty with the concept of selecting and flying an approach to a nominated aim point on the landing surface. With or without glide-slope guidance, pilots can learn to fly a consistent and stable approach angle to the aim point.

Accepting that the glide-path angle may be fixed within reasonable tolerances, it follows that any point located longitudinally on the approach path, short of the aim point, will correspond with a particular vertical height (simple triangulation).




Therefore, a flare-height of greater consistency than is possible using mere perception could be provided by a suitably chosen point along the approach path and overflown by the aircraft.

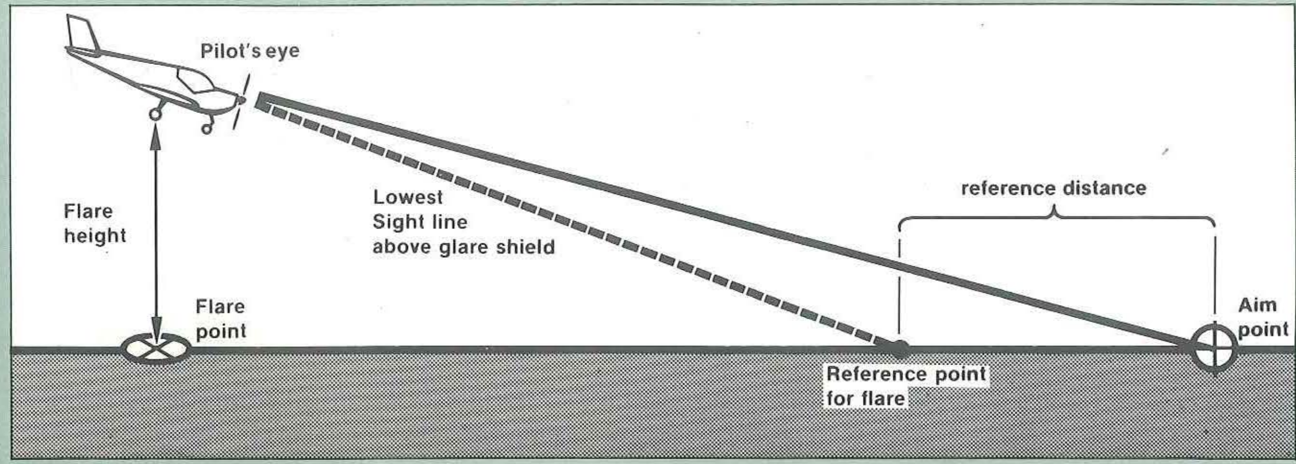
Much has been written on the subject of the aim point being the centre of expansion of a flow pattern, providing the pilot with a visual illusion as points surrounding the aim point accelerate radially outwards as the aircraft approaches the ground (motion parallax).




Points beyond the aim point will appear to move upward from the aim point, while points short of the aim point will appear to move downward. It is a point in this 'six o'clock' sector of the pilots' view which has proven useful.

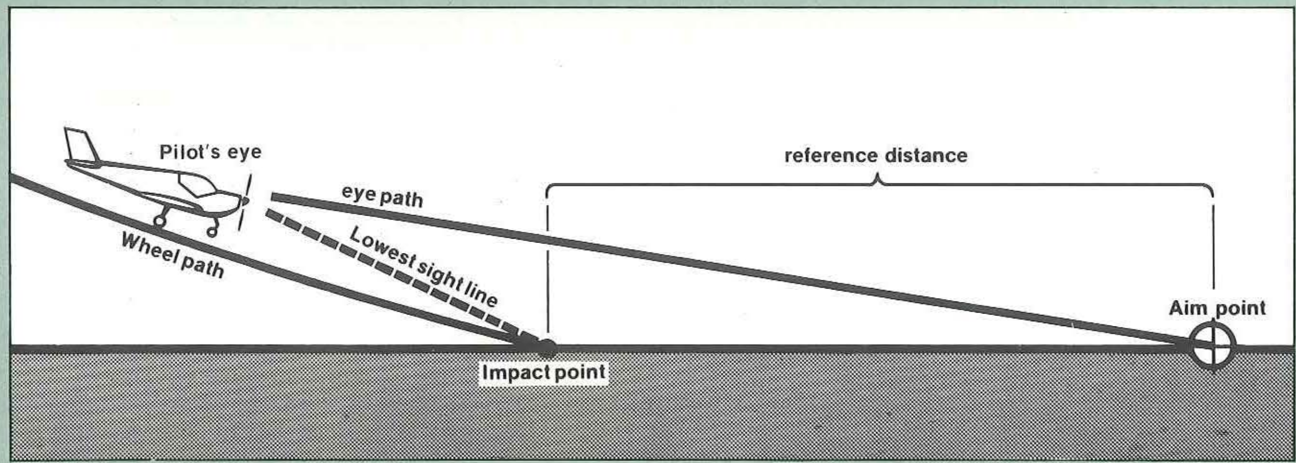
If such a point were selected and could be simply identified, a consistent longitudinal fix for the flare point for a given aircraft could be obtained as the preselected point appeared to move down the windshield (due to increasing depression angle) to the point where it reached the lower vision or cut-off angle (limit depression angle) of the cockpit. This angle is dictated by the geometry of the pilot's seating position in relation to the aircraft structure, where, within limits, some design consistencies exist between aircraft types.






Calculation of this distance from the aim point to the flare cut-off point involves energy/geometry considerations, quickly determined in practice but complicated to derive by analysis. However, a suitable approximation, based on aircraft/approach geometry, and thorough practical testing, has provided a simple and effective alternative technique with near universal application.

For a given aircraft type, the distance between the aim and impact points has provided suitable quantification for the flare-point estimate. This distance accommodates the critical variables of glide angle, eye height above mainwheels and horizontal distance between the mainwheels and the pilot's eye — when the aircraft is on a stable approach in the landing configuration and attitude.




## The Jacobson Flare

On final approach, the aircraft occupies space vertically, in practical terms between the pilot's eye and the main wheels. Two parallel paths may be traced down the approach path: the pilot-eye path which intersects the landing surface at the aim point; and assuming, no flare, the lower mainwheel path which would intersect the landing surface at a point called the impact point.

The exact formula for computing the position of the impact point is simplified as follows:

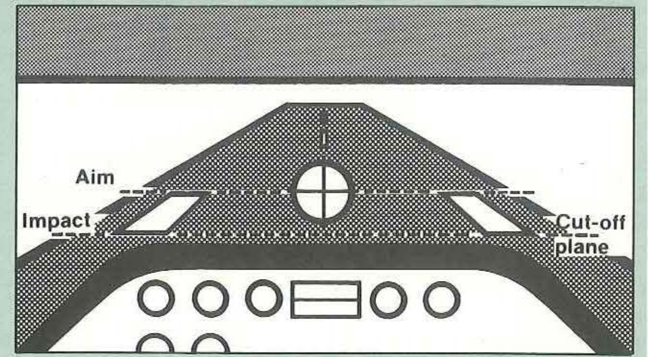
The flare is initiated when, on a stable approach, the pre-determined impact point, appearing to move downward from the aim point, reaches the cockpit cut-off angle and disappears from view under the aircraft. In practice, it is the simplest of tasks to notice the aircraft overtake the impact point while flying an approach using standard techniques. It does not detract from the pilot's attention because the point in question is on the approach centreline in the pilot's *normal* field of view.

$$\text{Distance short of aim point (Reference distance)} = \left(\frac{60}{\text{glide-path angle}} \times \text{vertical height of eyes above mainwheels}\right) + \text{horizontal distance of eyes from mainwheels}$$

For example: a light aircraft with the pilot's eyes 5 feet above the mainwheels and no significant horizontal distance between them -- on a 3% glide-path angle;

Reference distance $= \frac{60}{3} \times 5 = 100$ feet (i.e. flare reference point is 100 feet short of the approach aim-point and when that point disappears below the coaming, it is time to start the flare.)

The next important step is to locate the calculated impact point on the landing surface, short of the aim point. Many aviation authorities have developed runway surface markings as distance guides, often at 500, 1000 and 1500 feet from the approach threshold.




Simple interpolation of these markings by the pilot satisfies the practical requirements for a visual fix along the approach axis. Where distance markers do not exist on a landing surface, the pilot can estimate the position of the impact point using variations in surface colour or texture for identification. For night operations from these surfaces, calculations based on the known distance between runway-edge lights provide the pilot with a similar cue.

This flare-point concept is extremely tolerant when compared with traditional perception techniques. For a standard 3° glide path, any error of judgment of flare height will, within limits, be magnified approximately 20 times, longitudinally. In marked contrast, any longitudinal inaccuracy will be reflected as only 5 per cent of the figure, vertically. The expanded scale of the approach axis (approximately 20 times the vertical dimension), together with a visual fix, provides a model that is *visible* and which provides unparalleled consistency of judgment for student and experienced pilot alike.

## Non-standard approaches

The impact point calculated for a normal approach also serves for non-standard landing configurations, with their likely variations in aircraft attitude. An aircraft on approach at a higher attitude (body angle) than normal would require a higher flare point to accommodate the reduced mainwheel clearance. The higher attitude self-compensates because the lower cut-off angle is reached further back up the approach path, providing an earlier cue to flare, as would be expected. The converse also applies.

## Conclusions

This technique is simple, practical and extremely effective. It was developed and tested over a period of three years in many aircraft types, ranging from single-engine light aircraft to large jet transports, by civil and military pilots of varied ages, abilities and experience — and it works □

# The gentle touch

*There are many ways to skin a cat — and it seems there are just as many ways to land an aeroplane. Many of us have our pet theories. This is mine.*

*by David Robson*

WE HAVE discussed the control of the aircraft. I have mentioned the constant attitude approach technique that I favour. Warren Wilk's article modifies that technique to include the use of power to offset the drag of the flap — without changing attitude further. Captain David Jacobson has described his novel and successful cue for initiating the flare. Well we are almost on the ground — but not quite.

The major problems that I observed as an instructor were related to the actual process of flaring the aircraft, such as:

- early or late rotation,
- too fast or too slow an attitude change,
- too much or too little rotation,
- overcontrolling in the flare,
- holding the controls fixed and waiting for the 'crunch',
- pushing the controls forward to keep the runway in sight or to get the landing over with.

It was my feeling that the reason for all of these problems was that the pilot didn't have a reference point to aim for. There was a tendency to gaze at the approach aim-point, the far horizon, the expected touchdown point, some other part of the runway or even the nose of the aircraft.

I would now like to introduce a way of controlling the aircraft in the flare that has helped me and my students to land safely and consistently.

The flare is initiated by raising the nose attitude to reduce the rate of descent and to change the flight path. The power is reduced to cause the speed to decay, either ahead of, during or after the attitude change. The timing of this power reduction is largely a matter of whether the threshold speed was slightly high, low or spot-on, whether the descent angle was steep or shallow and what the shear and turbulence is like.

But let's consider the reference point a little further.

We can all fly visually — fly the aircraft so that it will actually hit an aim-point. So why not use the same technique for landing the aircraft?

## But what to aim to reach?

I found with my students that if I could convince them to actually aim to reach the centre of the far end of the runway, then the aircraft would land itself. They knew exactly what to aim for and they didn't 'tense up'.

From initiation of the flare the original aim-point serves no further purpose — it has already positioned us over the threshold at the desired height. We then need something else to aim for. The point at the centre of the far end of the runway is useful for several reasons:

- it is a constant point if we are flying directly towards it [and we are not trying to guess height or flight path from rapidly moving peripheral cues],
- it is the best reference for distance-to-go information,
- it is the best reference for tracking or directional information,
- it is the best reference for drift information.
- it is the best reference for flight-path information.

When I'm sure that the momentum of the aircraft will carry me to the approach aim-point, I transfer my attention to the centre of the far end of the runway. I simply start to flare, close the throttle and *continue to actively fly the aircraft in an attempt to get my eyes to actually reach the centre of the far end of the runway.* I **strive** to get there.

This reference then causes the aircraft's flight path to converge on the far end of the runway — both laterally and vertically. The aircraft descends ever so slightly until the wheels touch. There is no tendency to overcontrol nor for a divergent flight path to go undetected.

It only remains for the pilot to correct any drift before touchdown and to hold the attitude on touchdown until the nosewheel is lowered.

For landings with less than full flap or for taildraggers, it may not be possible to keep the flare aim-point in sight until touchdown — the nose gets in the way. I find that I can imagine the nose is transparent and I can picture the position of aim-point as if the nose weren't there. There are enough cues to be able to imagine this without difficulty — in fact, *this* may well be what we have been doing unconsciously for years.

With this flight-path aim-point and a deliberate attempt to reach it, I have found that it is rare for students to misjudge the flare and they seem to develop confidence in their ability to land consistently. There is just as much need to have the correct threshold speed and approach path and to start the flare at the right place but the landing itself becomes consistently easier — and the touchdown more gentle □



# When everything turns to worms

*It happens to all of us occasionally!*

*Every contact should have an escape clause.*

IF THE APPROACH doesn't turn out to be as controlled or as accurate as planned, then there are always escape routes — provided we have left ourselves an 'out'.

It is possible from any stage of a normal approach or landing to go around and start again.

Within the approved limits of loading, environmental conditions and runway criteria, a light aircraft can safely climb away from a misjudged approach or mishandled landing if the correct technique for that particular aircraft is used.

Check the technique described in the flight manual for your aircraft and rehearse it both mentally and actually so that when the time comes, you are prepared.

As a general guide, my normal procedure for a go-around is:

- smoothly apply full power (taking the propeller and mixture levers forward with the throttle),
- set the normal climb attitude, and
- partially retract the flap.

When the aircraft is positively climbing, I retract the undercarriage.

When the aircraft is safely clear of the ground, I retract the remainder of the flap.

For a bounce on touchdown, I force myself to concentrate on the far end of the runway and to set an attitude that will get me there.

If the bounce is bad or the aircraft gets 'hung up', then I go around.

There are rarely situations in flight where the pilot hasn't sufficient control or where the aircraft hasn't sufficient performance to 'escape' for another try provided:

- the decision is made as soon as the pilot feels less than comfortable with the way the approach is going,
- the procedure for our aircraft is rehearsed — at least mentally.

Both of these precautions save time and confusion when the landing 'turns to worms'.

See? Landing's not so difficult after all □

# Seat belt, belt, belt, belt, belt, belt, belt

*A stitch in time . . .*

*For the sake of a . . .*

AS THE PRINT folded out of the BASI computer I was frankly amazed at the results. I knew of the occasional aborted sortie due to noises and vibrations — noises and vibrations caused by the seat-belt or buckle oscillating in the breeze — but I had no idea of the frequency of these occurrences.

Have a look for yourself:

Oct 76 — Boeing 727 — RPT
Pilot aborted takeoff due to report from cabin crew. Strap handing out of buffet door.

Oct 77 — Cessna 150 — Training
Aborted takeoff due to banging noise. Seat-belt hanging out.

Oct 78 — Cessna 206 — Charter
Returned for landing due to flapping noise. Seat-belt hanging out.

Feb 79 — Cessna 150 — Training
Pilot made a precautionary landing on the field due to a loud metallic noise emanating from under the fuselage. Seat-belt found protruding from door.

Mar 79 — PA32 — Charter
Returned after report of seat-belt hanging out of door.

Jun 79 — BN2 — Charter
Knocking noise from side of aircraft. Returned for landing. Unused harness hanging out.

Mar 80 — Cessna 206 — Charter
Returned for landing due to seat-belt flapping in the slipstream.

Oct 80 — Cessna 152 — Training
Loud flapping noise and vibration experienced during turn at 500 feet during night VMC solo training flight. Seat-belt flapping outside.

Nov 80 — Cessna 210 — Private
Aircraft returned due to loud banging noise from side of aircraft. Protruding seat-belt was banging against side of aircraft.

Jan 81 — Boeing 727 — RPT
Returned due to strap caught in rear galley door.

Feb 81 — Cessna 172 — Private
Returned due to knocking noise after takeoff. Seat-belt banging against side of fuselage.

Mar 81 — PA38 — Training
Instructor heard a very loud banging noise and suspected an engine failure. Seat-belt was discovered hanging from door and flapping against fuselage.

Apr 81 — Bell 206 — Business
Climbing through 1000 feet a loud clunking noise was heard. Pilot landed in allotment. Seat-belt hanging out.

Apr 81 — PA31 — Charter
Returned after pilot reported a door problem. Seat-belt was hanging out.

Jun 81 — Cessna 152 — Private
Pilot thought that the engine was running roughly and returned. Seat-belt was flapping against fuselage.



Aug 81 — Bell 206 — Charter
Pilot heard a loud clapping noise; declared a PAN and landed. Passenger's seat-belt was hanging outside.

Sep 81 — Cessna 152 — Training
Shortly after takeoff the pilot heard a loud noise accompanied by vibration. Returned for landing. Probable seat-belt protrusion.

May 82 — Hughes 269 — Charter
Pilot reported noisy blades. Aircraft landed safely. Paint on fuselage suggested that seat-belt was flapping.

Nov 82 — Cessna 206 — Private
Pilot reported loud flapping noise and returned for emergency landing. Seat-belt found protruding from door.

Dec 82 — Cessna 152 — Private
Pilot reported unusual loud noises coming from outside the aircraft and requested an immediate landing. Seat-belt trapped outside the cockpit.

Jul 83 — Grumman A7 — Charter
Pilot realised that the sound from the right fuselage was caused by a seat-belt. He abandoned the takeoff.

Jul 83 — PA38 — Private
Just after takeoff a loud banging noise was heard at rear of cockpit. The aircraft was landed. Lap belt and buckle hanging out.

Jul 83 — Cessna 210 — Charter
Pilot reported that he was experiencing a thumping noise outside the aircraft. He returned for a landing. A few inches of the strap for the cargo net was hanging out of the door.

Aug 83 — PA28 — Private
After takeoff the pilot heard a severe banging noise and returned for a landing. Metal end of seat-belt was flapping against side of fuselage.

Aug 83 — Cessna 152 — Training
After takeoff the pilot heard a loud banging noise which he thought was coming from the engine cowling. The pilot declared a PAN and returned for a landing. Seat-belt was found protruding from the door.

Nov 83 — Beech 58 — Charter
Pilot advised she was returning for a landing due to a seat-belt hanging out of the door. After rectifying the seat-belt she advised that she was landing with the door open.

*. . . and so on.*

There are several lessons to be learnt here:

- *most of these incidents involved charter or training sorties — understandably*
- *almost every pilot correctly aborted the flight and returned for an immediate landing.*

As pilots-in-command, we are responsible for the safety and security of all on board. Instructors are ultimately responsible for their students and pilots are ultimately responsible for their passengers — *or their vacant seats.*

Every aircraft seat should possess a secured passenger, pilot, student or empty-but-tied-up harness.

Apart from the considerable loss of revenue due to these aborted sorties, there is always the potential for a more serious outcome due to the distraction alone.

There are two other aspects that come to light in these incidents:

- the aborted takeoff,
- the attempted in-flight cure for the problem.

## The aborted takeoff

When the pilot detects something unusual during the takeoff roll, there is a critical decision period — a period in which the pilot has to assess the extent of the problem and decide which is the lesser of the two evils — to abort or to continue with the takeoff.

Certainly at the very beginning of the takeoff roll there is no reason to continue and the aircraft can be brought to a halt without difficulty. As the aircraft accelerates, the problem becomes less clear. Aborting the takeoff may cause more damage than it cures. There again, continuing the takeoff with an aircraft that may be less than serviceable has inherent dangers.

There is no clear-cut, black-and-white criterion — the pilot must decide on the basis of the symptoms and his or her assessment of the risks.

I recently had a door come open on a Duchess just as I lifted off. That of course is a critical time for things to happen in a twin-engined aircraft and there is only an instant to decide what is occurring. I think that I waited a second to see if there were any changes in aircraft behaviour or performance, in control response or flight path, and I elected to continue the takeoff and reassess the situation when I was safely clear of the ground.

## The in-flight cure

In one of the incidents described above, the pilot attempted to recover the protruding seat-belt in flight and was then left with the problem of flying around with a door that couldn't be closed and locked. It is difficult if not impossible to close a door in flight — you can't open it enough to slam it shut and often there is some negative pressure that prevents it fully closing. It is noisy and somewhat distracting though and it makes it even more important for the pilot to concentrate on the job-at-hand — and to fix the problem when safely back on the ground.

It is worthwhile to muse occasionally on the possible events and our options in various scenarios. This I believe is one of the vital benefits of publications such as the *Digest*.

Think about it — please □

# AIRFLOW

Gentlemen:

We read your recent article 'I wouldn't be seen dead without my bone-dome' with interest. We congratulate pilot Gavin Thomson for his wisdom in persevering and wearing his helmet in spite of his original discomfort.

The Gentex SPH-4 helmet has been in service in the U.S. Army since 1969 and during those 18 years has been responsible for saving many lives. Consequently, it continues to be the helmet of choice in the Army, Navy (SPH-3C) and Air Force. Nonetheless, there has been a continuing effort to make it better as technology advances, and the result is a completely new SPH helmet currently known as the SPH-5. The features which distinguish this helmet from the SPH-4, to which it looks outwardly identical, are as follows:

- new lightweight shell of fibreglass on Kevlar
- new thicker, less dense impact liner with greater area of coverage
- new custom-fittable thermoplastic fitting liner
- new energy-absorbing earcups
- new adjustable universal retention
- new 300 pound chinstrap
- new lightweight dual visor system.

(Total weight for an extra-large-size helmet is less than 3 lbs with dual visors.)

The helmet now complies with a revised U.S. Government specification which substantially increased the impact resistance requirements, both in the cranial and lateral regions. This means that the 'g' forces transmitted to the head through the helmet in a crash are considerably less than before.

The Australian Forces have for years flown the SPH-4A which was a variant of the SPH-4 designed to their own requirements, and not a standard U.S. Army SPH-4. It was a heavier, dual-visor helmet system. In switching to another helmet, the RAAF did not take into consideration the properties of the SPH-5, which we consider to be unfortunate.

Please continue to encourage your readers to utilise their life-support products whenever flying. Whatever discomfort there may be is compensated for by the benefits of having the item in place when disaster strikes. We in the industry will in turn continue to strive to make the products more user-friendly, while maintaining the highest possible levels of protection.

Sincerely,

GENTEX INTERNATIONAL, INC.

Charles G. Rudolf
Managing Director
Worldwide Defence Marketing

Dear Sir,

Why the change of ruling with respect to DME limits in HOLDING PATTERNS? The old rule where the time could be exceeded as long as the DME limit was adhered to seemed quite logical. Could you explain why the inbound turn must now be commenced prior to the O/B time limit, even if within DME limit?

Yours sincerely,

Brent McColl

*I am advised as follows:*

*AIP IAL-2-6 para 3.4 describes how to fly the standard holding pattern. Sub-para (b) specifies the drift allowance to be used on the outbound leg. Procedure designers use this drift allowance coupled with the procedure time and the maximum IAS to assess separation from obstacles and other aircraft. If, as you propose, you continue outbound for a longer time than has been allowed, you have the potential to generate a greater cross-track error than that for which protection has been provided. Therefore, the use of DME is to control the absolute length of a procedure for fast aircraft and for strong tailwinds and not to allow slow aircraft to lengthen procedures.*

Several readers have written to me regarding the accident to VH-WRV at Bankstown. Briefly, the aircraft landed at night, wheels-up. The pilot vacated the aircraft after turning off the Master switch. A Cessna 172 was cleared for takeoff, with the Aerostar still occupying the strip. Luckily, the instructor in the Cessna saw the other aircraft in the beam of his landing lights and managed to clear the Aerostar by 20 feet.

Comments that I have received suggest that the wording of the accident summary implied criticism of the pilot for shutting everything down before advising the tower that the aircraft was still on the runway.

Both the tower controller and the instructor in the Cessna were tricked into believing the Aerostar was clear because it veered left just before it stopped.

My view is that the pilot of the Aerostar acted correctly in switching-off and vacating the aircraft immediately it came to a stop. However, I am not in the business of attributing blame. Both the controller and the instructor were deceived and perhaps should have double-checked that the runway was clear — but it does illustrate how easily such an incident can occur.

Dear Sir,

In his account of a flying trip to Wolf Creek Crater (*Airsport*, January 1986), Claude Meunier reported crossing paths with five wedge tail eagles, two of which dropped into vertical dives, and he posed the question, 'Is this their way of dodging aircraft?'

The great English glider pilot, Phillip Wills, writing of his experience while flying in Africa, pointed out that large soaring birds such as eagles and vultures are much too heavy to even sustain flight by flapping, much less climb to any marked degree. From the ground it requires a supreme effort to become airborne and to elevate themselves to a perch in the nearest tree. They are only able to flap briefly to launch themselves into thermals and if they didn't find lift almost immediately, they would return to their perch.

Many moons ago while flying cross-country in a sailplane, I spotted an eagle on the same heading about 200 metres ahead and slightly below, so I decided to sneak up on it and give it a fright.

As is their habit and purpose in such a situation, the bird had its head down, scanning the ground in search of a meal, and it was about three metres ahead and two metres inboard of the starboard wingtip when it became aware of company.

I still retain a mental snapshot of the look of terror in its beady eye in the instant it raised its head and saw its attacker. The reaction was immediate as it rolled to the right, folded its wings and plunged straight down.

It seems probable that eagles only take this evasive action when they are taken by surprise or feel menaced — only two of five birds encountered by Claude Meunier did so — and it is not unusual for eagles to share thermals with sailplanes when they have had the opportunity to become accustomed to the presence of the other large birds.

Considering that the best glide speed for the eagle is probably about 25 to 30 knots and its ability to climb in an emergency is practically nil, there is only one way to go — down. It seems likely that when eagles are said to have attacked aircraft, they were in fact simply seeking to escape by the only path available to them for a rapid exit.

In view of the above, it would seem that the rule for avoiding our feathered friends is around or over, *NEVER UNDER*!

G.A.

*I agree. In my experience birds do indeed head for the ground when they see you coming.*

Dear Sir,

I thought you might be interested to hear of the following incident involving my A36 Bonanza recently. The aircraft had been parked in the open on a country airstrip 25 miles south of Goulburn and had been left unattended for about three weeks. When I carried out my preflight inspection, I noticed bird droppings on the right main gear wheel. A careful inspection of the undercarriage-well revealed a Swallow's mud nest. I removed the nest at that time.

On another occasion, about three weeks later, on inspecting the undercarriage-wells I found another Swallow's nest in more or less the same location. On this occasion there were no telltale bird droppings to suggest the presence of a nest.

Accordingly, when aircraft are parked in the open it is important to carry out a careful inspection of all possible locations for nests. On the occasion when I found the first Swallow's nest in the undercarriage-well, there was also one in the engine compartment, which of course became perfectly obvious as part of the routine preflight check. It becomes apparent that an undetected bird's nest could be a cause of malfunction of the undercarriage mechanism.

I might mention another hazard which is probably rather more obvious. The aircraft had again been left in the open during some of the torrential rain last year. My initial check for water contamination was done with one of those narrow plastic tubes which has a screwdriver at one end. This did not demonstrate any fluid level but the colour of the drain contents did not look quite the normal fuel colour, although it did have a tinge of dye. Also when I tipped the contents over my hand, the surface tension did not appear to be that of fuel. Accordingly, further fuel was drained off into a small soft-drink bottle and after about three or four litres had been drained, the fluid level became apparent. It was necessary to drain a further two or three litres before the fuel presented free of water contamination. It is apparent that if on inspection of the drained fluid there is no fluid level, it may be assumed that there is no water contamination when in fact the drained fluid consists entirely of water.

This experience confirms the wisdom of checking for the presence of water with the water-detection paste should any doubts exist about water contamination.

If one has doubts whether the drained fluid consists entirely of water a small quantity of water can be added which will of course provide a fluid level if in fact the drained fluid is all Avgas.

Yours sincerely,

Edward W. Gibson