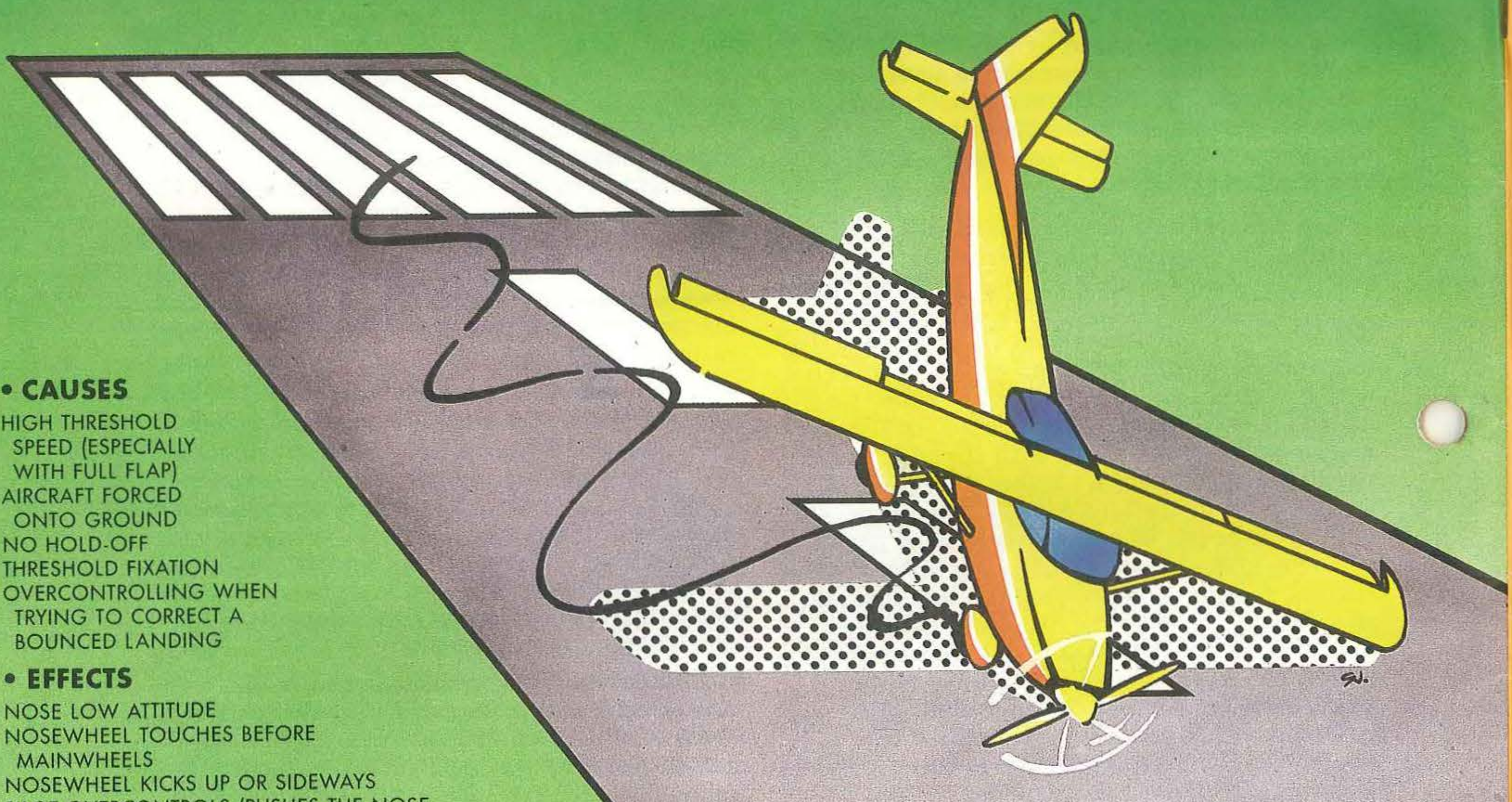
WHEELBARROWS
are designed for it ...



• CAUSES

HIGH THRESHOLD SPEED (ESPECIALLY WITH FULL FLAP)
AIRCRAFT FORCED ONTO GROUND
NO HOLD-OFF
THRESHOLD FIXATION
OVERCONTROLLING WHEN TRYING TO CORRECT A BOUNCED LANDING

• EFFECTS

NOSE LOW ATTITUDE
NOSEWHEEL TOUCHES BEFORE MAINWHEELS
NOSEWHEEL KICKS UP OR SIDEWAYS
PILOT OVERCONTROLS (PUSHES THE NOSE DOWN)
NOSEWHEEL COLLAPSES
PROPELLER STRIKES
AIRCRAFT BREAKS

• PREVENTION

CORRECT THRESHOLD SPEED FOR AUW AND CONFIGURATION
HOLD-OFF UNTIL LANDING ATTITUDE
DON'T FORCE IT ONTO THE GROUND
KEEP THE NOSEWHEEL OFF UNTIL THE MAINS ARE ON THE GROUND
GENTLY LOWER THE NOSEWHEEL BEFORE BRAKING
PULL THE CONTROL COLUMN BACK AS THE BRAKES ARE APPLIED

• CURE

IF THE AIRCRAFT BOUNCES OR THE NOSEWHEEL TOUCHES AND REARS UP OR THE AIRCRAFT STARTS SNAKING DOWN THE RUNWAY:

PULL THE CONTROL COLUMN BACK TO GET THE NOSEWHEEL OFF THE GROUND
OR THE WEIGHT OFF THE NOSEWHEEL
SET AND HOLD THE LANDING ATTITUDE
IF THERE'S ROOM — CONTINUE THE LANDING NORMALLY
IF THERE'S NOT — HOLD THE LANDING ATTITUDE
APPLY FULL POWER
SET CLIMB ATTITUDE
FLAPS TO INTERMEDIATE (IF THEY SERIOUSLY AFFECT CLIMB PERFORMANCE E.G. C150)
WHEN SAFELY CLIMBING — GEAR UP
FLAP UP
(IF YOU SUSPECT THE PROP HAS HIT THE GROUND — CLOSE THE THROTTLE AND STOP AS BEST YOU CAN.)

AUSTRALIA

Aviation Safety Digest

ASD 133
WINTER 1987

DEPARTMENT OF Aviation

Aviation Safety Digest *is prepared by the Department of Aviation and is published by the Australian Government Publishing Service. It is distributed to Australian licence holders (except student pilots), registered aircraft owners and certain other persons and organisations having an operational interest in safety within the Australian civil aviation environment.*

Distributees who experience delivery problems or who wish to notify a change of address should contact:

The Publications Distribution Officer (EPSD)
Department of Aviation
P.O. Box 1986, Carlton South, Vic. 3053,
AUSTRALIA
Telephone (03) 667 2733

Aviation Safety Digest *is also available on subscription from the Australian Government Publishing Service. There is a subscription form in this issue. Inquiries and notifications of change of address should be directed to:*

Mail Order Sales
Australian Government Publishing Service
G.P.O. Box 84, Canberra, A.C.T. 2601,
AUSTRALIA
Telephone (062) 95 4411. Telex AA62013

Subscriptions may also be lodged at Commonwealth Government Bookshops in the capital cities.

The views expressed in the Aviation Safety Digest are those of the editor or the individual contributor and are intended to stimulate discussion in the fields of aviation safety and related areas. They do not necessarily reflect the policy of the Department. The articles are intended to serve as a basis for discussion and even argument in an effort to identify and resolve problem areas and potentially hazardous situations.

Unless otherwise noted, articles in this publication are based on Australian accidents, incidents or statistics.

Reader comments and contributions are welcome but the editor reserves the right to publish only those items which are assessed as being constructive towards flight safety.

Reader contributions and correspondence should be addressed to:

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Canberra, A.C.T. 2601, AUSTRALIA

ISSN 0045-1207
R85/979(4) Cat. No. 86 0310 3

Printed by Ambassador Press Pty Ltd
51 Good Street, Granville, N.S.W. 2142,
AUSTRALIA

Contents

Editorial

Winter

IT'S AMAZING how many images a single word can generate. The precise image depends on our locale and our experiences — winter means different things to different people. It also varies in significance according to our professions, hobbies and means of travel. The aviator is probably the most significantly affected by weather — and I include mariners in that judgment.

The single-engined light aircraft is probably the most vulnerable vehicle of all. I don't mean unsafe. I mean that the pilot has to take special precautions because of that vulnerability. The aircraft is vulnerable to wind for takeoff and landing. The aircraft is vulnerable to rain in the form of pooled water or precipitation. The aircraft is vulnerable to frost and ice. The piston engined aircraft is vulnerable to carburettor icing. The slow aircraft is vulnerable to airframe icing. The VFR aircraft is vulnerable to low cloud and reduced visibility. All are vulnerable to mechanical turbulence and vertical gusts.

Sounds gloomy, doesn't it? But I say again that it isn't necessarily unsafe — just more demanding on the pilot to maintain adequate standards, margins and escape routes. The planning must be more thorough. The caution more evident.

Of all the threats to a safe flight, probably the most frequent is simply wind — in all its various guises. The aircraft is most vulnerable during takeoff and landing and that's just where the wind is least predictable because of frontal weather, local effects beneath and around storm clouds, terrain effects and the influence of buildings. The aircraft's vulnerability is reflected in the number of accidents that we have during these phases of flight.

This vulnerability also can be countered:

- by avoiding the critical situations — and this requires some sensitivity to be able to 'read' the conditions — such as watching for problems near thresholds that are partly sheltered by trees
- by allowing 'room to manoeuvre' — adding a small additional amount to approach speed, picking a runway that has very clear approaches and overruns, and picking the time of day that minimises the risk of gusts or shear
- by staying current in the particular environment and the particular skills that are necessary for this type of flying
- by having a check-flight with your CFI to brush off those cobwebs.

Winter flying can be most enjoyable and there is no reason to be deterred from flying in winter. Just keep a weather eye open ☐

DAVID ROBSON
Editor

Front. 'Raindrops on Roses, and Dewdrops on Noses.' A cold spring morning at Bathurst before the SCAR 1986. Corby Starlet VH-PVS.
Photograph by David Robson —
NIKON F — FUJICOLOR.

Back. Wheelbarrowing is a harrowing experience — and a recurrent one in the accident statistics.
Poster design by Soussanith Nokham.

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	P 8	*Ron Israel*
	P 19, 20	*Steve Small*
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Aphorisms:		*David Robson*

Kilmore — apt but sad

That dreaded gap

THE PILOT and his four passengers had planned a trip to Sydney and back for the ANZAC Day long weekend. In preparation for the flight, the pilot had obtained a flight check in a Bonanza.

On the morning of the flight, the pilot checked the route forecast and submitted a flight plan at Moorabbin. The flight plan showed that the flight would proceed via Mangalore OCTA, below five hundred.

When the flight plan was submitted the pilot was advised that the weather was not suitable for a VFR flight through the Kilmore Gap. For those who don't know the area, the Kilmore Gap is a route through high terrain north of Melbourne and allows a VFR flight out of Melbourne, clear of controlled airspace — weather permitting.

The pilot decided to delay his departure until the conditions improved.

The pilot and his passengers subsequently boarded the aircraft. His taxi call was not the normal GAAP procedural call and he asked for airways clearance which suggested he was not current on operations from Moorabbin.

The aircraft was cleared for takeoff at 0857 hours. The pilot had not requested an update of the weather in the Kilmore Gap. At 0904 a radar return was observed by the Melbourne Approach controller near Doncaster shopping town, inside Melbourne's CTR. The pilot was asked to activate his transponder. The aircraft was at 2500 feet and was asked to maintain altitude and heading.

At 0908, the pilot, on request, advised that he had Yan Yean reservoir in sight and that he was happy to resume pilot navigation. He was transferred to Flight Service and reported cruising at 2000 feet.

The Met radar at Laverton was showing an area of rain-bearing cloud between about Whittlesea and Broadford and also to the west. The pilot reported that he had received a revised area forecast that was transmitted on that frequency.

At about 0918 hours the aircraft was sighted over Kilmore at a height of about 600 feet agl, heading in a north-westerly direction. The aircraft was reportedly in and out of low cloud. Shortly after, the pilot was asked for an assessment of the weather in the Kilmore Gap.

In reply, he told Flight Service that the weather was unfavourable and that he was going to carry out a 180 degree turn. Some twenty seconds later he advised that he was unsure of his position and requested the aircraft's bearing from Melbourne. An Uncertainty Phase was declared. He was advised that the aircraft was not in radar coverage and asked if he could climb to 4000 feet altitude and still remain VMC.

The pilot advised that he was already IMC.

He was passed the Whittlesea weather in case he wanted to try and land there.

He was advised that three minutes earlier the aircraft was 30 miles north of Melbourne and that if he turned south he should come within radar coverage in a short time. Two minutes later the Flight Service asked his heading and altitude. The pilot replied that his heading was 120 and his altitude was 2000 feet.

Weather in the area included low cloud and rain. Nothing more was heard from the aircraft.

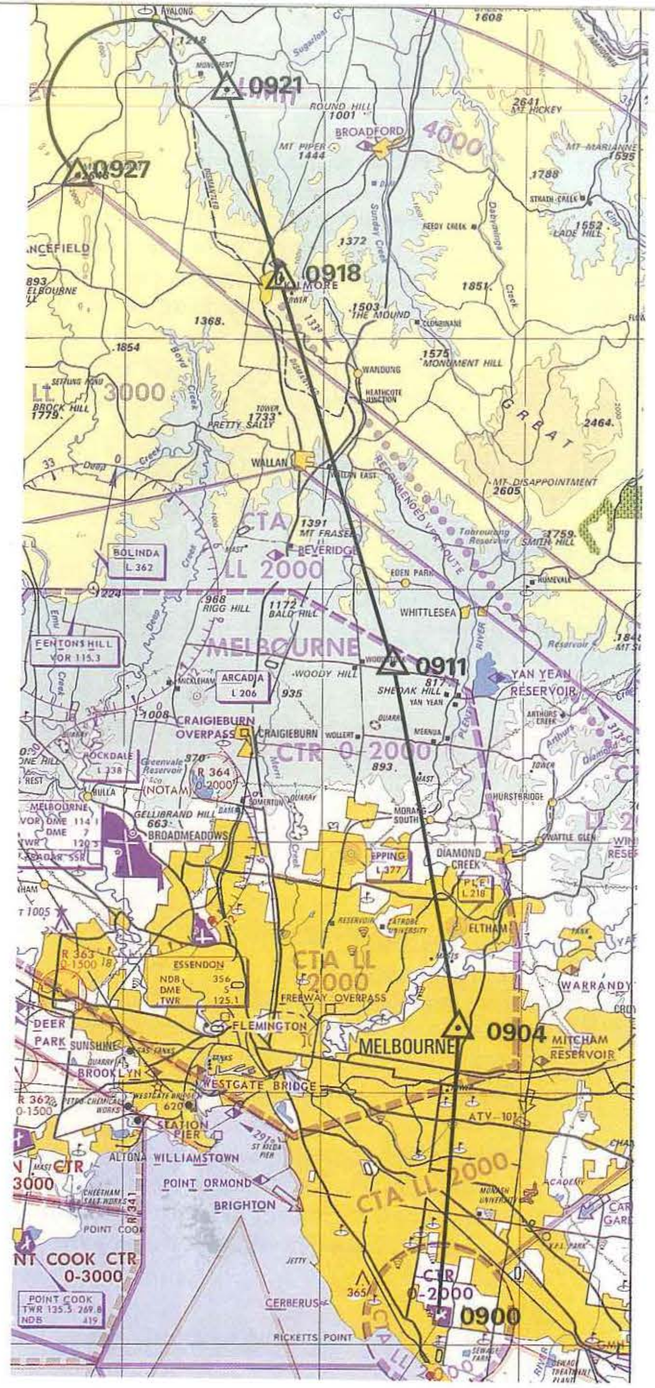
Residents in Mt William reported hearing an aircraft at about 0926. There was low cloud in the area, below 2000 feet. Some heard a muffled explosion shortly after. Another aircraft approaching Kilmore some five minutes later was VMC at 2000 feet but reported a wall of rain and cloud to the north and west of Kilmore. He turned back to Moorabbin.

The wreckage was finally located by a motor cycle rider that afternoon. Initial impact had been in a slight right-wing-low attitude on a heading of about 135 at an altitude of 2180 feet on the slopes of Mt William, the top of which is 2639 feet amsl. The aircraft was apparently under control at the time of impact.

After the initial impact the aircraft rolled inverted before striking the ground again, 70 metres further on.

Fire broke out and consumed the wreckage. There was no fault detected with the aircraft that would have contributed to the accident.

[I'll bet you knew the outcome of this accident as soon as I mentioned the Kilmore Gap.]



Priorities

1. AVIATE
2. NAVIGATE
3. COMMUNICATE

At certain times of the year, the Gap could be classified as a high-risk area for GA aircraft trying to remain VMC.

The pilot here was obviously a little rusty. He made some incorrect calls and was not fully current on the aircraft. To be fair he did have a check ride before this trip but the chain of circumstances was already in motion. Once he was in the shrouded valley his only way out was to climb — if he turned either way there was high ground — higher than his cruising altitude. He maintained control of the aircraft during the turn and nearly made it — but that mountain was in the way. The conditions demanded a very current, competent and confident pilot to safely complete the flight — even then it was likely that a non-rated pilot would have to turn back (or climb through the cloud even if not rated). This pilot maintained control through the turn and apparently could have coped just as well with a straight climb through cloud. In this predicament it is worth assessing the situation carefully before rushing into a turn. It may be better to climb on top, get radar assistance to a clear area and then let down visually. Most weather in my experience has gaps in it, and around Australia it is often layered so that you can safely fly on top of the scud until you reach a clear area. In any event, the first priority must be to climb to an altitude that gives you a safe margin above terrain. As soon as you lose your visual horizon, get 1000 feet above the surrounding terrain as quickly and as safely as you can — then sort out the navigational problem.

But let's not talk just about last ditch manoeuvres. There were many opportunities to discontinue this flight before the final turn.

Those of us who do not fly frequently have to allow greater margins, more time and very clear escape routes — *preplanned* escape routes.

First, establish some go/no-go criteria. For example, in the planned flight the pilot could have said to himself, 'If the cloud base is below 1500 feet or if the visibility is poor I won't depart the circuit. If the cloudbase is below 2000 feet I will not go beyond Ringwood. If the cloud base is 2000 feet I will go as far as Yan Yean reservoir and be ready to turn back. I will track to the eastern end of the reservoir so I can turn back to the left and avoid both the high ground to the north-east and the controlled airspace. If the cloud base is above 2000 feet and I can see Kilmore, I will go that far and be ready to turn back over the township if I can't obviously get through the Gap.'

In this way we can pre-consider the possibilities and have ready-made decisions. Decisions that will save time and confusion in the air. This sort of mental planning doesn't take long and it provides insurance — life insurance.

Think about it □

The keys of the kingdom

The airmanship checks

WE ARE ALL used to checks and checklists. We use them to start the engine, to functionally test the aircraft's systems and perhaps to check ourselves. It is these latter ones that I refer to as 'airmanship' checks.

Remember the 'CLEAR' check on a cross-country and the 'HASELL' checks before aerobatics or stalling? These are checks which go beyond checking the aircraft to include checks on the pilot, or more specifically, they cause the pilot to check on factors which affect the safe conduct of the flight, i.e. they are 'airmanship' checks.

Having sufficient altitude or ensuring the navigation log is maintained are aspects of common-sense good airmanship, but it is as well to have a reminder, particularly when we are learning or during times of distraction or high workload.

Some of you may have heard of the 'DOWNFAST' check prior to an instrument let-down, and of course the vital check that all pilots do, the pretakeoff vital actions — 'TMPFISCHH' (TTAFFIOHHHC to you RAAF operators).

But if we examine them carefully, we may find we are omitting the most important airmanship points of all.

Consider the situation where you are about to take off. What should you have considered in addition to the above V/As?

What about:

Weight and balance?
Density altitude?
Wind velocity?
Performance charts?
Runway suitability?

Or consider the situation prior to landing. You do a 'BUMFF' check but what about:

Wind velocity?
Runway surface?
Approaches?
Airfield elevation?
AUW and Threshold speed?

Maybe you check these things as part of your normal thought processes while you are flying, but perhaps there are occasions when one or other item might be overlooked. Wouldn't it be useful to have an 'airmanship' checklist to ensure that we hadn't missed anything important?

Here are a couple that I have developed to keep myself 'on the ball'. Perhaps they are of use to you too.

Having completed the checklist items by reference to the flight manual, I always run through the pretakeoff VITAL ACTIONS, TeeMPeeFISCH.

So I have double-checked the items critical to a successful takeoff. But what about the airmanship aspects?

I use my own mnemonic — 'WARTS', to ensure I have considered all the factors relevant to the takeoff.

'W' — WIND VELOCITY —
headwind component?
crosswind component?
gusts?
shear?
turbulence?
vortices?

'A' — ALTITUDE of the runway above mean sea level (this is Pressure Altitude as shown on the altimeter with 1013.2 mb set on the sub-scale — don't forget to reset QNH)

'R' — RUNWAY —
surface — ditches, water, sand, etc
slope
length
condition — long grass, dust, wet or dry
approaches, climb path — power lines
obstructions — trees, fences

'T' — TEMPERATURE —
Density Altitude (= P.A. factored for ambient temperature)
effect on performance for takeoff and climb

'S' — SAFETY BRIEF —
decision speed and decision point
passenger brief
self- brief of emergency procedures:
• engine failure, vibration or rough running
• aborted takeoff
• seat collapse
• door opening
• ASI failure
SPEEDS —
nosewheel rotation
liftoff
initial climb
single-engine safety speed.

Maybe you unconsciously consider all of these factors. I like to have a reminder. In many cases where you operate from one airfield of adequate length where you know there are no DA or runway problems for your particular aircraft, then you may choose to skip many of the items and merely use a safety brief as your airmanship check and have a look at the windsock as you line up. Realise, though, that by omitting any of the items from conscious consideration, you are taking some slight risk. It's better to be sure.

So much for takeoff. During the climb you need to maintain a look-out and monitor the engine instruments. Above 5000 feet you may lean-out the mixture. For such a continuous process you will probably not use a checklist — just your normal scan. If you wish, you could use 'FLEM' as a cue:

'F' — FUEL —
Selection and Contents
Boost Pump and Pressure

'L' — LOOK-OUT

'E' — ENGINE INSTRUMENTS

'M' — MIXTURE and Carby-heat
(I always check carby-heat with mixture).

While cruising, you probably already use the 'CLEAR' check at top-of-climb and at turning points. I use a modified version, 'O-CLARE':

'O' — ORIENTATION —
Are you going in the right general direction? (some old hands teach a CLEARO check to include this)

'C' — COMPASS —
check the D.G. alignment and your heading

'L' — LOG —
fill-in the navigation log
update ETA

'A' — ALTIMETER —
check area QNH and cruising level

'R' — RADIO —
position report

'E' — ENGINE —
engine instruments
mixture and carby-heat.

At about 15 minute intervals, I repeat the climb check — 'FLEM' — during the cruise, to keep track of fuel in particular.

Before descent we need the mixture rich and perhaps to pre-heat the carby throat. I do this as part of the last routine 'FLEM' check.

Before reaching circuit height, I repeat the 'WARTS' check for landing, except I consider the runway factors in relation to a landing, performance factors in relation to a go-around and safety aspects in relation to landing emergencies. Speeds, of course, include threshold speed (bearing in mind the weight and surface conditions), single-engine safety speed (minimum speed up to the point of commitment to land), and the tolerance on the threshold speed above which I will go-around rather than land (on that particular runway in those particular conditions).

In the circuit, I use the well-known 'BUMFH' check on downwind. Abeam the upwind end of the runway, I say to myself, 'Speed below . . . knots' (gear extension limit), brakes . . .

As soon as I roll out on Final, I use the 'PUF' check:

'P' — Propeller —
Full-Fine

'U' — Undercarriage —
Three . . . confirmed
DECISION — CONTINUE OR GO-AROUND

'F' — Flaps —
Full flap if I am landing.

I remind myself of my previously considered decision criteria for a go-around, particularly in relation to the maximum threshold speed I will accept under the circumstances and my tolerances on centreline and glidepath.

Back on the ground and clear of the runway, I stop the aircraft and use the written checklist for the after-landing and shut-down checks.

For aerobatics or stalling, I use 'HASELL'.

It may sound like a lot of checking but in reality you adopt the routine very quickly and it works. It develops a thought pattern that becomes a habit. It will stay with you for your whole flying career and it will increase the chances of that career being incident free.

'TeeEmPeeFischh, WARTS, FLEM, O-CLARE, BUMFH AND PUF' are the keys to safe flight — the 'keys of the kingdom' □

From now on I'll be more professional about my flying

Cooking with gas — turbines that is . . .

Darryl Newman is a very experienced jet instructor and has run jet conversions on Lears and Citations. He is currently a Chief Pilot and Check and Training Captain on Lear 35s. I though some words of advice from Darryl would help all of us who may be about to undergo a conversion onto jets, those who are studying the theory of jet performance and those who may never fly a jet but who are curious about the differences.

THE STEP FROM a GA light twin to your first jet is not only the most exciting but probably the biggest single step up in aircraft performance that you will make in your aviation career. As with all aspects of flying, preparation is the key word. The more ground work you put in, the more you know of your aircraft's systems, performance, flight planning, etc., the smoother will be the transition. With a little help from a tail wind, your jet can comfortably achieve a ground speed of ten miles a minute — that's not the time to find that you are uncertain of how to rectify a fuel imbalance, or be light on for knowledge of how to flight plan to an alternate when the destination weather turns bad.

Once again, it is a big step, so don't try to rush it. Be prepared to sit in the right hand seat and learn the ropes for a while. The initial endorsement is really only the stamp in your licence — the first step up the ladder. It takes hours of route flying during which time you will experience different operating conditions such as weather, changing aircraft weight, in-flight re-planning, and the odd in-flight malfunction, to complete the training and fully prepare a pilot to assume command of a jet aircraft.

The following text outlines some of the more obvious differences that you will encounter when transitioning to your first jet.

The engine

A jet engine is basically a very simple piece of equipment to operate. It has only one control lever and the further forward you push it, the more thrust it develops. All jet engines have temperature limits and, whether they be exhaust gas temperature, jet pipe temperature, or inter-turbine temperature, they must be strictly observed. In addition there are rpm limits (Fan and Turbine) and, on some aircraft, EPR (engine pressure ratio) to be watched.

A jet engine differs greatly from a piston engine in the power versus rpm relationship. In a propeller-driven aircraft, the horsepower delivered by the propeller is directly proportional to rpm (remember that power is speed-related). However, with a jet engine this is not the case. A modern high by-pass (fan) engine will idle at approximately 30-35 per cent N1 (N1 is a standard abbreviation for fan rpm). With thrust lever advancement through to maximum setting (usually rpm limited) only a small amount of thrust will result from the rpm increase to as high as 75 per cent N1. The vast majority of thrust will be produced between 85 and 95 per cent N1.

With the above in mind, it is vital that the pilot has some rule-of-thumb rpm settings for the following —

- the circuit
- an instrument approach
- the increase necessary for asymmetric operations

These settings will vary with change in aircraft weight. However, they will serve as a starting point from which adjustments may be made as necessary. Remember, a jet engine may be relatively straightforward in its basic operating technique; however, they are extremely expensive to repair if they are abused or damaged.

Overtemperature on starting is relatively unusual, but if encountered, it is rapid and if not checked quickly, will result in a repair bill containing six figures.

The airframe

There are probably four major airframe considerations to be taken into account when transitioning to your first jet:

- the large range of indicated airspeed
- the prospect of high altitude flight
- the relatively close proximity of the aircraft to the speed of sound
- the lack of propeller effect on the airframe

Airspeed envelope

The aircraft is going to be at least 250 kts faster than your GA twin, so you will have to plan well ahead for descent point, approach details, weather avoidance, deceleration point etc. You must fly the aircraft at a speed to suit your present set of conditions. You can fly downwind at 270 kts (in CTA) if you want, and have insufficient time to do anything but hang on, or reduce well in advance to the correct circuit speed for the aircraft which will in all probability be within 20 kts of the circuit speed of a reasonable-sized general aviation twin-engine aircraft.

The majority of small jet aircraft do not have powered controls and therefore have no artificial feel, i.e. they are manually operated like other GA aircraft. If your aircraft fits into this category it will be required to fly from 110 kts during a lightweight approach to land, to perhaps 350 kts on descent. Clearly the aircraft will not have the same 'feel' at both ends of the speed range — the most noticeable effect being at the high-speed end of the range where the aircraft will become extremely sensitive in both pitch and roll, and considerable care must be exercised in order to avoid overcontrolling.

High altitude

High altitude flight, i.e. flight above 30 000 feet, introduces a whole range of aerodynamic, performance, planning and physiological problems not associated with flight below 10 000 feet in general aviation light twins. All pilots undergoing or about to undergo a conversion onto a high-performance jet should complete the RAAF passenger decompression course at Point Cook. Whilst this will not simulate an explosive decompression, it will give the pilot an insight as to what to expect should such an event occur. One aspect of high altitude jet operations that has to be closely monitored by the pilot is the penetration of areas of turbulence. An aircraft flying at FL450 will usually be within 0.1 Mach of its maximum operating Mach number and only some 30 kts above its minimum (stall) speed. Any turbulence severe enough to cause even moderate airspeed excursions could put the aircraft quite close to either the high or low speed buffet. If you cannot avoid it (e.g. clear air turbulence) then you must descend. By descending you will place the aircraft at a level which will give it greater margins between the cruise Mach number and the high and low speed boundaries.

The speed of sound

Most jet aircraft performance, i.e. the top end of the climb, the cruise and the descent, is predicated on Mach number (the aircraft's TAS expressed as a ratio to the local speed of sound — e.g. Mach 0.8 is eight-tenths or 80 per cent of the speed of sound at that temperature). Most aircraft have a combination airspeed indicator/Mach meter, so IAS and Mach number can be read simultaneously. As Mach 1.0 (the speed of sound) is a function of air temperature, the true airspeed will vary as OAT changes. For example, at an OAT of −45 C, a Mach number of 0.75 gives a TAS of 440 kts. If the OAT were to drop to −60 C, the same Mach number will now produce a TAS of only 427 kts. From this it can be seen that time intervals and therefore endurances may vary despite a constant Mach number being flown.

Modern jet aircraft cruise relatively close to the speed of sound, between 75 per cent and 85 per cent of it. As the aircraft's Mach number increases towards its maximum (MMO) there is a sharp increase in the drag produced by the airframe. Obviously then, cruising at or close to the aircraft's Mach limit while producing a high TAS will usually involve a fuel flow out of all proportion to the increase in speed. If the aircraft is pushed beyond its MMO, the airframe may become unstable, even to the point where control is lost. If maximum range or endurance is required, the figures quoted in the Aircraft Flight Manual should be strictly adhered to, as any deviation above or below the Mach number for the particular aircraft weight will result in an increased fuel burn.

Lack of propwash

The airframe is totally devoid of any effect such as — propeller wash, critical engine, torque or propeller blade effect. All the airframe understands is angle of attack and airspeed, whether on one engine or two (or three if applicable).

In any asymmetric situation the airframe will perform exactly as it does with all engines operating except that it will require additional power from the operating engine and exhibit yaw toward the dead engine. The aircraft must be flown continually by reference to attitude — set a pitch attitude (and thrust setting), hold it, observe the result, adjust if necessary and repeat the procedure.

Flight planning

Most of the current smaller GA jet aircraft cost close to $2000/hr to operate, and in order to get the absolute maximum out of every hour, accurate flight planning is essential. The capacity to operate a jet aircraft *inefficiently* is almost limitless. Setting maximum cruise thrust at a flight level well below the optimum for the aircraft's weight and having little regard for the prevailing wind component will produce fuel consumption figures that will make the company accountant's eyes water. In still air (a rare animal) a jet aircraft will use less fuel per ground nautical mile as its operating altitude is increased. The limit here being the maximum altitude achievable at the aircraft's weight at the present OAT. Simple you say. Go as high as possible and you have it made. Unfortunately, across Australia at varying altitudes and latitudes, depending upon the season, we have a series of jet streams, the strength of which can reach 180 kts. This introduces all sorts of variables — can you climb above the core? Is it worth dropping below it to improve your ground nautical miles per pound? Is there a turbulent level? — you can't have the managing director spilling his Bourbon all over himself. Close attention to the factors mentioned above may even eliminate a possible en route fuel stop on a long leg — a very worthwhile saving in terms of both aircraft operating costs and passenger inconvenience.

Flight profile

All jet aircraft, regardless of size, consume large quantities of fuel. A Lear 35, probably one of the most fuel-efficient of all the small jets, will use around 1300 lb (approx. 600 kg) of fuel between Melbourne and Sydney *if it is flown efficiently*. With this in mind the flight profile must be monitored closely. Deviations from this minimum-fuel climb speed, excessively high (or low) cruising Mach number, or an incorrect descent point resulting in the aircraft going above or below the optimum descent profile, will result in an increased fuel burn. Deviations below the descent profile will necessitate the use of power to correct, and hence more fuel. Being above the profile will require the use of the aircraft's spoilers and this is simply a waste of energy — energy gained by the consumption of fuel earlier in the flight.

The conversion

After satisfactorily completing the engineering course, the time will arrive to commence flying and the practical side of the endorsement will be covered something like this —

External	External daily inspection Normal preflight inspection Engine bay inspection Fuelling procedures
Internal	Cabin familiarisation covering: fire extinguishers, first aid kit location, operation of life jackets or raft, emergency oxygen, emergency escape hatches, baggage areas, use of the galley etc. Cockpit layout: instrumentation, controls, crew oxygen, radios, navigation equipment. Aircraft weight and balance Takeoff data Crew briefing

In the air

A normal takeoff and climb to, depending on the type, FL390 or FL410 covering:

use of climb power,
airframe and engine anti-ice,
the autopilot.

On reaching cruise speed, the following will be carried out:

general handling,
level turns,
limiting Mach number.

This is all hand-flown in order to gain proficiency in flying the aircraft at high altitude. On completion, a simulated explosive decompression with an emergency descent to around FL150 is conducted.

At this level the following sequences will be covered:

handling at high and low IAS,
the effect of flap, gear and the spoilers,
steep turns,
emergency gear extension,
hydraulic malfunction,
stalls,
Dutch roll,
basic instrument flying,
flight on limited panel,
unusual attitudes,
general handling with one engine out,
engine fire drill,
engine shut-down and relight,
and any idiosyncrasies that the type might display.

From here to the Navaid work — all engine and asymmetric NDB's, all engine and asymmetric ILS's and a VOR approach.

The last part to be covered is the circuit work. By this time the trainee should be developing a feeling for the aircraft and the all-important areas of manoeuvring in the circuit and low speed asymmetrics can be tackled. The circuit training will embrace:

normal flap takeoff,
full flap landing (usually fullstop landings),
flapless landings,
landing with a runaway pitch trim,
engine failure below VI (aborted takeoff),
engine failure after VI but before VR (takeoff continued),
single engine landing,
single engine overshoot,
crosswind takeoff and landing.

To complete the endorsement, night circuits (all engines) are required, again to a full stop. This will give you your endorsement. However, remember that it is a basic training period and it will require considerable route flying to give you the depth of experience necessary to efficiently command a jet aircraft.

Some pitfalls along the way:

- Never try to fly a jet aircraft by any primary reference other than the A.I. Attitude is all important in accurately controlling the airspeed, Mach number, rate of climb or descent and altitude.
- Give yourself sufficient time to slow down to the prescribed speeds for the circuit, an approach, turbulence penetration etc. Any problems you already have will treble if you arrive 100 kts too fast.
- The aircraft will be heavier than the types you have been flying. It will have more momentum so sink rates on approach will have to be more closely controlled. Get set-up early on final and hold the approach angle. Remember the thrust lever controls both the rate of descent and the airspeed.
- You must have some rule-of-thumb thrust settings for situations such as — circuit speed, ILS approach and the approximate increase required in the event of losing an engine. It is quite different to 'feel' power settings in a jet aircraft.
- Descent profiles must be monitored closely. Any reduction in speed on descent will result in the aircraft going high on the profile. Correct any excursion early — if high by the use of the spoilers, or if low by either reducing speed slightly or by increasing power.
- Under normal cruise conditions the aircraft will be covering ground at around seven to eight nm per minute. The old IFR training comment 'If you sit there for two minutes and do nothing, you have forgotten something' was never more pertinent than in a jet.
- Don't try to 'do it all yourself' in the cockpit. Apart from some Cessna Citations, all jet aircraft are two crew operations and for good reason. The company operations manual will detail cockpit procedures and responsibilities — stick to them.
- To fly in a jet with a pilot who can accurately and *smoothly* control the aircraft and put it where he wants it without high roll rates or pulling the skin from your cheeks is a pleasure. Aim to achieve a technique where you can get the aircraft where you want it without the passengers ever knowing it happened.

The two pilot cockpit

You are now (or about to become) part of a two crew operation. Getting the aircraft from A to B in the safest and most efficient manner must be a team effort. The captain and co-pilot both have a role to play, each depending on the other for certain actions or calls to be taken or made. It may initially seem tedious to work off the same checklist time and time again when you feel that you could *probably* do just as good a job by heart. Every item could result in an expensive aborted flight (a pitot cover left on), damage to the airframe or engines (engine anti-ice on at too high a temperature), or in the extreme, the loss of the aircraft (pitch trim fully forward or aft and a premature rotation, or no rotation).

If the above appears a strong pitch for the use of the checklist, then the case of the in-flight emergency is an even stronger one. Here the Phase 1 checks (memory items) will be carried out by the captain immediately following the emergency and backed up by the co-pilot with the checklist to confirm the Phase 1 checks and continue with the engine shut-down or whatever is required to deal with the situation. In some aircraft the checklist to deal with something as apparently simple as a failed inverter consumes two pages, the actions to be taken depend upon the position of circuit breakers and the effect they have on the system when they are either pulled or reinstated. Here of course the painstaking use of the checklist is an absolute necessity. The moral here is not to adopt a cavalier attitude towards the checklist, it may well save your life, your passenger's life, and your aircraft — not to mention your job.

Well there it is, your first jet endorsement. Most pilots you talk to will agree it will make you think quite differently about your flying. Even your attitude towards flying a light twin will change.

A jet is exhilarating to fly, and very satisfying to fly accurately. Take your time and enjoy yourself. **You're** a jet jockey now □

AIRFLOW

Our article 'Shades of Darkness' (ASD131) by Adrian Zentner, may have shed more light on this vexed topic than originally intended.

The article recommended pilots obtain ND15 lenses. Such lenses are a neutral density tint as described; however, they transmit *15 per cent of ambient light, not* absorb *15 per cent as inadvertently suggested in the article. Lenses that absorb only 15 per cent of light would be 'ND85' — which fortunately are not generally available.*

Some pilots have found it difficult to obtain sunglasses that meet the Australian Standard for 'specfic purpose' use. This is because very few manufacturers are able to meet all the infra-red requirements of this standard. A pair of 'ND15' sunglasses that meets AS1067 — 1983 for general purpose sunglasses may be considered quite satisfactory for flying. The Standard (many argue it is too stringent) is in the process of being reviewed.

So for flying we recommend ND15 sunglasses, approved to AS1067 for general purpose use.

My apologies for any confusion this may have caused.

A Trinidad was on track from Wonthaggi to Strathbogie at 8000 feet, when the engine misfired and began to run roughly. The pilot diverted to Essendon where he landed safely. Subsequent inspection revealed water and contaminants such as paint and metal particles in a sample of fuel that was drained from the fuel strainer.

Although it is a requirement of the Daily Inspection that the strainer be drained, I don't believe this check is included in the aircraft manual. In my experience it is an essential check before the first start of the day. I have found contamination similar to that described above. Bleeding the engine drain is recommended as a daily check by the engine manufacturer and in light of this incident, I would suggest that it is a wise precaution to remove the contamination from the strainer each morning and give it a helping hand to do its job.

You don't need to turn on the mixture or fuel pump — just the fuel cock. By the way, on the TB20, the strainer drain is accessible through the underside of the rear of the engine cowling, on the left side.

If there is any significant contamination or if it is a regular find, then the aircraft is unserviceable and the fuel system needs purging.

It may be that similar contamination is possible in your aircraft/engine type. It would be worth checking with the maintenance organisation — just in case □

Dear Sir,

I read with interest the article in ASD 131 titled 'Y'all come back now, y'hear?'. The inference seemed to be that it is fine to arrive at a winch gliding site with no prior knowledge of the operation or the site, have a good look while in the circuit and then cautiously let down.

Fair enough, but . . .

Unless a gliding field has a quite separate power landing area, there is considerable possibility of conflict for the following reasons:

- A glider's wings may be levelled prior to takeoff as advice to other pilots or crew on the ground that takeoff is imminent. It may be very difficult to see from the air and the wing may be lifted only seconds before takeoff.
- No mention is made of the fact that gliders climb on the winch at up to 3000 ft per min at a forty-five degree angle at speeds up to 70 kt and may lay-off to windward by a very considerable amount.
- It is stated that the cable may be several inches off the ground if broken. In fact, after cable-break single strand cables often form coils up to half a metre high.
- That one should even consider taxiing where cables are laid is surely less than responsible.
- These cables, and there may be more than one, whether broken or not, are quite invisible from the air and often from beyond a short distance on the ground. Most certainly from short final they would be hard to detect given the poor forward view from most powered aircraft.
- When cables do break they may be anywhere on the field, and the position of the drogue is no sure indication of the rest of the wire.
- For a number of quite good reasons, a number of clubs do not permit power operations. In our case it is outside the terms of the lease, for example. Clubs do operate successfully with both winch and power operating together. However, where this is done, everyone involved has a thorough knowledge of the situation and works within it.

Certainly gliding clubs welcome visitors. However, unless you have been able to make prior contact with that club's experienced staff and been thoroughly briefed, I am sure you would be even more welcome if you arrived by road.

N. H. KENNEDY

Thanks for your advice, Norman. Your points are valid and I would certainly advise pilots to talk to the CFI at the particular site they intend to visit, before they set out. The article was intended to point out aspects that could cause difficulties to unwary pilots who had not previously encountered winch operations.

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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Dear Sir,

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Yours sincerely, ...

Name: ....

Address: ....

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

Aircraft accident reports

First 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

Piper PA28-151, VH-BSY, McKinley Qld., 06 Jan. 87, Instructional — dual.
Shortly after the student had made a normal touchdown, a sheep ran across the strip in front of the aircraft. The instructor had not been looking forward, and he was taken by surprise when the student applied a considerable amount of nosewheel deflection in an effort to avoid the animal. The aircraft ran off the side of the strip and struck an earth run-off water vane.

Cessna 182-G, VH-DGF, Yatton Qld., 20 Jan. 87, Non-commercial — pleasure.
The pilot was approaching to land in light crosswind conditions. Turbulence was encountered in the circuit area and the pilot elected to approach at 80 knots with 20 degrees of flap selected. After a normal flare, the aircraft floated for half the 610-metre strip before touching down. The pilot applied heavy braking but was unable to stop the aircraft within the confines of the strip. Damage was sustained as the aircraft passed through three drains.

Cessna 402-B, VH-TLQ, Mt Dianne Qld., 02 Feb. 87, Charter — passenger operations.
The aircraft was the first of a group of four aircraft being used to return staff to an alluvial gold mine after a week-end break. It is reported that the weather in the area of the destination was scattered low cloud on the hills, overcast and drizzle.

The aircraft was initially held in the area of the Mount Dianne copper mine, ten kilometres to the south of the strip, for about six minutes. Two of the surviving passengers reported that the pilot then conducted an approach straight to the strip. One passenger, who had travelled in the aircraft previously, stated that the gear was extended and as the aircraft became close to the strip, the gear began striking the tops of trees. The pilot then applied power and the aircraft commenced a steep turn to the left before impacting the ground in a left-wing, low nose-down attitude. During the turn, the passenger reported hearing a horn buzzer sound. The aircraft came to rest inverted after a ground-slide of approximately 45 metres and caught fire.

Cessna A188B-A1, VH-HOP, Thangool Qld., 21 Feb. 87, Aerial agriculture.
The pilot was engaged in the spraying of a crop of beans. After completing several successful spray-runs, the aircraft struck a power line with the maingear. It dived into the ground in a 60 degree nose-down attitude, nosed over and slid 73 metres before coming to rest.

Piper PA31, VH-PNL, Cape Flattery Qld., 04 Mar. 87, Charter — passenger operations.
The aircraft was engaged in the transfer of passengers from Cape Flattery to Cooktown. It was observed to overshoot from the first approach and to carry out a low-level circuit subsequently landing with the gear retracted.

GAF N24-A, VH-FCX, Noosa Qld., 05 Mar. 87, Non-commercial — pleasure.
A person who previously held a Commercial Pilot Licence gained entry to the aircraft and was able to start the engines. The aircraft then apparently rolled forward and collided with a disused fuel tanker.

At about 0530 hours in the morning the regular pilot arrived to find the aircraft embedded in the side of the tanker with the engines still operating at high power. The person was subsequently located, by police, asleep on the side of a nearby road.

Beech 95-A55, VH-FDP, Well Close Qld., 11 Mar. 87, Non-commercial — aerial ambulance.
The pilot had been advised by the property owner to land on a strip about two kilometres from the homestead instead of the usual strip. The available length was 1400 metres, which was adequate for the operation. The pilot reported that when the aircraft became low during the later stages of the approach, he applied power, but realised that the main wheels would probably pass through tall grass near the threshold. Just prior to touchdown, the pilot heard and felt a loud bang. Immediately after touchdown, the aircraft adopted a left-wing low attitude before the propellers of the left engine and left wingtip contacted the ground. The aircraft slewed through 90 degrees to the left and ran off the strip.

An inspection found that the left wheel and oleo leg had been detached after contact with a mound of dirt seven metres before the threshold.

Piper PA44-180, VH-KHG, Herberton Qld., 18 Mar. 87, Instructional — check.
Shortly after touchdown, the nosewheel struck a 20-centimetre high anthill. The downlock latch on the nosegear was broken and when the nosewheel entered slight depression, some 145 metres further along the ground roll, the nosegear collapsed.

De Havilland DH82-A, VH-CCD, Canberra A.C.T., 08 Jan. 87, Non-commercial — pleasure.
As the pilot was about to flare the aircraft for landing, a sheep ran onto the strip. It struck the left landing gear, and the pilot carried out a go-around. The aircraft continued to perform normally, and a decision was made to land in the opposite direction, which gave a distance of about 1000 metres to the body of the sheep. During the landing roll, the left gear progressively collapsed and the aircraft swung to the left. The propeller dug into the ground as the aircraft nosed down before coming to rest in an upright position.

Anvspier Robin, VH-NXY, Wollongong N.S.W., 06 Jan. 87, Instructional — dual
The student was undertaking his first instructional flight. At about 2000 feet during the climb towards the training area, the engine failed completely. A successful forced landing was carried out; however, during the landing roll the gear struck a number of rocks.

Initial investigation revealed a defect in the fuel cock selector mechanism, in that irrespective of the cockpit indication, the fuel supply cock remained.

Rockwell S2R, VH-WBW, Mungindi N.S.W., 06 Feb. 97, Aerial agriculture.
The pilot had ferried the aircraft to the strip in order to carry out aerial top-dressing operations. At the conclusion of the seventh load for the day, the pilot calculated that he had been operating for a total of about 150 minutes. The expected endurance of the aircraft was 180 minutes and the pilot elected to conduct a further short flight to complete the task. During this flight, the engine stopped suddenly and the pilot attempted to glide clear of the flooded paddock. The aircraft subsequently stalled and struck an embankment between the end of the crop and a road on which the pilot was attempting to land.

Initial inspection revealed that there was virtually no fuel remaining in the tank.

Ayres S2R-T15, VH-IWI, Boggabri N.S.W., 10 Feb. 87, Aerial agriculture.
The pilot was engaged on cotton spraying operations. During the second takeoff for the day from this particular strip, a cow ran in front of the aircraft. The pilot attempted to fly over the top of the animal; however, the left maingear struck and killed the cow. The pilot was unable to maintain control of the aircraft and diverted to a more suitable aerodrome, where a landing was made without further damage.

Cessna 172-M, VH-UGK, Bankstown N.S.W., 19 Feb. 87, Non-commercial — pleasure.
The pilot reported that during the takeoff roll the aircraft was slow to accelerate. At about 50 knots, the aircraft became airborne in a nose-high attitude and the pilot experienced difficulty in lowering the nose. Shortly afterwards the aircraft stalled, the left wing dropped and the aircraft turned through about 120 degrees before impacting the ground. It was determined that the takeoff had been conducted with the flaps in the fully extended position.

Piper PA30, VH-CON, Bankstown N.S.W., 23 Feb. 87, Charter — cargo operations.
During a training sequence, the pilot-in-command simulated a failure of the left engine. The pilot under check correctly identified the failed engine and applied full right rudder to counter the effects of yaw. The flight then continued normally but the crew was later unable to obtain a down and locked indication for the landing gear. An inspection from another aircraft revealed that the gear was only partly extended, with the nosewheel turned to the right. After all efforts to lower the gear were unsuccessful, a safe wheels-up landing was made. It was later discovered that there was a rigging fault in the rudder system. This had allowed a roller, which normally engages in a channel to centre the nosegear during retractions, to move outside the channel when full right rudder was applied. This resulted in jamming of the nosegear.

Socata MSTB10, VH-JTJ, Luddenham N.S.W., 25 Feb. 87, Instructional — dual.
The student was receiving training in forced landing procedures. The first three exercises were completed without incident. At the end of the fourth approach to the selected paddock, the student applied full power and initiated a climb, intending to return to 3000 feet for a further exercise. However, when the aircraft had reached about 1700 feet, the engine lost power. The instructor took control but was unable to gain any response from the engine. The aircraft was landed in a paddock and collided with a fence some 200 metres from the point of touchdown.

Piper PA25-235, VH-BCJ, Wagga N.S.W., 26 Feb. 87, Non-commercial — business.
When the pilot arrived at his planned destination, he was unable to obtain a down and locked indication for the nosewheel. Both normal and emergency means of lowering the gear were employed, but without success. A diversion was made to a more suitable aerodrome, where a safe landing was made with the nosegear retracted.

Mooney M20-J, VH-IJL, Wee Waa N.S.W., 26 Feb. 87, Charter — passenger operations.
When preparing for the return leg of a charter flight, the pilot discovered that the engine starter motor would not engage. He elected to hand-start the engine, and briefed the passenger on the operation of the controls. No wheel chocks were employed. When the engine started, the aircraft commenced to move and the passenger's efforts to control the aircraft were ineffective. After travelling about 20 metres, the aircraft ran into a ditch and the engine stopped after the propeller struck the ground.

Bellanca 8-KCAB, VH-SFK, Schofields N.S.W., 08 Mar. 87, Non-commercial — pleasure.
The pilot intended to conduct a practice aerobatic flight and had received a clearance to operate up to 4000 feet in the local area. Witnesses reported that the aircraft performed a number of manoeuvres without apparent problem. However, the aircraft was then seen to descend from a height of about 1000 feet in a stable but steep nose-down attitude, turning to the left. This descent continued unchecked and the aircraft struck power lines before impacting the ground. A fierce fire broke out and consumed the wreckage.

Mooney M20-J, VH-UDD, Bankstown N.S.W., 11 Mar. 87, Instructional — check.
As part of a refresher check on the aircraft, the instructor required the pilot to use the manual system for lowering the landing gear. At the end of this procedure, the gear-down light did not illuminate and the pilot continued to rotate the appropriate crank handle. A loud bang was heard, following which there was little resistance to crank handle movement. All attempts to obtain a gear-down light were unsuccessful. Observations made by another aircraft and persons on the ground indicated that the gear was down and locked. However, the gear collapsed immediately after touchdown.

Piper PA32-300, VH-PWD, Coots Crossing N.S.W., 14 Mar. 87, Non-commercial — pleasure.
The aircraft had not been flown for about two months. Some 20 minutes after departure, the engine commenced to run roughly and the pilot elected to divert to the nearest suitable aerodrome. Shortly afterwards, the engine backfired severely and black smoke entered the cabin through an air vent. The engine subsequently stopped completely and the pilot was committed to a forced landing on unsuitable terrain. The gear collapsed and the aircraft collided with two fences before coming to rest. On vacating the aircraft, the pilot discovered that a fire was burning under the cowls on the right side of the engine. The fire was extinguished by the pilot and passengers.

Piper PA60-600, VH-NOA, Armidale N.S.W., 17 Mar. 87, Charter — cargo operations.
Shortly after touchdown, the left wing began to drop and the aircraft veered off the runway. It came to rest after colliding with a runway light and a culvert. Inspection revealed that the castellated nut from the left gear torque link pivot bolt was missing. This allowed the lower torque link to rotate with the wheel and separate from the upper torque link.

Cessna 180-G, VH-DJS, Albury N.S.W., 20 Mar. 87, Non-commercial — business.
The pilot was making a landing approach in moderate crosswind conditions. He commenced the flare at about 15 feet above the runway, with the intention of touching down in a three-point attitude. The aircraft sank rapidly, touched down and bounced to about ten feet. The pilot maintained rearward pressure on the control column but did not apply power. The nose of the aircraft dropped sharply and the propeller struck the runway. The aircraft subsequently overturned, coming to rest on the runway centreline.

Beech 58-TC, VH-FTZ, Tamworth N.S.W., 31 Mar. 87, Non-commercial — pleasure.
On arrival at the destination aerodrome, the pilot was unable to obtain a down and locked indication for the landing gear. He noted that when the gear was selected, there was an abnormal noise and the gear motor only ran for a few seconds. On a subsequent re-cycling, a down and locked indication was obtained but the pilot noticed a strong smell of hydraulic fluid. A diversion to a more suitable aerodrome was made, where a flypast confirmed that the gear appeared to be extended. The gear warning horn did not sound when the throttles were closed. However, the pilot was unable to move the emergency gear handle from its stowed position when he decided to use this device to ensure the gear was in fact down. Shortly after touchdown, the right main gear collapsed.

Preliminary investigation has revealed that the right gear-up lock roller was seized, the relevant gear position microswitch was incorrectly adjusted, and the manual extension handle could not be moved because of an incorrectly fitted trim panel.

Cessna U206-A, VH-RPZ, Pakenham Vic., 04 Jan. 87, Sport parachuting (not associated with an airshow).
The two parachutists were preparing for a jump in which one pulled the other from the aircraft. During the final stages of the preparation, the pilot parachute of the front jumper prematurely deployed. Both persons were ejected from the aircraft and the leading jumper struck the tailplane. A portion of the horizontal stabiliser was torn off and the aircraft pitched down beyond the vertical. The pilot was unable to regain any control and, with some difficulty, abandoned the aircraft. He deployed his parachute at about 500 feet above the ground and landed safely. The parachutist who had struck the tailplane was initially rendered unconscious and had suffered a broken right arm. She recovered sufficiently to deploy her parachute and control her descent when close to the ground. The aircraft was destroyed when it impacted the ground in a steep nose-down attitude at high speed.

Piper PA34-200T, VH-STT, Latrobe Valley Vic., 14 Jan. 87, Non-commercial — business.
The pilot was approaching to land in what he believed were light wind conditions. As he crossed the threshold, he realised that there was a tailwind component, but he elected to continue the approach. Touchdown occurred with about 415 metres of the strip remaining. During the landing roll, the pilot became concerned that the aircraft would not stop before the boundary fence, and a ground loop was attempted. The maingear collapsed as the aircraft came to rest 103 metres before the fence. The landing attempt had been made in 12 to 15 knot downwind conditions.

Cessna A188B-A1, VH-UDV, Toora Vic., 20 Jan. 87, Ferry.
The pilot had landed at the one-way agricultural strip in order to deliver covers for a load of superphosphate. The subsequent takeoff was normal until the point where the tail of the aircraft was raised. At this point, the aircraft was affected by a strong wind gust and the pilot was unable to maintain directional control. The aircraft ran off the side of the strip and struck scrub and a steel fence post. The wind at the time was relatively strong, giving a substantial downwind/crosswind component.

Siai Mar F260, VH-ARU, Yabba North Vic., 24 Jan. 87, Non-commercial — pleasure.
At a height of about 100 feet after takeoff, the engine faltered briefly. It then returned to full power, but the pilot decided to conduct a low-level circuit and land in order to investigate the apparent anomaly. On the downwind leg, the engine stopped and the pilot was committed to a wheels-up landing in a paddock. Shortly before touchdown, engine power was regained and the propeller contacted the ground under almost full power. The pilot later advised that he had inadvertently selected an almost empty fuel tank prior to takeoff. He had not checked the fuel selector when the first loss of power was noticed because he had been convinced that he had selected the correct tank.

Cessna 170-B, VH-BUX, Ballarat Vic., 07 Feb. 87, Instructional — check.
The pilot arranged for a checkflight in the aircraft, as it was a type he had not flown for some time. The instructor commented that as the pilot made rudder corrections during the takeoff roll, he also inadvertently applied light braking. After a period of general flying, the aircraft was returned to the circuit for a landing in moderate crosswind conditions. Touchdown was made in a three-point attitude but shortly afterwards the aircraft commenced to swing to the right. Corrective measures by both pilots were unable to arrest the swing and the left gear subsequently collapsed. The pilot had used left aileron and right rudder inputs to align the aircraft at touchdown, and had possibly inadvertently applied braking to the right mainwheel.

Cessna 172-H, VH-KWV, Fyansford Vic., 15 Mar. 87, Instructional — solo (supervised).
The pilot was undertaking a solo navigation exercise prior to a flight test for the removal of area restrictions on his licence. About 20 minutes after departure, the engine commenced to run roughly and the pilot diverted toward a suitable aerodrome. However, the engine performance deteriorated and the pilot elected to carry out a precautionary landing in a paddock. Towards the end of the landing roll the aircraft collided with a fence. Initial investigation revealed a broken rocker arm on one of the engine cylinders.

Piper PA28-140, VH-PBR, Swan Hill Vic., 31 Mar. 87, Instructional — dual.
The student was being instructed in crosswind techniques and several circuits and landings had been completed without incident. On the final circuit a normal approach and touchdown were made, but during the landing roll the right wing lowered and the aircraft swung through 90 degrees. Initial inspection revealed that the lower torque link bolt on the right gear had failed, allowing the wheel assembly to detach.

Cessna 210-N, VH-UFA, Numbulwar N.T., 08 Feb. 87, Charter — passenger operations.
The aircraft was to be ferried out of the path of an approaching cyclone. Shortly after takeoff, the pilot heard a loud noise and the engine began to vibrate violently. The pilot turned the aircraft towards the only available area and transmitted a 'Mayday' call. During the turn, oil began to stream over the windscreen from the rear of the engine. The area selected for landing was about 600 metres long and surrounded by low trees. The approach was high and fast and the aircraft was still airborne as it approached the end of the area. The pilot elected to stall the aircraft into the trees.

Cessna 172-D, VH-DEN, Pine Creek N.T., 14 Mar. 87, Ferry.
At about 500 feet above ground level after takeoff, just after the pilot commenced a left turn, the engine lost power. The pilot was unable to rectify the problem and chose a cleared area in which to land. During the approach, it became obvious to the pilot that the aircraft would not make the selected area, so he decided to land on a bush track. The aircraft touched down on the nosewheel and bounced, then touched down again before running through thick grass, coming to rest 74 metres beyond the second point of touchdown. A fire then broke out in the engine compartment which subsequently destroyed the aircraft.

Cessna A185-E, VH-KPF, Meekathara W.A., 10 Jan. 87, Non-commercial — company flight.
When the pilot arrived at the destination, he noted that the wind direction indicator showed apparently calm conditions. Almost immediately after touchdown, the aircraft began to swing to the right. Attempts to correct the swing were unsuccessful and the left gear leg collapsed. After vacating the aircraft, the pilot noticed that there had been a quartering tailwind of about ten knots during the landing.

De Havilland 82-A, VH-FAS, Jandakot W.A., 31 Jan. 87, Non-commercial — pleasure.
As the aircraft was executing a stall turn, the pilot noticed that the engine and propeller had stopped. He attempted to restart the engine by diving the aircraft. However, the engine had not restarted by the time the aircraft reached 2000 feet above ground level and the pilot decided to land the aircraft in an open area. During the approach, the pilot realised that the selected landing area was unsuitable, so he chose another area. As the aircraft approached the new area, it struck trees and came to rest among the trees prior to that area.

Cessna 182-P, VH-MOO, Albany W.A., 07 Feb. 87, Non-commercial — pleasure.
In the course of a daily inspection, a LAME discovered that the aircraft had sustained damage to the nosewheel support structure and the firewall. It was evident that the damage had occurred as a result of a heavy landing. The last pilot to fly the aircraft reported that after making an enroute landing, he had noted that the nosewheel oleo was flat. After seeking advice from the aircraft operator, he had flown the aircraft to its home base. It was possible that the damage had occurred during the enroute landing.

Piper PA31-A1, VH-HFD, Cervantes W.A., 20 Feb. 87, Non-commercial — aerial ambulance.
The aircraft was carrying out a night flight to a strip lit by portable fluorescent lights. These lights were spaced 190 metres apart along the length of the strip. During the approach, the left maingear struck rising ground which formed the end of the built-up strip surface approximately 29 metres short of the threshold. The gear was bent rearward but did not collapse, and the landing was completed without further incident.

Rotary Wing

Hiller 12E, VH-HJW, Ayr Qld., 23 Jan. 87, Aerial agriculture.
The pilot reported that the engine lost power while the aircraft was flying at a height of 30 feet above the ground. The subsequent forced landing was made onto newly cultivated ground and all four skid legs were bent.

Bell 47-G2, VH-RFY, Maroochydore Qld., 25 Jan. 87, Charter — passenger operations.
The helicopter was being flown along a beach at 500 feet above ground level when the engine lost power without warning. The pilot turned the aircraft into wind and carried out an autorotation. The subsequent landing was heavy, in soft, uneven sand. Both occupants evacuated the helicopter while the rotor blades were still turning. The pilot stated that as he was about to return to the helicopter and turn off the fuel and switches, the right skid broke through the sand and the helicopter lurched to the right rear, causing the main rotor blade to sever the tail boom.

Hiller UH12-E, VH-HJW, St. Pauls Stn. Qld., 27 Feb. 87, Ferry.
During the descent the pilot heard a loud bang, following which the engine stopped. An autorotational descent was carried out for a landing onto the clearest avaialble area — a dry river bed. The helicopter touched down with some forward speed on the soft sand, pitched forward and rolled over.

An inspection of the wreckage revealed that a connecting rod big-end had failed.

Hughes 269-C, VH-PHK, Atherton Qld., 25 Mar. 87, Non-commercial — pleasure.
On the previous day, the pilot had ferried the aircraft to a maintenance organisation for a scheduled servicing. No abnormalities were discovered and a satisfactory engine run was carried out by the pilot prior to departure for the return flight. A search was commenced when the helicopter did not arrive at the destination, and the wreckage of the aircraft was located when a VSB signal was heard. The aircraft was lodged in the branches of a tree some 18 metres above ground level. The tail boom was lying near the base of the tree and most components had received severe impact damage. Initial examination of the wreckage revealed substantial internal engine damage.

Bell 47G2, VH-KHK, Balranald N.S.W., 10 Mar. 87, Non-commercial — aerial application/survey.
The pilot reported that as he brought the aircraft into the hover in preparation for landing, it sank to the ground from a height of about ten feet. The tailrotor blades struck a lygnum bush and the drive shaft sheared. The pilot indicated that the main rotor rpm had decayed, possibly from over-pitching during the latter stages of the approach.

Hiller UH12-E, VH-ECK, Tamworth N.S.W., 18 Mar. 87, Charter — cargo operations.
The pilot had been carrying out crop spraying operations and was hurrying to return to his base before last light. He was concerned with the fuel state and made an enroute landing, where one of the passengers dipped the tank. Believing that adequate fuel remained, the pilot took off again but shortly afterwards the engine lost all power. During the subsequent autorotation, manoeuvring was necessary to avoid power lines. The helicopter then landed heavily and the main rotor blades struck and severed the tail boom. It was determined that at the time of the accident, the aircraft had been operating for seven minutes longer than the expected endurance.

Hiller UH-12E, VH-MJV, Darwin N.T., 11 Mar. 87, Non-commercial — aerial mustering.
The pilot was directing cattle through a gate when a cow turned and began to walk back towards the helicopter. It stopped in front of the aircraft before charging. The pilot applied back-cyclic and up-collective in an attempt to avoid the animal but the tail rotor struck the ground. The helicopter began to yaw and the pilot landed the aircraft immediately. It continued to yaw after the landing and the landing skid assembly was substantially damaged.

Hughes 269-C, VH-THQ, Alroy Downs N.T., 17 Mar. 87, Aerial mustering
The pilot was chasing a calf that had broken away from the main herd. When the animal turned towards the helicopter, the pilot attempted to take evasive action. The pilot felt the aircraft rock, and believing that it had been struck by the animal, he pulled it up to about 40 feet above the ground. The aircraft began to yaw. During the subsequent landing, while still yawing, the landing skids collapsed.

Gliders

Entwicklung Phoebus, VH-GYC, Maryborough Qld., 14 Jan. 87, Non-commercial — pleasure.
The pilot was returning to land after a period of thermalling flight when severe turbulence was encountered. The pilot's head hit and broke the canopy and he then had problems with his vision. Heavy sink was also experienced and an outlanding was attempted in a canefield. The area selected was a five-metre wide strip between areas of cane growing to about 1.7 metres in height. The left wing caught in the cane and the aircraft slewed violently before coming to rest with the wing completely torn out of the fuselage.

Schemp Std. Cirrus, VH-GGC, Kingaroy Qld., 24 Jan. 87, Non-commercial — pleasure.
During the approach, the pilot became aware that the aircraft was going to undershoot the intended landing area. He adjusted the approach; however, the aircraft landed short of the aerodrome in a cultivated field and struck an earth bank.

Schemp Std. Cirrus, VH-IIZ, Geelong Vic., 23 Feb. 87, Air show/air racing/air trials.
The pilot, who was an experienced glider pilot and instructor, was taking part in a gliding competition. Only two of the 12 competitors were able to complete the exercise, the remainder being required to outland. Almost four hours after being launched, the aircraft was sighted in a right-hand circling descent, apparently being manoeuvred for an outlanding. At low level, the angle of bank was seen to suddenly increase and the nose dropped. The right wing struck the ground and the aircraft cartwheeled before coming to rest 22 metres from the point of initial impact.

Shemp Ventus A, VH-FQS, Benalla Vic., 12 Jan. 87, Air show/air racing/air trials.
Schleicher ASW20, VH-KYF, Benalla Vic., 12 Jan. 87, Air show/air racing/air trials.
A large group of pilots were practising for the forthcoming World Gliding Championships. There were a number of weak thermals in the area near the starting gate position, and there were several gliders in each terminal. The pilot of VH-FQS encountered a surge of lift and commenced to increase the angle of bank and pull-up, achieving a climb rate of about six knots. Shortly afterwards, the canopy of this aircraft struck the wing of VH-KYF which was at a climb rate of about four knots. The canopy was shattered and the left flap of VH-KYF was broken in half. The pilots maintained control of their aircraft and subsequently landed safely.

Schleicher K7, VH-GNX, Woodvale Vic., 24 Jan. 87, Non-commercial — pleasure.
The pilot had conducted a soaring flight for an hour in particularly turbulent conditions. The subsequent landing was conducted with a light crosswind from the right. The pilot misjudged the flare and the aircraft ballooned to a height of about 15 feet while veering to the left. The pilot then retracted the air brakes, and the glider probably stalled before impacting the ground heavily.

Schneider ES-60B, VH-GYT, Oatlands Tas., 21 Mar. 87, Non-commercial — pleasure.
The pilot was conducting a soaring flight when deteriorating lift conditions made an outlanding necessary. A paddock was chosen and the pilot carried out a standard approach pattern, aiming to land into wind. He noted a powerline pole on a hill some 500 metres away but could not see any other poles near the intended landing area. However, as he was about to turn onto final approach, he noticed a single power line directly ahead of the aircraft. There was insufficient time available to take any avoiding action and the wire struck the aircraft canopy. The aircraft subsequently impacted the ground and cartwheeled to a stop 87 metres beyond the point of collision with the wire. Initial investigation revealed that the supporting poles for the power line were one kilometre apart.

Glasflugel 206 Hornet, VH-GMU, Saddleworth S.A., 30 Jan. 87, Non-commercial — pleasure.
The pilot was attempting a 300 km cross-country flight. After release from the aerotow, the glider gained altitude slowly, obtaining only 3000 feet above mean sea level. As the flight continued, the glider did not gain any further altitude and the pilot decided to carry out an outlanding. While the glider was being manoeuvred in the circuit at about 50 feet above ground level, the right wing dropped and struck the ground.

Burkhart Astir CS, VH-GDZ, Bond Springs N.T., 01 Feb. 87, Non-commercial — pleasure.
The pilot was carrying out local gliding in the Bond Springs area attempting to achieve a flight time of five hours. He had flown away from the vicinity of the airfield in search of lift. On returning to the airfield, he became aware that he would be unable to reach the airfield and selected the only suitable area to carry out a landing. The aircraft failed to make the selected area and struck a tree during the approach, subsequently impacting the ground on the right wing and slewing through 180 degrees before coming to rest.

Glasflugel Libelle H201, VH-GYQ, Bond Springs N.T., 08 Feb. 87, Air show/air racing/air trials.
While returning to the airfield, the glider experienced a deterioration of lift and the pilot decided to carry out a landing on the Stuart Highway. The pilot observed two vehicles on the road and attempted to warn them of intention to land. One vehicle stopped but a bus continued along the roadway. The pilot decided to land before reaching the bus. After touchdown, the pilot moved the glider to the side of the road but the left wing struck a tree, then a road sign. The glider slewed off the road and the landing gear was torn off.

Burkhart Twin Astir, VH-IKU, Waikerie S.A., 25 Mar. 87, Instructional — solo (supervised).
The pilot had completed a soaring flight of some two and a half hours duration. The aircraft was seen to make an apparently normal approach but during the landing flare, the tail cone contacted the ground and the glider pitched nose down. The forward fuselage area then struck the ground heavily. The glider received only minor damage; however, the pilot suffered serious back injuries.

Ultralights

Sadler Vampire SV2, N/A, Wilton N.S.W., 17 Feb. 87, Test.
The pilot was completing a 50-hour test flying program on the aircraft. Two previous sorties had been flown during the day, without incident. On this occasion, the pilot was conducting a glide approach, but when the power was re-applied to go around, the engine delivered some 400 rpm less than normal. The pilot attempted to conduct a circuit; however, the engine power continued to decay. The turn onto base leg was conducted at about 100 feet, and shortly afterwards all power was lost. The aircraft had been close to stalling speed, and landed heavily in a paddock.

Firebird M1, N/A, Judbury Tas., 07 Feb. 87, Non-commercial — pleasure.
The aircraft was the only known one of its type in the country and had been imported by the pilot in 1982. It had not been flown since April 1984. The pilot intended to ferry the aircraft to a neighbouring strip, but about seven minutes after departure the aircraft was seen to turn back. Approaching the departure point, the aircraft suddenly pitched up, and shortly afterwards the left wing failed. The pilot attempted to use the recovery parachute, but this became entangled in the rotating propeller and the aircraft fell to the ground.

Gemini Thruster, N/A, Kapunda S.A., 31 Jan. 87, Non-commercial — pleasure.
The pilot was carrying out a cross-country flight. After passing over one of his planned turning points, he became concerned about the aircraft's location and decided to follow a road back towards the destination. Enroute the pilot descended the aircraft to read a road sign in an endeavour to establish his location. However, the aircraft struck a power line and subsequently collided with the ground.

Final reports

The investigation of the following accidents has been completed

Fixed Wing

Cessna 172, VH-RDP, Quilpie Qld., 24 Jan. 87, Non-commercial — pleasure, PPL. 118 hrs.
The aircraft had been flown from an adjoining property by the owner. Because of difficulties encountered in starting the engine, the owner left it running while the pilot for this flight took his seat. At the time, weather conditions were hot, with a shade temperature of 46 degrees Celsius, and with little wind. The pilot subsequently advised that during takeoff, a steeper than normal nose-high attitude was adopted and the aircraft stalled from a height of about 20 feet above the ground.

The particular aircraft was an early model of the type, with a different instrument panel layout, instrument coaming shape and height to that which the pilot had been operating during the preceding month. The pilot believed that the attitude selected after liftoff was the appropriate one, but because of the difference in instrument coaming heights, the actual attitude was too steep. The departure had been hurried and the pilot had not familiarised himself with the layout of the instrument panel. The extreme ambient temperature had probably caused a degradation in the pilot's performance.

Cessna 172-F, VH-DFW, Musgrave Stn. Qld., 13 Mar. 87, Non-commercial — pleasure, PPL/Cl. 1, 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 10 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.

Piper PA28-R200, VH-SVX, Coffs Harbour N.S.W., 16 Jan. 87, Non-commercial — pleasure, PPL, 160 hrs.
About five minutes after takeoff for a sightseeing flight, the latches on the cabin door released and the door partially opened. The pilot was distracted by the resulting airflow noise and was concerned that the door may have opened further. An immediate return was made to the departure point but the pilot then forgot to lower the landing gear before touchdown.

The subsequent investigation revealed that the top-door latch had probably not been correctly secured before departure. The pilot had not checked the security of the door but had asked his passenger to make sure the door was closed. The main latch was found to be out of adjustment, such that a firm push could cause the door to spring open.

The pilot had not previously experienced a door-open in flight situation. He had been unduly anxious to land and had not completed the prelanding checks. The noise of the airflow past the door had masked the sound of the gear warning horn. The aircraft is equipped with an automatic gear lowering system; however, the handle for this system was in the manual override position.

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

Piper PA28-180, VH-NBF, Bankstown N.S.W., 06 Feb. 87, Non-commercial — pleasure, PPL, 350 hrs.
The pilot had hired the aircraft in order to maintain currency on the type. After an uneventful flight in the training area, he returned to the circuit and carried out a normal approach. However, shortly after touchdown the aircraft swerved to the left and the pilot was unable to regain directional control. The aircraft ran off the side of the runway and the nosegear collapsed.

It was discovered that the elevator trim had been set almost fully nose down and the rudder trim was set almost fully nose left at the time of the accident. The nosewheel had contacted the runway at about the same time as the mainwheels and it was likely that the subsequent loss of control was the result of the aircraft 'wheelbarrowing' on the nosewheel. The pilot, who had only limited experience on the type, had believed that the aircraft had been correctly trimmed prior to touchdown.

Cessna A188B-A1, VH-UDV, Nar Nar Goon, 10 Jan. 87, Aerial agriculture, CPL/Ag. Cl. 1, 2500 hrs.
The pilot had been carrying out spraying operations for most of the day. The flight in question was to be the first for the day from this particular strip. The pilot had pumped 644 litres of water-based spray into the hopper, having previously carried this size load from the 604-metre strip. Normal takeoff procedures were employed; however, the aircraft failed to become airborne as expected. Almost immediately after liftoff, the left gear leg struck and severed the top wire of a fence. The left flap, horizontal stabiliser and elevator collided with a fence post. The pilot was able to retain control of the aircraft, dumped the load and returned for a successful landing on the strip.

Although the pilot had previously operated with a water-based spray-load of 644 litres from this strip, he had overlooked the fact that the loads had different specific gravities. On this occasion, the specific gravity of the load was significantly higher and resulted in the aircraft being about 190 kilograms above the gross weight permitted for agricultural operations. Under the conditions, there had been insufficient strip length available to permit a safe takeoff.

Cessna 152, VH-IBL, Shepparton Vic., 18 Jan. 87, Instructional — solo (supervised), Student, 23 hrs.
The pilot was conducting practice forced landings in the training area. When overshooting from one of these approaches, he observed that the flap would not retract from the two stages-down position. After advising the flying club by radio of the problem, the pilot returned for a landing. The aircraft bounced on touchdown and then began to porpoise. The nosewheel was dislodged and the aircraft slewed off the runway before nosing over onto its back.

The flaps had failed to retract because of a faulty microswitch. The pilot had not experienced a malfunction of this nature before and had allowed this to distract him from the operation of the aircraft. He had persevered with the landing after the initial bounce but had not been able to exercise adequate pitch control.

Cessna 152-M, VH-WLA, Geelong Vic., 30 Jan. 87, Instructional — solo (supervised), Student, 18 hrs.
The student lost directional control of the aircraft during a touch-and-go landing in moderate crosswind conditions. The aircraft ran off the runway and collided with the aerodrome boundary fence.

The student had only limited experience in handling the aircraft in crosswind conditions. The accident occurred during the first landing of the practice session.

Cessna 172N, VH-BAC, Cox Bight Tas., 02 Feb. 87, Non-commercial — pleasure, PPL, 132 hrs.
Before commencing a fishing expedition, the pilot had determined that a particular section of beach was frequently used by light aircraft. An uneventful landing was made on the beach and later the pilot made a takeoff and circuit of the area before landing on another section of the same beach. The group had no success with their fishing and the pilot decided to fly to another beach on the opposite side of the bight. During the landing roll, the pilot discovered that the left brake was not operating. The aircraft subsequently ran through a shallow-water run, entered an area of soft sand, and overturned.

The pilot had no previous experience in operations from beaches and the operator of the aircraft was not aware that a beach landing was intended. The section selected was not used by other pilots who operated in the area. The reason for the brake failure was not determined; however, the left brake unit had a recent history of malfunctions, possibly related to defective seals.

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

Cessna 182-Q, VH-BXL, Numbulwar N.T., 31 Jan. 87, Charter — passenger operations, CPL/Cl. 4, 417 hrs.
The pilot was conducting the return leg of a charter flight when weather conditions deteriorated about 130 kilometres from the destination. Thunderstorms were evident on either side of track and converging ahead of the aircraft. The pilot elected to return to the departure aerodrome; however, approaching this strip the weather again deteriorated to the point where flight in visual conditions was not possible. After searching for over an hour to find a clear route to another aerodrome, the pilot elected to land in what appeared to be a suitable paddock. During the landing roll, the nosegear sank into the soft surface and the nosegear was dislodged.

The pilot had only limited experience in operating in the Northern Territory during the wet season and had probably not received sufficient training and supervision from the aircraft operator.

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

Gliders

Aer-pagaso M-100s, VH-HDJ, Waikerie S.A., 02 Feb. 87, Air show/air racing/air trials, Glider, 112 hrs.
The glider was being launched via an aero-tow. It became airborne after a short ground run and climbed to a higher than normal altitude. The pilot attempted to correct the situation but the glider bounced twice on the strip, breaking off the tail skid. As the glider climbed away, it continued to oscillate in a position above the tug aircraft. The tow rope was released when the glider was about 120 feet above ground level and the pilot, believing that there was insufficient runway remaining to land, attempted to turn back for a landing on the strip. During the turn the glider entered a spin, subsequently striking the ground in a nose-low attitude.

The pilot was inexperienced on the aircraft type, having not flown the type for about two months. On the day, there was a gusty wind blowing and it was the opinion of experienced local pilots that a landing straight ahead after rope release would have been possible.

Schemp Discus A, Unknown, Deniliquin N.S.W., 29 Jan. 87, Air show/air racing/air trials, Glider, 4000 hrs.
Schemp Discus A, VH-GSO, Deniliquin N.S.W., 29 Jan. 87, Air show/air racing/air trials, Glider, 3620 hrs.
The pilots were competing in a race as part of the World Gliding Championships. The gliders were in a group climbing in a thermal when they collided at about 3900 feet above mean sea level. The Italian pilot in LB did not see the other aircraft, while the Polish pilot of VH-GSO only became aware of the proximity of LB at the last moment. The collision severed the right half of the horizontal stabiliser of LB; however, the pilot was able to retain control of the aircraft and landed without further damage.

This accident was regarded as an operational hazard inherent in this type of competition, and was not subject to an on-site investigation.

Glasflugel Libelle, VH-GBN, Bathurst N.S.W., 25 Jan. 87, Non-commercial — pleasure, Glider, 130 hrs.
The pilot was approaching to land at the end of a soaring flight. There was turbulence in the circuit area with a moderate crosswind for the landing direction. The pilot realised he was overshooting his planned touchdown point, and side-slipped the glider to lose height. At the conclusion of this manoeuvre the glider was some 1000 feet in from the threshold. It then landed heavily and bounced, before a second heavy touchdown occurred.

The pilot had evidently been distracted by the presence of another glider and a tug aircraft at the strip threshold, and probably by the wind strength and turbulence.

Schemp Nimbus 2, VH-WVY, Coleambally N.S.W., 16 Feb. 87, Non-commercial — pleasure, Glider, 278 hrs.
While conducting a cross-country flight, the pilot encountered deteriorating lift conditions, and an outlanding became necessary. On short final approach to the selected paddock, strong lift was experienced and the pilot overshot the touchdown point. During manoeuvring for another approach, the glider stalled and struck the ground in a very steep nose-down attitude.

When it was apparent that the aircraft would overshoot the target touchdown point, the pilot had carried out a steep turn to re-position for final approach. During this manoeuvre the spoilers, flaps and landing gear had been left extended. The pilot had evidently not monitored the airspeed and the glider had stalled and entered an incipient spin.

Std Jantar-3, VH-HNG, Horsham Vic., 14 Feb. 87, Air shoe/air racing/air trials, Glider, 345 hrs.
The pilot was conducting the last leg of a competition flight when he realised that an outlanding would probably be necessary. However, he was able to reach a point about three kilometres from the destination aerodrome, and while manoeuvring towards the selected paddock he considered he could in fact reach the aerodrome. The planned outlanding attempt was abandoned, but approaching the aerodrome boundary the pilot realised he was too low and decided to land in a stubble paddock. During the turn onto final approach, the left wingtip contacted the stubble and the glider struck the ground heavily.

The pilot had delayed making an outlanding because of his desire to complete the competition. Wind conditions were calm and the pilot could have conducted a straight-in approach to the stubble paddock thus avoiding a turn at very low height above the ground. The pilot had been airborne for nearly five hours and it was possible that he was affected by fatigue.

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

Schneider ES-60, VH-GQW, Euroa Vic., 19 Feb. 87, Non-commercial — pleasure, Glider, 1188 hrs.
The glider was winch launched to a height of 900 feet above the ground. The pilot was unable to find any strong lift and when the glider had descended to 600 feet, the pilot rejoined the circuit for landing. Some sink was experienced on the downwind leg and the glider was only about 200 feet above the ground when the base turn was made. During the turn onto final approach, the right wing of the glider struck the ground. The aircraft swung sharply to the right and subsequently landed heavily.

There was no other traffic in the area and the pilot could have modified his circuit and landed on a cross-strip. It was likely that he had attempted to land the aircraft close to the winch launch cable to facilitate the next flight.

Ultralights

Thruster Gemini, N/A, Goulburn N.S.W., 01 Feb. 87, Non-commercial — pleasure, N/A.
The pilot held a Student Licence as issued by the AUF. During a landing approach the aircraft overshot the intended touchdown point. It subsequently ran off the end of the strip and collided with a tree.

It was reported that the student was not being supervised by an instructor at the time of the accident. The reason he apparently misjudged the approach was not determined.

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

Sorrell Hyperlight, N/A, Oxley Island N.S.W., 25 Feb. 87, Non-commercial — pleasure, N/A, 6500 hrs.
During a flight earlier in the day, the pilot noted that an airspeed indicator he had fitted was not operating. This had been of no concern, as the original indicator fitted to the aircraft was functioning correctly. After landing and rectifying the defect in the new indicator, the pilot elected to carry out a further short flight. At about 200 feet after takeoff the engine failed and while attempting to restore power, the pilot forgot to monitor the airspeed. The aircraft stalled at a height of about 100 feet and the pilot was only able to regain partial control before the aircraft stuck the ground heavily.

The reason for the loss of engine power has not been established.

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

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

Piper PA31, VH-CJB, Cairns Qld., 02 Sep. 86, CPL/Cl. 1, 895 hrs.
The pilot hired the aircraft privately from his employer to conduct a holiday flight during his leave. The journey commenced at Moorabbin on 25 August and the aircraft arrived at Cairns about midday 30 August, after stopovers at Coolangatta and Proserpine. The pilot and his passengers then spent the next three days at leisure in the Cairns area.

On the day of the accident, the pilot attended the Cairns Briefing Office where he collected the relevant weather forecasts and submitted a flight plan. The flight plan indicated that the flight would be conducted in accordance with Instrument Flight Rules. It contained a deficiency in that no details were given for the first route segment from Cairns to Biboohra. It is apparent that the pilot had not noticed that the tracks to the west of Cairns, on the relevant enroute chart, emanate from Biboohra, and not Cairns. There was no track line which joined Cairns and Biboohra. Such a line might have alerted the pilot at the time he planned the flight. The error in the flight plan was not detected when the plan was submitted.

When the pilot was issued with an airways clearance prior to departure, it was apparent that he did not understand the terms of the clearance, which gave the initial tracking point as Biboohra. The location of this point was explained to the pilot and he subsequently accepted the clearance. He elected to depart using visual procedures, after being offered a choice of these or the published Standard Instrument Departure profile. A visual departure from the particular runway in use allows an aircraft proceeding towards Biboohra to intercept the required track sooner than is possible with an instrument departure.

The aircraft was issued with takeoff instructions which included clearance for the pilot to a right turn after takeoff. Witnesses observed that the aircraft complied with this clearance and headed in a south-westerly direction before turning to the north-west and subsequently entering cloud. The cloud base was estimated to be between 2000 and 2500 feet above mean sea level. No further communications were received from the aircraft and a search was commenced that afternoon. The search effort was hampered by the weather and the wreckage was not located until the following afternoon.

Inspection of the wreckage indicated that the aircraft struck the top of a ridge line 250 metres south-west of the highest point of the Mt Williams area. At the time, the aircraft was on a west-north-westerly heading, flying wings level and climbing at an angle of about five degrees. No fault was found with the aircraft that could have contributed to the occurrence.

At the time the aircraft entered cloud, the pilot should have reverted to Instrument Flight Rules procedures. To comply with these procedures, a pilot is required, *inter alia*, to ensure that adequate terrain clearance is achieved during climb to the lowest safe altitude. The relevant altitude for the route segment Cairns to Biboohra is 4500 feet above mean sea level (amsl). As the aircraft was apparently under control at the time of impact, with the ground at about 3250 feet amsl, it was likely that the pilot had overlooked the lowest safe altitude requirements.

De Havilland C2, VH-IDG, Cooma N.S.W., 09 May 86, CPL/Ag. Cl. 1, 17 000 hrs.
During the takeoff roll, the left mainwheel struck a tyre which was being used as a strip marker. The tyre deflected into the tailplane; however, the pilot did not feel the impact and discovered the damage at the conclusion of the flight. An inspection indicated that the tyre had been moved from its normal position prior to the impact and was hidden from the pilot's view by the long grass on the strip.

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

Cessna 310-B/A1, VH-TTM, Bankstown N.S.W., 26 Aug. 86, CPL/Cl. 1, 349 hrs.
The purpose of the flight was to deliver the aircraft to its new owner. The aircraft had been imported from Papua New Guinea in December 1985 and had flown only a limited amount since that time. The pilot carried out three circuits prior to departure and made a successful landing enroute for refuelling. However, on touchdown at Bankstown following a normal approach, the nosegear collapsed. Initial investigation revealed that the nosegear-down lock had not completed its travel to the overcentre position. In addition, the microswitch was incorrectly adjusted, giving a down and locked indication before the lock was fully engaged.

The nosegear had collapsed because of faulty rigging on the gear, which prevented it from completing the full extension cycle. The applied loads had been held by the actuating rods and bellcranks until a bellcrank rod-end had failed in overload.

Cessna 150-E, VH-KML, Tundulya N.S.W., 25 Nov. 86, PPL, 300 hrs.
The pilot had been carrying out a number of flights to strips in the general area. After completing repairs to a bore pump, the pilot and passenger prepared to return to the property homestead, some 20 kilometres to the north. Shortly after the takeoff roll commenced, the aircraft began to veer to the right. Full left rudder was progressively applied, but directional control could not be maintained. The right wing collided with a number of bushes and saplings alongside the strip. The aircraft then slewed rapidly to the right and the nosegear collapsed.

Investigation revealed that the aircraft had rolled for 104 metres before the right wing struck and broke a small sapling. This coincided with the initial veer to the right as reported by the pilot. As the aircraft diverged from the centre of the strip, it entered an area of soft loam which increased the drag on the right wheel. The scrub struck by the aircraft had encroached onto the strip, reducing the width in places to about 15 metres. The pilot had been aware that the strip had not been cleared of undergrowth for some 21 months.

Piper PA23-250, VH-MBU, Essendon Vic., 29 May 86, CPL/ Flt. Inst. Gr. 3, 610 hrs.
The pilot was carrying out a preflight inspection of the aircraft in preparation for an Instrument Rating flight test. He had selected the flaps down and began operating the hydraulic hand pump to extend the flaps. After a few pump cycles, the right maingear collapsed and the pilot then noted that the gear selector was in the up position.

It was suspected that the anti-retraction valve, which is designed to prevent gear retraction on the ground, was unserviceable. However, no fault was discovered. Test determined that the gear could be unlocked if the hand pump was operated rapidly, and the pilot advised that he had pumped briskly on this occasion. The checklist provided by the aircraft operator did not alert pilots to confirm the position of the gear handle before using the hydraulic hand pump. It was not possible to establish why or by whom the gear selector had been placed in the up position.

Gulfstream 695-B, VH-LTM, Mangalore Vic., 20 Nov. 86, SCPL/Cl. 1, 6000 hrs.
The crew was conducting a series of circuits and landings. The checkpilot was sitting in the right-hand control seat and was holding the checklist. During the circuit in question, the checkpilot spent a considerable amount of time discussing various aspects of the aircraft operation. There was further cockpit talk during the final approach, and neither pilot realised that the landing gear had not been lowered. The aircraft slid on its belly for some 360 metres after touchdown.

No fault was subsequently found with the aircraft or its systems. The gear warning horn was serviceable but had probably been deactivated by the pilot when power was reduced in the early stages of the circuit. To re-arm the warning system, the power levers have to be advanced to about 30 per cent torque. The particular circuit was being flown with the flaps up and was consequently conducted at a power setting lower than that required to effect re-arming.

The pilot in the left seat had experienced minor difficulties in handling the aircraft as precisely as desired and the checkpilot had assumed an instructional role. Under these circumstances, the normal two-pilot challenge and response method of conducting the various prelanding checks had broken down.

Piper PA28-161, VH-BZB, Lilydale Vic., 09 Dec. 86, PPL, 560 hrs.
After conducting a thorough preflight inspection, the pilot prepared to ferry the aircraft to a maintenance organisation which was to perform a scheduled inspection. The aircraft performed normally until it reached a height of about 200 feet after takeoff. At this point, the engine lost a substantial amount of power and the pilot was committed to a forced landing. During the landing roll, the aircraft collided with a fence and came to rest in the adjacent paddock. Initial inspection revealed that there was a serious leakage of fuel past the fuel filter bowl seal and it was likely that the defective seal had allowed air to enter the fuel system.

The clamping nut which held the filter bowl in place had evidently been modified by someone other than an approved engineer. The modification had not allowed the bowl to be held with sufficient tension to prevent the leakage of fuel past the seal.

Cessna 210-M, VH-ITM, Batchelor N.T., 03 Sep. 86, CPL/ Cl. 4, 1290 hrs.
After takeoff, at about 100 feet above ground level, the engine began to surge. The pilot changed the fuel tank selection and operated the auxiliary fuel boost pump, but the engine did not regain power. The pilot then manoeuvred the aircraft in an attempt to find a clear area to land. However, he was unsuccessful and the aircraft collided with trees at a low forward speed. During the impact sequence, a fire broke out and almost completely consumed the cabin area and the inboard sections of the wings.

Despite the extensive fire damage, small amounts of water and rust were found throughout the fuel system. No other defects were discovered which might have explained the reported engine malfunction and it was likely that the power loss was caused by water contamination of the fuel. The method by which the water entered the fuel tanks was not established but may have resulted from condensation and/or the ingress of rain water through the tank caps. The water had not been detected by the pilot during his preflight inspection.

Gliders

Schleicher KA-6, VH-GTW, Tumbarumba N.S.W., 06 Dec. 86, Glider, 205 hrs.
Following a winch launch, the pilot spent 12 to 15 minutes gliding before returning for a landing. On the downwind leg, he noted that the aircraft appeared to be lower than the height indicated on the altimeter. At about the base-leg position, the aircraft was very low and witnesses expected the glider to land in one of several suitable paddocks. However, the pilot continued towards the strip and the glider touched down during the turn onto final approach. The tail section was broken off when it contacted long grass.

The pilot had accumulated most of his gliding experience at the particular strip and was familiar with the area. The flight in question was to be the first made by the aircraft since returning from another aerodrome. During his prelaunch checks, the pilot had forgotten to re-set the altimeter to read zero feet. As a result, the altimeter was over-reading by some 500 feet. The pilot had concentrated on the indicated height and had not visually assessed the approach profile. He was unable to explain why he had persisted with the approach when he became aware that the aircraft was abnormally low and there were suitable outlanding areas available.

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

Std Jantar 3, VH-HNI, Scone N.S.W., 30 Dec. 86, Glider, 715 hrs.
Because of deteriorating lift conditions, the pilot was required to make an outlanding. A normal circuit and touchdown were carried out, but after a ground roll of about 20 metres the landing gear struck a large rock which had been hidden in the long grass.

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

Corrigendum

In the Final Reports section of Aviation Safety Digest 131, *an incorrect registration was given in the preliminary information for a DH82A accident at Bankstown on 02 Aug. 86. The correct registration was VH-ASC, not VH-ASG as stated.*

Aviation Regulatory Proposals

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.

Each edition of the *Digest* contains a listing of those ARPs circulated since the previous edition.

Should you wish further information about any of the ARPs, please contact your industry organisation.

Number	Subject	Status
86/14	Aircraft maintenance Engineer Licensing system	Issued 9 February 1987 Comments due 1 April 1987
86/20	Agricultural operations	Issued 10 February 1987 Comments due 31 March 1987
86/21	VFR Flight below 5000 ft	Issued 19 February 1987 Comments due 30 April 1987
87/2	Authorised landing areas	Issued 11 February 1987 Comments due 30 April 1987
86/3	Aircraft maintenance policy review	Issued 6 March 1987 Comments due 1 June 1987
86/19	Supplementary airline licence requirement	Issued 18 March 1987 Comments due 31 May 1987
86/9	Approved organisations policy review	Issued 26 March 1987 Comments due 1 July 1987
87/6	Aircraft navigation and flight management computers	Issued 8 April 1987 Comments due 7 July 1987

AIRFLOW

Dear Sir,

Recently I was asked to participate in a group activity, the purpose of which was to take some folk flying in groups of three while others were enjoying a BBQ at the airport.

The flights were to be of various durations, viz: 20, 30 and 45 minutes. Total flying time was to be about 220 minutes.

While checking the aircraft I noted that one wing tank was full and the other was at the tab level, giving a total of 155 litres of fuel in the aircraft and a duration of 258 min. A refuelling stop would be made some time during the day.

The various flights took place without incident — I changed tanks during run-up and downwind checks as required. The fuel gauges were showing the usage of fuel as they indicated reducing contents as the day wore on.

The second-last group of passengers boarded the aircraft for a 45-minute flight and while I don't specifically remember checking the fuel gauges while running-up on this occasion, I certainly turned into wind and, to the best of my memory, carried out those checks.

This flight was without incident except that, after turning off the runway, where I stopped to carry out the postflight checks, the engine tended not to idle very well, and when the throttle was opened to taxi to the boarding area, the response was very hesitant. Nonetheless, we taxied without further irregularities. Even at this point of time I didn't recognise that there may have been a fuel problem; maybe I pushed the throttle foward too fast?

I was aware that the gauges were showing that the fuel was getting low so as I left the cabin, I grabbed the dip stick to check how much fuel was in the aircraft. When I removed the filler cap from the tank it was painfully obvious that it was not going to be needed, as I could not see any fuel at all. For whatever reason, perhaps in disbelief, I still dropped the dip stick into the tank to double-check that it was so empty. It was!

Numbed as I was, I checked the left tank and found that the fuel in this tank was just visible, but not even up to the baffle. It was obvious that the aircraft needed to be refuelled, and so I climbed aboard and did my start-up checks. Imagine my further surprise when the electric fuel pump did not quieten until I changed from the right tank to the left.

While refuelling the aircraft I noticed that the right tank took approximately 20 litres before it was to the same level as the fuel in the left tank. At this stage, after the first few litres discharged as usual, I must have pulled the hose and caused it to kink and restrict the flow. Not wanting my plight to be discovered I was content to let the fuel dribble into the tank and, after about 20 litres, I looked into the tank to see if the fuel was visible. It was, but it was not enough for a further flight of 30 min (18 l) and the mandatory reserve of 45 min (27 l) — a total of 45 litres. Someone happened by and I suggested that the underground tank might be empty. They quickly pointed out that the hose was 'kinked' and re-arranged the hose to remove it. The fuel flowed freely once again.

There are many 'what ifs' that come out of this experience.

What if I had kept an accurate duration for each flight? I would have found that each trip (of which there were nine) was over by several minutes each time. The total time logged for the day was 280 minutes, as compared with an estimated 220 minutes.

What if the engine had quit on an undershoot at 100 feet? Would I have been quick enough to recognise the problem and change to another tank?

What if a 'go-around' had been necessary from a low height — same problem.

One could go on. However, what concerns me is why this happened. I don't think I'm irresponsible, but perhaps I was complacent because I was operating from a familiar airport. Was I getting tired and missing vital checks? — and the 'kink' in the fuel hose? Were there other checks that I was missing? Why was I too embarrassed to find out why the fuel was not flowing properly?

This has been a vital lesson to me. Even though the next and last trip was uneventful, I know that I will agonise over these events for some time to come.

I shudder when I think how close I came.

ANON

I think that there are several lessons, but the glaring one is about fuel management. You must not rely on the fuel gauges. You must keep track of your fuel usage. You must allow a generous margin. You must not take off without knowing *how much fuel is on board.*

'THERE'S PROBABLY ENOUGH FUEL FOR JUST ONE MORE CIRCUIT' is the same as 'THE GUN'S PROBABLY NOT LOADED'. Good luck.

IF YOU

TRUST THE GAUGES

MORE FUEL YOU

Orchestrating a non-accident

Steve Tizard is a most experienced pilot and instructor. He is currently the CFI of the Canberra Aero Club.

It takes a deliberate effort to arrange a flight so as not to have an avoidable accident and to minimise the probability and the consequences of an unavoidable accident. Steve's analogy of an orchestra which aims to have a series of individual inputs co-ordinated into a smoothly running and polished performance is a good one.

IN MUSIC, EACH part of an orchestra and each musician has to work in harmony to produce the ultimate sound. Piloting an aircraft is much like being the conductor of the orchestra. The pilot has to harmonise the various inputs to achieve a polished (error-free) performance.

Too often, aircraft accidents are blamed on pilot error (finger trouble) or, in these more enlightened times, the human factor. That is to say, they are avoidable. We all know only too well the likely types of accidents that occur and we can each predict with some accuracy the probable causes of next year's accidents. With this knowledge surely we can do something about our individual vulnerability to accidents.

Too little knowledge from past accidents is applied to the prevention of similar occurrences in the future. We keep repeating history. The publication of accidents in the *Digest* is a step in the right direction. But we read about accidents and then I don't think we consciously relate them to our own vulnerability. It is a pity that trends in accidents and *causes* of accidents (as distinct from types of accidents) are not more readily identified so that emphasis on certain aspects of training could be changed.

The accident that does not result in death or injury should not be ignored. Repair bills cost us all. A spate of accidents results in an increase in insurance premiums — and look at the effect of litigation on the US aviation industry.

Aircraft accidents usually result in the ensuing investigation revealing what happened, but too little knowledge is gained of why it happened. The orchestration of many accidents happens years, weeks or hours before the event — not seconds. There is always a series of events leading to the accident and the interruption of this sequence is often all that is necessary to avoid the accident.

In general, the factors in a safe flight (or otherwise) can be sub-divided as follows:

the operator	(the pilot)
the machine	(the aircraft)
the environment	(the weather)
the terrain	(the airfield).

Each of these factors has many elements. However, only the major ones are detailed here.

The pilot

Undoubtedly he or she is the most complex aspect of all. The question is often asked, 'Why did a cautious and conscientious pilot convert a costly piece of serviceable machinery into a heap of junk?' It is interesting to note that a pilot is tested on a wide range of topics, yet rarely, if ever, is he encouraged to make a critical examination of himself. A healthy person with a valid pilot's licence and meeting all legal requirements is not immune from having a flying accident. Take the case of a pilot who arrives at an ALA after a long flight. His judgment and ability during that final landing may not be commensurate with his 'normal' performance.

This pilot may have been subjected to navigational difficulties, deteriorating weather, sick passengers and tiredness (to name a few examples). His performance, under these circumstances, may not be as good as the same landing situation when not subjected to these additional pressures. Such pressures are not necessarily counteracted by experience but rather by a disciplined approach to all aspects of flying and an awareness of the problems.

The aircraft

Knowledge of all flight procedures, the aircraft's handling characteristics, normal and emergency procedures plus currency on type, are essential. No matter how mentally prepared you are for the flight, the knowledge and proficiency described above is still paramount.

To load an aircraft over its AUW or CG limits or to fly outside the approved flight envelope is courting disaster — and there is no excuse.

Flight instructors regularly find, during biennial flight reviews, that essential knowledge of the aircraft is lacking. A reason for this is often due to insufficient flying. While flying training has become comparatively cheaper over the last forty years, many people do not allocate sufficient funds for continuation training. Remember currency requirements are *minimum* requirements. And currency relates directly to the type of flying that you are about to do.

The weather

Knowledge of weather and its effects is often forgotten immediately after an exam, having been dismissed as no longer relevant. Yet the theory of many 'Met' topics is an essential aid to understanding the subject in broad terms — to explain what we encounter in practice and then to be better able to predict what the consequences will be. Flying conditions associated with thunderstorms, fronts, icing, sea breezes, the formation of fog and the effects of density altitude are among the subjects which *must not* be forgotten.

The airfield

How many pilots are fully aware of the requirements for using an ALA? If in any doubt you can check the VFG. Estimates of length, width and slope are often suspect. Also be aware that an ALA meeting minimum aerial agricultural standards, will not meet private or other aerial work standards. And of course, any assessment of the airfield has to be related to the performance of the aircraft and the performance of the pilot *in those conditions on that day.*

What about flying skill?

This article deliberately avoids discussion on skill or technique. These aspects vary from individual to individual and from day to day. Only you know if your performance is up to scratch. Only you can ensure that you have a margin for error to allow for your level of skill *in that situation on that day.* However, the old saying of 'poor planning leads to a poor performance' just as 'a poor approach leads to a poor landing' is very true. No matter how skilled you are as a pilot you are vulnerable to an accident — in some circumstances. You have to recognise that vulnerability and make an allowance for it. If all else fails always leave yourself an escape route.

Conclusion

For the reasons discussed, you and you alone, as the pilot in command, are totally responsible for orchestrating a successful flight.

Remember this formula

PILOT PROFICIENCY AND CURRENCY ON TYPE
+
CORRECTLY LOADED AIRCRAFT
+
CORRECT TECHNIQUE
+
SATISFACTORY ENVIRONMENTAL CONDITIONS
+
SUITABLE AIRFIELD
=
SUCCESSFUL FLIGHT.

The safe and successful integration of these various inputs is up to you as the conductor, the orchestrator of the performance, the pilot-in-command.

[Bravo! Bravo! Encore! Encore!] □

Water, water everywhere and not a drop to drink

Once

THE PILOT was taking his grandchildren on a short cross-country trip. During the preflight he found water in the fuel when he drained samples. He drained them until no water remained and also drained the strainer drain until it appeared clear of water.

Most of the flight was routine with the right tank selected. The pilot selected both tanks on downwind before landing. As he rolled out on final he selected full flap (none had previously been extended) and the engine suddenly suffered a total loss of power.

The pilot managed to glide over a railway cutting but the left main gear hit a cement post and the aircraft hit the ground some two metres further on. The undercarriage leg was severed half-way along and the stub had dug into soft earth. The Cessna pitched forward on to its nose and right wing tip before falling back onto its belly.

No-one was hurt. (Remember this pilot was carrying his grandchildren. Imagine his feelings if they had been injured.)

During an on-site inspection it was found that the strainer contained mostly water and the carby contained a fifty-fifty mix of fuel and water. Samples from the right tank were clear but the left tank contained significant amounts of water.

The pilot was apparently not aware of the wing rock requirement for checking the drains in Cessna aircraft with bladder fuel tanks.

The seals on the fuel caps were in poor shape and the aircraft had been out in the open during rain showers during the previous few days. It is presumed that the attitude change associated with full flap selection together with the prior selection of both tanks was enough to dislodge water that had been pooled in the recesses of the left hand bladder tank and this failed the engine.

Twice

The Cessna 206 had undergone a major inspection and subsequently remained in the open. During this period there was heavy rain and flooding. The tanks were full except for the fuel used during regular ground runs of the engine.

The aircraft was then sold, and prior to delivery was taken on a check flight. The pilot carried out what was described as a 'casual' daily inspection and found a 'normal' quantity of water in the fuel. On takeoff there was an engine problem and the aircraft was put back down on the airfield. Fuel samples showed about a fifty-fifty mixture of fuel and water — and some brown 'gunk'.

The fuel system required extensive dismantling to remove the sludge. The fuel pump had to be reconditioned and the fuel tank caps had to be replaced as the seals had deteriorated.

The method for checking for water, specified by Cessna and the Flight Manual Supplement, was then carried out. (This entailed rocking the wings and lowering the tail to disturb the water trapped in the gullies of the fuel bladder inside the tanks. This check was done until there was no further sign of contamination.)

The aircraft then departed on its delivery flight. During this flight there was another serious engine problem which required an emergency landing. More water was found in the fuel system and, after further fuel draining, it was delivered to its new owner. The aircraft was refuelled and more water was subsequently found. That evening the CFI took his wife and family on a night VMC flight! He returned safely but subsequently more water was found in the fuel system.

Neither the new owner nor the CFI was told about the history of water contamination in this aircraft.

Thrice

The Cessna had been parked in the open for some days and had been subjected to numerous rain showers. A substantial amount of water was drained from the fuel system during the preflight.

Shortly after takeoff the engine lost power and the pilot manoeuvred for a forced landing. He was able to obtain partial power for a brief period and then the engine failed completely. The pilot was committed to a landing on soft wet ground.

Water was found in both wing tanks, the fuel filter and the carburettor. One of the fuel cap seals was defective. Two of the three drums of fuel from which the aircraft had been refuelled were contaminated.

Older Piper aircraft had a fuel drain at the front of the tank and it was possible to have a water-free sample while the tail was down. When the aircraft changed to a level attitude the water could enter the fuel lines. The Pawnee was in this category as were the older J3 and Super Cubs. The major problem today though is with the Cessna singles which have a rubber bladder tank inside each wing. It is a frequent occurrence that water can sit in the folds of the bladder and not be detected in a fuel drain — hence the procedure of rocking the wings and lowering the tail to disturb the puddles.

Our lives depend on a reliable engine. The engine depends on pure and correct fuel.

I would add two further points:

- *if you are doing a 'check flight' don't risk other peoples lives, especially loved ones*
- *if you suspect the aircraft has a problem* tell the poor pilot who is about to fly it. *Perhaps one day someone will return the favour and warn you of a problem, and that warning could save* your *life or the lives of* your *family* □

Shear terror

WINDSHEAR has become the bogey of modern flying. Several large jet aircraft have been lost because of it. It is still not fully understood, at least to the extent of being able to predict or detect it. The avionics manufacturers are working flat-out on solutions employing doppler radar, inertial sensors and vertical velocity sensors. These techniques are designed to help the pilot to detect the presence of marked windshear early enough for the aircraft to avoid or to recover from it.

It seems to have only recently appeared but like the medical profession, most ailments have been around a long time and only now are being understood and correctly classified. Windshear has always been around too. Only now is its significance being understood as only now are massive aircraft with enormous values of momentum commonplace.

That's correct — the large aircraft are more vulnerable to shear than smaller ones. And that has only recently been understood. It's incredible to think that a 'Jumbo' of some half a million pounds all-up weight is vulnerable to wind effects.

It is a little hard to come to grips with, but it is essential in understanding windshear to understand the dynamic effects as well as the aerodynamic effects on an aircraft.

An aircraft cruising along at constant altitude and airspeed has a certain momentum, i.e. a certain tendency to continue at that speed and in that direction. The strength of that tendency is equivalent to its velocity multiplied by its mass. Momentum equals m × v. That is, the more massive it is and the faster it is travelling the greater the momentum.

The velocity we are talking about here is its velocity in space, measured from its starting position on the earth, i.e. *its speed relative to the earth.*

This concept is the crux of our understanding of windshear. When we are talking about momentum we are dealing with speed relative to the earth and that is 'ground speed'. As far as momentum is concerned there is no wind and no such thing as airspeed. It only deals with speeds relative to the earth. And that is the problem, because aeroplanes must deal in airspeed. They must, because below a certain value the aircraft will cease flying, or at best, suffer from an enormous drag rise.

So our Jumbo, cruising at a ground speed of 550 knots at a mass of 300 000 kg, has a momentum of 550 × 300 000 units. A Warrior at a ground speed of 100 knots and at a mass of 1000 kg has a momentum of 100 × 1000 units. The momentum of the Jumbo is 165 million units compared to the Warrior's 100 thousand. It is 1650 times as much, and that represents a much stronger tendency to continue at its particular ground speed and in its particular direction.

This momentum is both good news and bad news. It means that the Jumbo is more resistant to a disturbance of its flight path, and in terms of ease of flying, this is a bonus. The aircraft will tend to stay 'on the rails' or 'in the groove'. Conversely the Warrior will require more active pilot participation to maintain a steady flight path.

If the Jumbo experiences a transient gust or momentary turbulence, it will ride the disturbance by the aircraft continuing due to momentum and the structure absorbing the disturbance by flexing of its wings. The Warrior will feel the disturbance, and because of the low momentum, will react to it by a change in flight path. The pilot is required to contribute more to the maintenance of a steady flight path in the small aircraft than the Jumbo. These then are the benefits of high momentum. What is the disadvantage?

Look again at the Jumbo cruising at a ground speed of 550 knots. Say there is a head-wind of 50 knots. The airspeed is therefore 600 knots. (Assume for now that TAS = IAS = CAS.) Remember the momentum is the strength of the tendency to continue at that ground-speed and in that direction. Let the wind suddenly stop. The aircraft will tend to continue at a ground speed of 550 knots. With the wind gone, the airspeed drops instantly to 550 knots. If the thrust was left at the value for 600 knots IAS, then the aircraft will gradually accelerate to that speed (and a ground speed of 600 knots in nil wind, but the thrust has to change the momentum and that takes time). Note that for a finite time the airspeed dropped by the value of the change in wind velocity.

Try a Jumbo at a ground-speed of 550 knots and a tailwind of 50 knots. The airspeed is 500 knots. The wind drops and the Jumbo quickly shows an airspeed increase to 550 knots until the thrust deficiency causes a reduction in momentum. (Note that while the momentum is the tendency to continue at that speed, the thrust must still overcome the drag to prevent a gradual decay in speed.) Note also that the drop in tailwind has caused an increase in airspeed equal to the change in the wind velocity.

Once more, an aircraft with high values of momentum shows a change in airspeed due to a change in wind velocity. The magnitude and suddenness of the change is a direct function of the changing wind. The duration of the change is a function of the ability of the aircraft to change its airspeed and that depends on excess thrust available, pilot reaction time, and engine reaction time.

The small aircraft with low values of momentum on the other hand is affected by the drop in wind and simultaneously by the changed drag due to the changed airspeed. It therefore responds immediately to restore the trimmed airspeed, and because of the low momentum, there is not a significant delay. That is not to say that the small aircraft is not vulnerable to shear but that it reacts more quickly and is therefore less likely to develop high sink rates or to fall below Vs during the airspeed transients.

The problem is compounded when we realise the low values of excess thrust possessed by the large transport and the lengthy acceleration times of a gas turbine engine. Further, the momentum comes back into play if the aircraft starts heading downhill; remember, momentum is also a tendency to continue in a particular direction, and once that is downwards, the aircraft will almost inevitably consume a large amount of altitude in the attempted go-around.

The piston engine has almost instantaneous thrust response. The turbo-prop has the turbine already spun-up and only requires a change in propeller blade-angle for instant thrust. The turbo-jet or turbo-fan has to spool-up, to accelerate to high rpm before any significant thrust increase is available.

So the problem is compounded in jet aeroplanes.

What can be done?

Problem number one is to predict the conditions where the windshear is likely or is severe. Data is being accumulated to this end.

Next we can surmount the thrust delay problem by carrying extra drag and therefore extra thrust on final approach.

But we can't carry sufficient excess airspeed on finals to counter the shear and still land successfully.

This is the real problem. We need a reserve of airspeed which we can't afford to carry and an excess thrust we can't afford in terms of reduced payload.

Research in the United States has employed Flight Simulators to replicate the behaviour of aircraft in severe windshear conditions. Pilots can then develop and rehearse flying techniques to counter the problem.

In some conditions experienced in practice and reproduced in the simulator, the only survivable technique was to go-around and wait until conditions improved. Before putting our heads into the lion's mouth, we should consider the consequences of it sneezing!

As far as the problem of flying is concerned, the optimum technique appears to be:

- apply full power early
- hold a constant angle of attack while the engine is accelerating, i.e. keep just out of the stall warning regime by gently lowering the nose, but
- don't lower the pitch attitude to the extent of developing excessive descent rates, while you are trying to eradicate the stall-warning
- gently trade airspeed for a positive rate-of-climb as the thrust picks-up.

BETTER STILL, DON'T BE PLACED IN THAT POSITION IN THE FIRST PLACE.

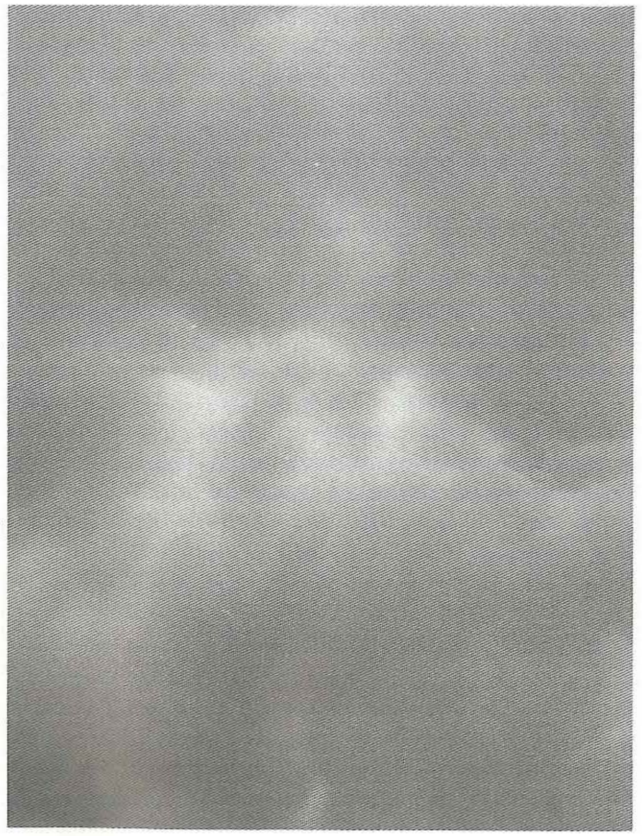
What does all of this mean to us littlies? Although it appears we are not as badly off as larger aircraft, we can still lose control. We are better off if we keep our minds on the job and avoid these situations. We have many cues to windshear in a small aircraft because we are more exposed and more sensitive to conditions than a large aircraft.

The pilots involved in the following situations have kindly described what they experienced. I publish them, not to criticise but to show that windshear is serious, and in retrospect there were clues that they could have used to avoid the problems.

Southern Cross Scare Race?

Bill Huntly recalls his confrontation with a storm at Echuca. [I was on the ground watching and I thought that the aircraft was going out of control as it tried to go around.]

Under the storm ▼



'My incident occurred during the final stages of Day 1 of the 1986 Southern Cross Air Race. As pilot-in-command of the PA-28-181 we were third in line to commence an extended downwind for runway 35 at Echuca. This extended downwind commenced about 5 nm north of the aerodrome. At about this time I became conscious of a "black wall" approaching from the west. This thunderstorm also showed a few flashes of lightning. I estimated it to be quite a few miles away.

'However, when we were approximately half-way along the downwind side of the strip, I had my doubts that we would beat the storm. As I turned Base I noticed the aircraft in front of me had touched down and the windsock was pointing directly down RWY 35.

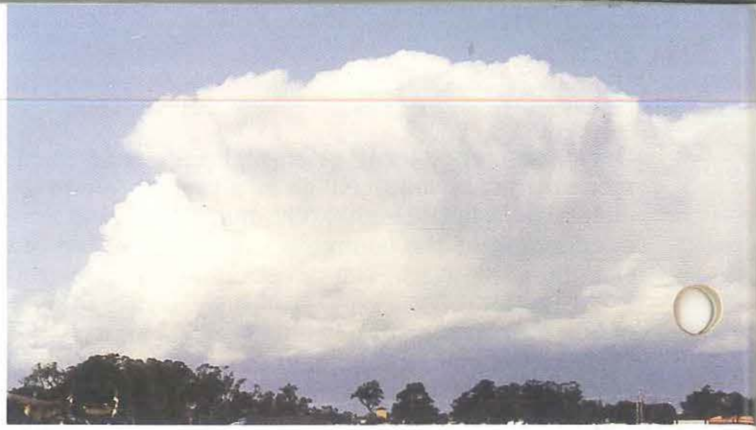
'When I turned final, the wind direction had changed and was now indicating the wind to be from the west. The strength of the wind was such that I was easily blown off the runway centre-line although I was laying-off about 30-35 degrees of drift. Without hesitation I elected to have "another go" — this time for 17, now that the wind was more or less favouring the south/west — it had changed yet again. Turning final at a height of 500 feet, I felt that the wind was of a force that I had never experienced before. I elected to go around and at the same time turn on an easterly heading away from the storm which was over the western perimeter of the aerodrome.

'I "firewalled" everything and tried to gain height, but the aircraft was still descending at 1000-1500 feet per minute on the VSI. At one stage the airspeed indicator was indicating 135 knots and the stall warning beeped. The turbulence was horrendous. I thought we were going to roll inverted. The biggest problem at the time (which lasted a couple of minutes) was the inability of the aircraft to outrun the storm. It seemed to be gaining on us. I started turning north gradually, trying to get on a heading for Deniliquin which I knew was OK because other aircraft were landing there. I eventually completed the turn towards Deniliquin and we were in the clear. Then we heard a radio broadcast that the storm had passed over the aerodrome. We proceeded around behind the storm and completed an uneventful landing.

'In writing this note I'd first like to say I have never experienced anything more vicious (for want of a better word). My pilot friends on board were of a similar frame of mind. The pure force of this wind was unbelievable. I'd like to know what the wind velocity was!'

Discretion is the better part . . .

It was quite windy when the Arrow took off from the strip at Fraser Island. The strip was about 450 metres long with overruns of 40 metres at the northern end and 110 metres at the southern end. On the western boundary, along the northern half of the strip, was a line of trees and shrubs which effectively shield the northern threshold from a westerly or south-westerly wind.



▲ Bill's storm

After the storm ▼

The wind was from the south-west at about 30 knots. The pilot soon realised that the conditions were not suitable for his flight and decided to land.

Final approach was made to the south with some power and with full flap selected. The speed was about 10 knots higher than normal. The conditions were gusty. The aircraft did not settle in the flare and the pilot decided to go around.

The main wheels touched down briefly as the pilot rotated the aircraft and the aircraft had reached a height of about 10 feet when it passed abeam the end of the sheltered zone. Suddenly and violently the aircraft shifted to the left.

The nose dropped sharply and then veered to the right when the nosewheel contacted the ground with a loud apparent breaking noise. The mains then touched down. The nosewheel was dragged along the grass for about 10 metres before the aircraft became airborne again.

After liftoff the nosewheel light went out and the gear unsafe light illuminated. The pilot diverted to Bairnsdale where a safe landing was made. The nosewheel leg was bent sideways.

Post flight weather analysis showed that wind-gusts in the area could have been as high as 50 knots.

The pilot's decision to go to Bairnsdale was a good one — if only he had made it before attempting the approach into the ALA.

[A part-sheltered threshold or strip is no place to be when the wind is that strong.]

Aggravated approach?

The pilot had landed at the one-way Ag strip before. It was 490 metres long, grass and on the crest of a hill.

The pilot called the owner to make sure it was clear of sheep and cattle and took off. Enroute conditions were turbulent with a moderate to strong north-westerly blowing. The pilot decided to make a dummy approach to assess the conditions before landing.

As he crossed the threshold he found the conditions were good. He made a snap decision to land as he reached a point one-third of the way along the strip. After touchdown the aircraft passed beyond the portion of the strip that was protected by trees and it was suddenly exposed to a strong gusty crosswind. The left wing was lifted and the aircraft moved to the right.

The right wheel was twisted when it struck an earth mound and the aircraft crossed two deep vehicle tracks and passed through a fence. No one was hurt.

[That part-sheltered threshold again.]

Fatal arrival

Dr Donold Allsop from South Africa recounts his bitter meeting with a storm.

'It was in December 1977, in North Transvaal, South Africa. I was planning a pleasure trip. The weather was cloudy with scattered thunderstorms. Johannesburg weather was assessed as "safe to fly" (VFR). I was coming in to land about an hour-and-a-half later in a Cessna 172. By this time the thunderstorms were heavy and much nearer to the airfield.

'On the first touchdown, the wind was swinging behind — I was too fast — I went round. An instructor happened to be flying nearby. We discussed the situation on the radio and I turned to make another approach. (I had 450 hours and had done some aerobatic training.) I can't remember anymore after that. I spun from 1000 feet on Final — due to wind shear — confirmed two years later by the DCA inspector at the inquest. My wife was killed and I was badly injured. It was *NOT* PILOT ERROR! I had never heard of "windshear" before this incident.

'My advice is, "KEEP AWAY FROM THE EDGE OF THUNDERSTORMS". This one was more than five miles away and passed over in 15 minutes. What rotten luck!'

In all these instances there were warnings. The big blokes can be caught out without warning, but we will rarely not have some clues. It's up to us to listen to our inner self and get out of the situation before it becomes uncontrollable. It is not good enough to 'suck it and see'. While a light aircraft will generally be able to escape from the shear, it is still possible to find ourselves in a situation where we lose control near the ground or where we simply haven't sufficient excess thrust or control power to climb away and maintain attitude.

We have to make the decision before we commit ourselves to a landing and that decision should be made on final. I use the PUF check as the point where I decide whether or not to give it a go. If there is any significant turbulence, any significant airspeed fluctuations, any lateral control problems, i.e. if I have to use large and rapid aileron inputs, or if there are any significant changes in lift and sink on final, I go around and reassess the situation from circuit height. It is difficult to define a yardstick for the go-round decision. Ultimately, if it starts to *worry* me unduly, I give it away and climb for another look.

If there is a decent wind blowing and there are trees on short final I prepare myself for a go-around from the flare.

If it gets out of hand:

- SET FULL POWER AND THE CLIMB ATTITUDE AND HOLD ON.
- RETRACT THE GEAR AND REDUCE THE FLAP FROM FULL TO INTERMEDIATE WHEN YOU CAN □

My eyes are dim, I cannot see . . .

This article is based on the Executive Summary of a Report by B. L. Cole and J. L. Ungerer of the Victorian College of Optometry. It describes a survey of the use of glasses by pilots over the age of forty. It has significance for many of us 'old-and-bolds'.

THE ABILITY of the eyes to focus at near distances decreases progressively with age so that between the ages of 40 and 50 years difficulty is experienced seeing objects clearly at close range. This limitation is called 'presbyopia' and is a normal physiological change that occurs with age. It requires correction with reading glasses or multifocal glasses to provide clear, comfortable vision for near-reading tasks.

Pilots have a visually demanding task requiring clear close-in vision for reading operational charts and manuals as well as flight and engine instruments — especially at night when cockpit lighting is subdued. Because of this it was expected that pilots may be troubled by the onset of presbyopia at an earlier age and since pilots are subject to regular assesssment of vision, work in a highly regulated and safety conscious industry and have a visually demanding occupation, it was expected that most pilots over the age of forty would seek spectacle correction for presbyopia and make use of glasses when flying.

It is well known that the near visual tasks involved in flying pose some special problems for presbyopic pilots because charts, manuals and instruments are at widely varying distances from the eye. The overhead panel in particular poses a problem because of its location and closeness. It is difficult to prescribe corrective lenses that enable clear vision at near distances and still ensure that more distant instruments are clearly seen. Alternatively, there may be a need to use complex forms of lenses, such as trifocals, progressive power and quadrifocals, that provide clear vision at several near distances. It was expected therefore that older pilots would experience problems with some near tasks even with appropriate spectacle correction for their presbyopia and would frequently have spectacles using more complex lens forms.

A questionnaire asking about the use of glasses and visual difficulties when flying was designed. It was sent to 1300 pilots who were over the age of forty years and held an Australian commercial, senior commercial or airline transport pilot's licence. The response rate was 75 per cent. Although the study did not encompass private pilots, it was considered to be equally valid.

The purpose of the questionnaire was to document the use of glasses by pilots likely to be presbyopic and to relate the main visual difficulties to the type of glasses used. Perhaps some conclusions could then be drawn about the forms of visual correction best suited to the task of flying.

Principal conclusions

1. Failure to obtain or use presbyopic correction. A surprising result was that 45 per cent of all the pilots who responded and 17 per cent of those over the age of 50 years (an age when presbyopia is well established), *did not use glasses when flying even though a number had glasses for use at home or were required to carry glasses when flying*. Several respondents admitted difficulty seeing at near distances although they had passed the statutory test and were not required to wear glasses. These findings suggest that the procedures for examination of near vision for pilots over the age of forty years should be re-assessed, possibly introducing earlier and more frequent assessments and more rigorously defined methods of assessment. In addition, a significant proportion of pilots had not had a change of glasses for five or ten years. *Age of glasses was related to visual difficulties especially with charts and manuals* and more rigorous periodic assessment of vision might encourage the maintenance of optimum spectacle correction.

2. Factors determining use of glasses. The use of glasses when flying was strongly dependent on age, as expected, but only weakly associated with the extent of flying or the degree of responsibility taken. Thus it cannot be assumed that senior pilots flying scheduled air transport will show greater compliance in the wearing of glasses than those who fly smaller aircraft or who are part time. The question of compliance in the use of glasses when flying may deserve further investigation.

3. Infrequent use of multiple focus glasses. The most common forms of spectacle correction were lookovers (43 per cent of those who wore glasses when flying) and bifocals (36 per cent). Relatively few (9 per cent) made use of trifocals, progressive power lenses or other multiple focus lens forms. Even for pilots over the age of 55 years, when multiple focus correction is strongly indicated for a task like flying, only 19 per cent of pilots had been prescribed these forms of lenses. A large proportion of pilots report difficulty seeing charts and manuals and there is evidence that this arises in part through the prescription of glasses to ensure clear vision for instruments at the cost of the ability to see charts and manuals. In order to overcome this problem there is a need to explore the means by which the use of multiple focus glasses can be encouraged.

4. Suitability of trifocals. There is some evidence that conventional trifocals are not suitable for flying. Only two of the 16 pilots who had trifocals for their previous glasses had trifocals prescribed for their current glasses. The others had changed to other lens forms. Eighteen per cent of trifocal wearers complained the 'segment was too small' while only six per cent of bifocal wearers had that complaint. This and other comments made by the respondents suggests that the vertical depth of the intermediate segment of conventional trifocal is not deep enough to give a sufficiently wide field-of-view for the instrument panel. The suitability of the occupational trifocal with a deeper intermediate segment should be investigated.

5. Are progressive power lenses suitable? Although progressive power lenses are currently not recommended for use in flying, four per cent of those wearing glasses had progressive power lenses. Some pilots reported that the lens form was ideal although others commented that it was not suitable for flying. Those wearing progressive power lenses made significantly more reports of difficulty with the instrument panel and there were a number of reports of trouble with distortions and illusions. However, five of the seven who had this form of lens in previous glasses retained the same form in their current glasses — suggesting the lens form is successful for them. The literature indicates that this form of lens has high acceptance by pilots. The suitability of progressive power lenses requires further consideration. There are two basic forms of progressive power lens and one may be more suitable than the other for flying.

6. Problems with sunglasses. Two-thirds of pilots use sunglasses when flying, supporting the conventional view that pilots are often exposed to glare. A common problem reported was that there was no glare protection incorporated in spectacle correction so that either the spectacle correction had to be removed to enable sunglasses to be worn or glare protection had to be foregone. Lookovers pose a special problem in this regard and nearly half of the pilots who used lookovers removed their lookovers to wear sunglasses. Of those pilots who reported the need to use their lookovers for the instrument panel, over a third removed their lookovers when wearing sunglasses. There is a need to encourage the prescription of bifocals instead of lookovers so that a sunglass tint can be incorporated in a second pair or clip-on sunglasses can be used. Although the use of photochromic lenses is discouraged, 13.6 per cent of pilots use photochromic sunglasses. Three pilots reported that the reaction of photochromic lenses was too slow.

7. Problems with charts. Over one-quarter of pilots reported difficulty with charts and manuals. In part this is shown to be the result of the compromise between the need to see the instrument panel at distances of 750 to 1200 mm as well as charts at ordinary reading distance of 300 to 400 mm. Many pilots commented that the design of charts could be improved by increasing the size of critical alphanumeric information and increasing contrast and there may be merit in investigating the options for improving the design of charts. The problem can also be addressed by encouraging regular eye examination and maintaining optimum spectacle correction and by encouraging the use of suitable multi-focus lens forms rather than lookovers and bifocals.

8. Problem with the overhead panel. The survey confirmed that the overhead panel does cause visual difficulty. Forty per cent reported difficulties although two-thirds said it was not a problem. Only six pilots had special glasses designed to assist them with the overhead panel. Pilots and prescribing practitioners should be made aware of the options available to assist those who have particular difficulty with the overhead panel.

9. Compatibility with the oxygen mask. Thirty-six pilots commented that glasses were not compatible with the use of oxygen masks and 11 reported the same difficulty with the radio head set. The lack of compatibility with the oxygen mask deserves further investigation.

[*The survey has shown us some potential problem areas but in the interim it can only be emphasised that if near-distance focus is a problem, you must seek professional advice. Vision is still the pilot's most important asset. And please — if glasses are prescribed — wear them.*] □

FLYING is not . . . a *TRIVIAL PURSUIT*