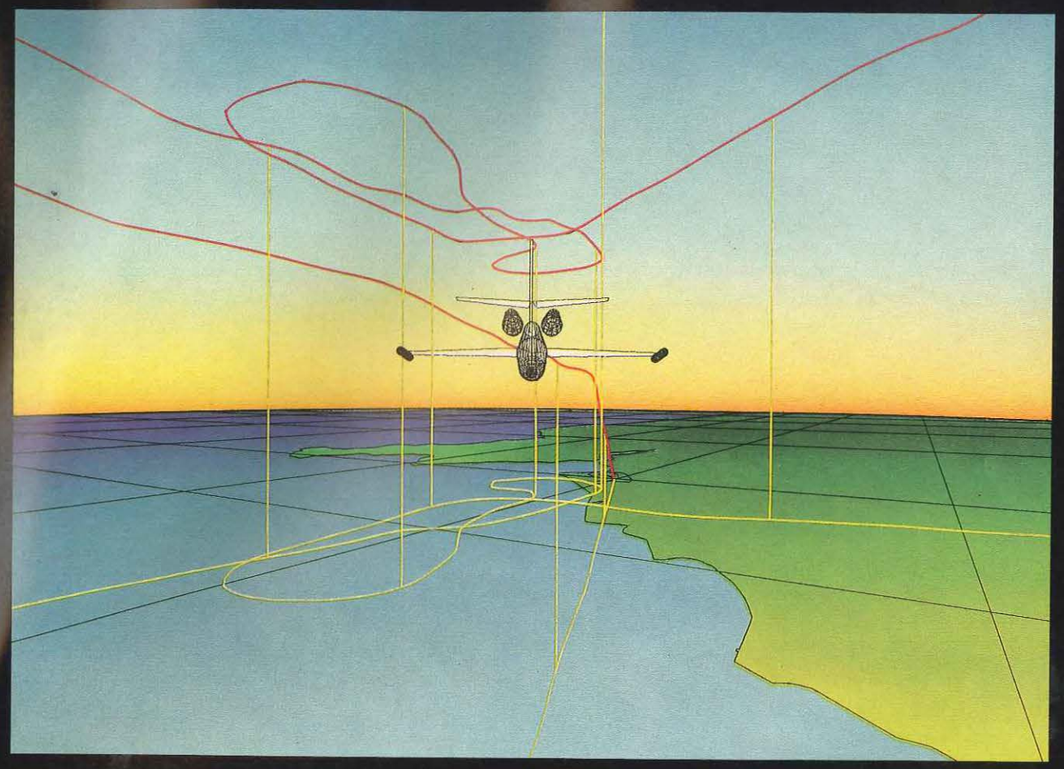
for safety's sake

REPORT ALL BIRDSTRIKES

Black Kite, photo by Michael Wright

AUSTRALIA

Aviation Safety Digest



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Contents

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Cover

The artwork on the front cover of this issue is based on a printout from the Bureau of Air Safety Investigation's computer graphics system. The scene portrayed is that of an aircraft involved in an actual incident whilst carrying out a non-precision instrument approach to an Australian airport close to the coast. However, the image of an IAI Westwind used in the graphics is for illustrative purposes only and the incident portrayed did not involve this type.

The reconstructed flight and ground paths were derived from the aircraft's flight data recorder. The coastline, the airport, the letdown profile and the aircraft's ground track, as well as the aircraft model, are animated and to the viewer it appears as if you are in a following aircraft. The view can be changed at will from that shown to virtually any view which best suits the purpose of the investigation. If more than one aircraft is in the airspace it will be seen in its relative position. The display can be speeded up, slowed, stopped or run in reverse. Terrain data is derived from maps of the area in question.

The graphics system can also be used to simultaneously display flight and navigation instrument readings throughout the approach, so that the instruments fly the profile of the aircraft based on the recorded flight data.

For the technically minded the computer graphics system is an Evans and Sutherland PS300 high performance interactive graphics computer with 3Mb of memory.

Editorial

There is now widespread recognition within the aviation community that human factors, in one way or another, are the most significant contributions to breakdowns in aviation safety.

Seeking to maintain and, where possible, improve upon our existing safety record is a responsibility we must all share regardless of our position or standing within that community.

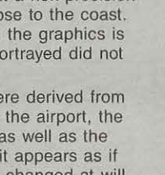
In order to adequately discharge that responsibility, it is important for all of us to have not only a knowledge of the rules and procedures and the rationale for their existence but also of the need for all things associated with aviation to be done meticulously.

This is fundamental to the safe and orderly conduct of operations and is the cornerstone upon which a sound sense of airmanship can be based. Most experienced pilots, maintenance staff and Air Traffic Services personnel already have this knowledge and the qualities that stem from it. Others, perhaps less experienced, must gain it if they are to accept their share of the responsibility.

The Department is now moving to put additional emphasis on programs to address the human elements of aviation safety. The Flight Standards Division of the Department, which is charged with the responsibility of seeking to ensure safety in civil aviation, has now taken the initiative to press home the message about the need for all of us to continue to be very safety conscious. As part of this initiative, the editing and production of the *Aviation Safety Digest* will in future be undertaken by Flight Standards as part of its developing safety promotion activities.

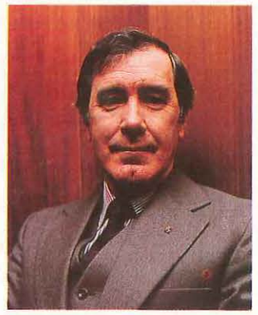
The Digest has proven to be a very popular publication. While its change of 'management' will not initially lead to significant changes in style, format or content, we will, in time, endeavour to improve its usefulness by including more general information on why we should practise pilot and aircraft operating procedures as they are prescribed, why airworthiness and maintenance procedures need to be as they are and why we maintain the medical standards that we do.

In future editions I will be commenting upon the 'immunity' of pilots from punitive action following calls to Air Traffic Services units for assistance and will be seeking comments from readers on how the publication may be improved. However, the editorial policy will be to concentrate on safety education and promotion of the human factors safety message.



(Jerry O'Day)

First Assistant Secretary
Flight Standards Division



Accidents involving private pilots in Australia

Key results from a recent study by the Bureau of Air Safety Investigation

During the years 1983, 1984 and 1985 the number of accidents in General Aviation fell from 263, to 220 and 209 respectively. Over the five-year period prior to 1983 the annual average had been 239 accidents. These statistics include all GA accidents regardless of the category of pilot licence held, although gliding accidents have been excluded. While the large number of GA accidents in 1983 could have several explanations, nevertheless there has been a worthwhile decline since then from the five-year average of 239.

Accidents involving PPL holders which are included in these same statistics were 123, 81 and 69, so that the decline in the number of all GA accidents is almost entirely explained by the fall in the number of accidents involving PPL holders. Rather than provide private pilots with a large amount of statistical information on the subject, the Bureau of Air Safety Investigation has summarised results of the study for the benefit of PPL holders, flying schools and owners of private aircraft.

The question of whether there has been a meaningful decline in the number of accidents or whether the decline is purely a random one has been set aside for the purposes of this article. What appears to be particularly significant however, is that there has been a decline in the proportion of pilot to total factors in accidents involving private pilots. Accident factors are assigned from several different categories which cover pilots, weather, powerplants, systems, airframes, terrain and several others. In 1983, pilot factors assigned to accidents involving private pilots represented 30 per cent of the total of all factors assigned to these accidents. In 1984 the proportion was 23 per cent and in 1985 21 per cent. In highlighting this favourable trend, it must also be stressed that during the past eight years only 19 per cent of accidents involving private pilots failed to attract any pilot factors at all when the probable causes were being determined. BASI then examined the pattern of pilot factors assigned during the five-year period prior to 1983 and compared this with the years 1983, 1984 and 1985 taken individually.

It became apparent that there were thirteen pilot factors from a total inventory of several hundred which accounted for two-thirds of all instances in which pilot factors were assigned to PPL accidents. These thirteen factors are listed below in order of relative importance according to the number of occasions each was assigned over several years:

- Inadequate pre-flight preparation and/or planning
- Improper inflight decisions or inflight planning
- Improper landing flare
- Did not obtain or maintain flying speed
- Selected unsuitable area for takeoff or landing
- Lack of familiarity with aircraft
- Attempted operation beyond experience/abilities
- Diverted attention from operation of aircraft
- Improper recovery from bounced landing
- Did not initiate go-around/missed approach/ overshoot
- Improper compensation for wind conditions
- Improper operation of powerplant controls
- Delayed initiating go-around.

Since 1983 there has been a considerable improvement in the following areas, signified by a decline in the number of occasions on which the factor was assigned:

Operational decisions

- Improper inflight decisions or inflight planning
- Selected unsuitable area for takeoff or landing
- Did not initiate go-around/missed approach/ overshoot

Handling techniques

- Did not obtain or maintain flying speed
- Improper compensation for wind conditions

Other

- Lack of familiarity with aircraft

A much weaker improvement occurred amongst the following factors, although it is difficult to know whether the small changes involved are sufficiently significant to reveal an underlying trend:

Handling techniques

- Improper landing flare
- Improper recovery from bounced landing

Other

- Attempted operation beyond experience/abilities

Little or no change occurred in the case of the following three factors:

- Diverted attention from operation of aircraft
- Improper operation of powerplant controls
- Delayed initiating go-around

The outstanding feature of the results of the study however was that it is apparent little impact is being made in the area of the most important factor of all:

INADEQUATE PRE-FLIGHT PREPARATION AND/OR PLANNING.

There were several possible influences at work in the areas where improvement appears to have occurred. For instance the biennial flight review may have had some effect by 1984 following its introduction in September 1982, while the wider use of pilot safety seminars and higher levels of safety education throughout the industry generally must be important considerations.

It is clear though that Private Pilot Licence holders are in a key position to make substantial contributions towards reducing the number of accidents, through greatly improved pre-flight preparation and planning. This area includes the study of weather forecasts, selection of route and altitude, method of navigation, allowance for alternative courses of action, calculation of fuel reserves, evaluation of Notams, study of maintenance releases, pre-flight inspection of aircraft, fuelling, evaluation of departure aerodrome surface and weather conditions and many others. Pre-flight preparation and planning needs to be completed in an unhurried fashion by pilots who are properly rested, and who feel physically and mentally alert for the proposed operation.

The improvement in some areas will require continuous reinforcement through a disciplined approach to all aspects of flying operations if the trends are to continue. Pilots of all licence categories could give careful consideration to the broad findings of this review, while flying instructors conducting ab initio training and biennial flight reviews should find the information particularly useful. Without in any way detracting from established syllabuses and methods of training, it is repeated that these thirteen accident factors together account for two-thirds of all the instances in which pilot factors were assigned to accidents involving private pilots ●

Planning, checking, replanning

The process of planning, checking and replanning is one that is never completed in piloting. At all stages of a flight a pilot possesses information relating to any one of a number of operational considerations — navigation, aircraft performance, fuel consumption and so on — which must be continually reviewed and updated; and as a result of that process, the pilot either verifies or amends existing decisions. This latter action might range from a minor heading change or an amendment to ETA, to a decision to divert.

In the investigation summary which follows, the pilot involved failed both to plan properly on the ground and check on operational data in the air. Consequently, he was not able to replan inflight to adjust for prevailing conditions, and ran out of fuel about 8 miles from his destination.

Fuel exhaustion

A PPL holder with about 800 hours flight experience and a Class Four rating was asked to ferry a Grumman American AA5 from N.S.W. to Perth. After three days the pilot had reached Eucla in W.A. On the morning of the fourth day he refuelled at Eucla and flew to Forrest, where the Grumman was again refuelled, this time for the leg to Kalgoorlie. The pilot assessed that he would not be able to reach Kalgoorlie without a further refuelling, so he took a 5-gallon jerry can of Avgas with him, intending to land at Zanthus to add this fuel. He also took on board at Forrest a passenger who urgently needed to get to Kalgoorlie.

The fuel top-up was completed at Zanthus as planned. However, about 30 nm east of Kalgoorlie the AA5's starboard fuel tank ran dry and, for the first time, the pilot began to feel some anxiety about the fuel state. This anxiety was well founded, for about 8 nm east of Kalgoorlie the aircraft's engine stopped, and the pilot was forced to make an emergency landing on the road he had been following. This was done successfully, without damage either to occupants or machine.

A casual attitude

The pilot's approach to planning and flying this long trip can only be described as off-hand. As was his 'normal practice', he had not obtained any weather briefings or Notams, nor submitted flight plans. Further, during the first three days of the trip, no attempt was made to determine actual fuel usage, as compared to the book figures.

For the Eucla–Forrest–Kalgoorlie flight a written flight plan was not prepared. A mental 'plan' of the Forrest–Kalgoorlie leg was done, with the pilot selecting his own en route wind, which he decided would be abeam at 20 knots, i.e. no allowance was made for any headwind or tailwind component.

It seems that, once airborne, little effort was made to exercise operational management over events: although the basic requirement for track-keeping was observed by following prominent features (in itself, a sound practice), little if any attention was paid to fundamental navigational techniques and applying the information those techniques produce. There was no disciplined monitoring of fuel usage, while the pilot also seemed prepared to sit back and let checkpoints and destinations appear.

As it happens, the Grumman had a carburettor unserviceability which caused a higher than expected fuel flow; while aircraft performance was below that detailed in the pilots operating handbook, for both the climb and cruise. Obviously, these factors considerably reduced the AA5's range and endurance.

Also working against the pilot was his lack of thorough flight planning. The area forecast predicted an abeam wind for half of the Eucla–Kalgoorlie flight and a 10–12 knot headwind component for the remainder. In fact the actual winds (determined later from meteorological balloon data) were more westerly than forecast, thus giving a greater headwind component.

In combination with the pilot's failure to plan properly on the ground, check inflight, and then replan on the basis of any new information or different performance data, the unexpected — and, equally as dangerous — undetected increase in fuel usage exposed him to the deathly hush that no pilot wishes to experience.

Comment

There is no formal requirement for flight notification or weather briefing for the type of operation the pilot planned to undertake, although the Visual Flight Guide does state that for flights where no forecast is required, the pilot '. . . must study all available weather reports to form an appreciation of the conditions you are likely to meet'. All that was needed here was a reverse charge call to the nearest Flight Service Unit. The opportunity also was not taken during the preceding three days to record fuel added, monitor the gauges carefully in flight, and dip the tanks after landing, and so calculate an accurate fuel flow.

Finally, by not observing the plan/check/replan cycle, the pilot was not able to control events but, rather, just let things happen ●

Accumulative stress

About five miles east of an uncontrolled aerodrome serving a large country centre, the crew of a Supplementary Airline (SAL) aircraft passed a PA28, apparently bound for the same destination.

Upon arrival the SAL aircraft joined crosswind, flew a standard circuit and transmitted the usual radio calls before completing a routine landing. After rolling through to the end of the runway the pilot turned and started to backtrack — only to be confronted by the Cherokee which was on a very short final approach.

The SAL pilot stopped and flashed his aircraft's landing lights, but to no avail. The PA28 continued with the landing and then turned off the runway before reaching the other aircraft.

An independent observer later stated that the Cherokee had not overflown the field but, instead, had joined the circuit on final approach.

When the incident was discussed with the Cherokee pilot, it became apparent that he was uncertain how he had entered the circuit. It also became apparent that his dangerous landing was, to a large extent, a result of accumulated inflight stress which had caused his overall performance level to deteriorate

A solo navex

The PA28 pilot held a PPL with area restrictions: the flight during which the incident occurred was his seventh solo navex. As it happens, this exercise had been very difficult, probably even traumatic at times.

Initially the pilot had been able to cruise at 3000 feet but a lowering cloud base forced him to descend to 1500 feet. Conditions were such that at one stage he came close to carrying out a 180 degree turn to 'get out', but the cloud had thinned and he had emerged into the clear. However, by then he was off track and could not recognise any ground features. He decided to maintain heading until he could get a fix, and finally came across a large town he recognised, although it was on the opposite side of his planned track.

Sensibly, the pilot orbited over the town for several minutes to collect his thoughts and give himself time to re-organise the navex. Eventually he set heading again and some time later was very relieved to see his destination.

A recap on the events to date will be useful here in assessing the pilot's probable state of mind when he entered the destination aerodrome's circuit. He was inexperienced, had been on a solo navex and had become lost en route. This had been very disturbing for him. Further, from reviewing the actual weather conditions later, it was possible that some of the flight may be have been conducted in conditions less than VMC. This would have been a source of more pressure. To his credit, the pilot — through common sense and keeping his head — finally extricated himself from his stressful circumstances. He was understandably relieved to arrive at his destination.

The Cherokee pilot later stated that he had been upset by the navex problems, and when he reached his destination he was feeling a bit panicky. In that state of mind he was unsure of exactly how he flew his approach, but he did remember concentrating very hard on his landing. Unfortunately this proved to be at the expense of other essential actions. The culmination was an extremely hazardous landing, not only for himself but also for all on board the SAL aircraft.

Discussion

It might be easy to say, but it's true: a flight is not finished until the aircraft is tied down, signed off and so on . . .

Given this pilot's inexperience and the problems he encountered, the anxiety he felt — the stress which gradually accumulated — is entirely understandable. However, having sensibly dealt with the problems, the effects of the stress he had been under — again understandably — did not entirely dissipate. Thus, still a bit panicky, he found he had to make one 'last effort' i.e. join the circuit and land safely. This, of course, can be one of the highest workload, most demanding sequences a pilot has to complete. Regardless of what may have happened beforehand, standard procedures must be observed *and* sound judgment exercised.

Dealing with stress

In the words of some unknown fellow human being: 'When you're up to your butt in crocodiles it's hard to remember that your initial task was to drain the swamp'. The above quotation is not only somewhat amusing, but also reasonably accurate. One of the most common and predictable behavioural results of the stress reaction that we call fear, or panic or anxiety is a narrowing of our focus of attention, sometimes called channellised attention.

A pilot experiencing channellised attention may find him or herself monitoring attitude so intently that they stop monitoring airspeed and/or altitude. This type of reaction often happens when VFR pilots find themselves in IMC conditions.

As the pilot of the PA28 stated, when he reached his destination he was feeling a bit panicky. He did not see the aircraft on the runway, but he did remember concentrating very hard on his landing.

The question is: how can we recognise and overcome these types of stress-induced behaviours?

Apart from continuing one's education through articles such as this and finding out what type of behavioural patterns can result from specific psychological reactions, the only effective and portable method for recognising and dealing with these types of problems is by learning to pay more attention to yourself.

It is generally true that most pilots are acutely aware of the condition of their aircraft. Not only are the instruments a source of information which tells a pilot how the aircraft is performing, but most pilots are also aware of whether or not the aircraft 'feels' right and whether it 'sounds' right.

Perhaps surprisingly most pilots do not seem to pay as much attention to their own state as they do to the state of their aircraft. Yet we know that in the majority of occurrences the weak link in the chain is often the pilot, not the aircraft. We also know subjectively from our experiences as human beings inhabiting planet Earth that the way we make decisions and the types of decisions we make are quite different if we are angry and aggressive as opposed to being happy and calm.

Anger is one of the psychological states that we tend to be aware of, perhaps because we experience anger more often than other psychological states of mind because anger is usually directed at some specific event or person.

With less commmon psychological states such as fear, particularly if the fear is non-specific and not entirely and immediately tied to some specific person or event, we tend to be less aware of the effect that such a psychological state has on the way we process information.

If as a pilot you find yourself in a situation where you are afraid or anxious, take the time to say consciously to yourself 'I am afraid' or 'I am anxious'. Take the time to recognise fully the psychological state you are in and then simply ask yourself: 'What am I doing or not doing now that I would or would not be doing if I were not afraid or anxious?'

Summary

In summary, clearly and consciously acknowledge your emotional reaction. Recognise the potential for a deterioration in your performance as a result of your emotional state. Ask yourself, 'What are the standard procedures for this situation?' and force yourself to follow each of these procedures ●

In brief

A PA 28-R201 (retractable) landed wheels up on a country airfield at the conclusion of a practice forced landing. Two pilots were on board, one under training and the other as instructor.

Most of the trainee's flying had been in fixed-gear aircraft, and in this instance, during the forced-landing emergency drills, he followed his usual checks — which did not include the undercarriage. The instructor seems to have been concentrating on the immediate exercise at the expense of vital actions.

* * * *

The alternator drive belt on a Cessna 210 failed, causing loss of output. With a low battery voltage, the aircraft's landing gear motor was incapable of fully extending the gear and continued to run at a reduced speed. Eventually the motor overheated and burned out.

Airworthiness engineers recommended that landing gear motors be examined for damage if the gear has been cycled on low voltage.

A review of Australian helicopter accidents 1974–83

Delivery of replacement propeller for Indonesian Patrol boat, Thursday Island wharf. Photograph by Mr John Devine.

The Bureau of Air Safety Investigation has recently received requests for an overview of past helicopter accidents, and the 10-year period 1974–83 has been selected for this purpose. The number of registered helicopters more than tripled during this time and now exceeds 300. When helicopters were first introduced during the 1950s they were relatively small, carried little payload, tended to be underpowered and were soon involved in a number of accidents. Until the 1970s helicopter accident statistics were amalgamated with those for fixed-wing aircraft, mainly due to their small numbers. From 1973 onwards new and separate statistical series were developed for helicopters and these records form the basis for this review.

Unique characteristics of the helicopter make it adaptable to a wide variety of environments which frequently take it into difficult or unusual situations. Helicopter operations cover a wide range of activities including the following: air taxi, charter, cattle mustering, patrol (pipelines and powerlines), agriculture, road traffic control, National Parks surveillance, water sampling (creeks and rivers), fire-fighting, news media, geological survey, Reg. 203 services, search and rescue, evacuation, police, oil rig support, supply (mountain and snow country), industrial sling-loading, training.

Although statistics for the number of takeoffs and landings per pilot per day are not collected, cycles of up to 60 per day are known to occur. The inherent aerodynamic instability of helicopters means that most, particularly early models such as the Bell 47, cannot be trimmed to various phases of flight as can fixed-wing aircraft, and piloting tends to be a full-time task. Helicopter autopilots are very rare and their use is largely confined to twin-engine types and IFR operations, consequently the bulk of operations involve continuous hand flying.

Accidents by phase of flight

Table 1 shows the distribution of helicopter accidents amongst 19 different phases and types of operation, and compares them with similar information for all fixed-wing (single-engine) aircraft accidents.

There were 234 helicopter accidents during the ten-year period, and 1779 accidents in the fixed-wing (single-engine) aircraft group.

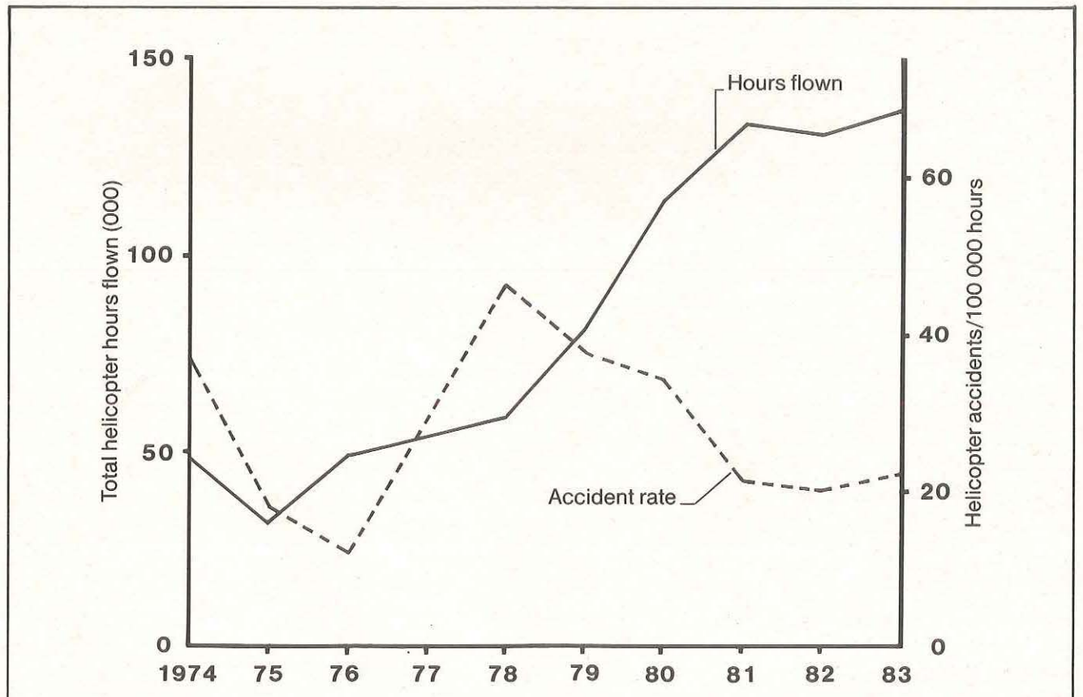
In the takeoff phase the results are broadly comparable to one another although the takeoff run is generally not applicable to helicopters. However, 58.9 per cent of helicopter accidents occurred during the segments listed under the flight phase compared with 23.7 per cent for fixed-wing aircraft. If the flight phase is confined to climb, cruise and descent, helicopters were still higher than fixed-wing aircraft with a proportion of 22.6 per cent compared with 13.3 per cent. Agricultural and low-flying accidents accounted for 29.9 per cent of the helicopter total against 10.3 per cent for the fixed-wing aircraft. The majority of helicopter accidents in the low-flying category occurred during aerial mustering. These helicopter statistics reflect the fact that a considerable proportion of helicopter operations are conducted in close proximity to the ground. The position is reversed with the landing phase, helicopters experiencing 21.0 per cent of accidents in this area compared with 50.5 per cent for fixed-wing aircraft. This substantial difference is principally due to the high level of fixed-wing aircraft accidents in the level-off and touch-down manoeuvre, where the proportion was approximately 10 times higher than for helicopters.

Table 1: 1974-83 (incl.)

	Accidents by phase of flight	*All helicopters* %	*All fixed-wing single-engine aircraft* %
GROUND	engine(s) operating	4.3	1.7
TAXI	to takeoff	1.7	2.5
	from landing	1.3	2.9
	other	0.4 (3.4)	0.0 (5.4)
TAKEOFF	run	0.9	6.9
	initial climb	10.7	9.8
	discontinued	0.4	2.0
	other	0.4 (12.4)	0.0 (18.7)
FLIGHT	climb	0.4	2.4
	cruise	16.2	8.9
	descent	6.0	2.0
	aerobatics	0.4	0.1
	agriculture	3.4	6.4
	low flying	26.5	3.9
	holding/hovering	6.0 (58.9)	n/a (23.7)
LANDING	approach	2.6	8.2
	level-off, touch-down	2.6	22.7
	roll	14.1	16.5
	go-around	1.7 (21.0)	3.1 (50.5)
		100.0	100.0

Accident rates

Accident rates are measured in terms of the number of accidents per 100 000 flying hours. As total hours increase it is found that the accident rate normally declines. Graph 1 compares total helicopter hours flown and the accident rate. The dotted line through 1978 is drawn to separate two periods with different characteristics. During the early half of the period, total hours and accident rates tended to move in similar directions, which is the opposite to that normally expected. This may have been partly due to a considerable amount of technological change which occurred in the helicopter segment of the industry during the early and late 1970s. Rises or falls in helicopter flying activity involving new equipment may have been correlated with rises and falls in the number of accidents, until sufficient learning had occurred for the appearance of 'normal' trends after 1978. During this time, for example, many helicopters were refitted with more



GRAPH 1

powerful engines, several new types were introduced, while others were phased out. Some Hughes 369 series and many Bell 206 helicopters had Allison C20 engines substituted for the original C18 engines. Fleet changes also occurred as operators began to show preference for new Bell 206 helicopters, while earlier models were simultaneously being re-engined with the C20 engine. The advent of turbine-powered helicopters was another technological change which introduced new and different problems. For instance, sustained operation of turbine-powered helicopters in outback desert conditions caused compressor wear through dust ingestion. In turn this reduced compressor efficiency and therefore power output, although the extent of the problem was not recognised for some time. However, it is not possible to be precise on the extent to which technological change affected helicopter statistics prior to 1978.

From 1978 onwards the common relationship between accident rate and total hours flown emerges. Growing technical sophistication of helicopters along with improved knowledge and skill amongst ground and flight crews probably contributed to this gradual change. Also, statistical trends would have become clearer as the number of helicopters increased. The altered trends from 1978 are discussed further in the following section.

Assigned factors

Table 2 shows the proportion of helicopter accident factors which were assigned to different categories and compares them with similar information for all private/business fixed-wing single-engine aircraft accidents. This further refinement of the presentation was deliberately selected in order to highlight differences between rotary and fixed-wing aircraft accidents, rather than to draw parallels. Only one accident to a multi-engine helicopter is included in the data. The comparison is therefore between single-engine helicopter accidents and single-engine fixed-wing aircraft accidents. Arranging the information in this way also makes a deliberate comparison between two essentially different pilot groups. 90.7 per cent of the helicopter pilots involved in these accidents held Commercial or Senior Commercial Helicopter Pilot Licences, while only 15 per cent of the private/business pilots held equivalent licences. The total number of helicopter accidents covered by the table was again 234, while the total for the single-engine group was 1113.

Table 2: 1974-83 (incl.)

Assigned accident factors by category	*Helicopters* %	*Priv/business fixed-wing single-engine aircraft* %
Pilot	53.7	60.7
Weather	4.8	8.0
Powerplant	8.9	3.9
Other systems	8.4	1.5
Terrain conditions, off aerodrome	9.8	4.3
Miscellaneous	3.0	2.8
Aerodrome/landing area	0.6	3.3
Other personnel	9.4	4.5
Airframe	1.4	11.4
	100.0	100.0

Pilot factors

The proportion of pilot factors in helicopter accidents during the ten-year period was 53.7 per cent compared with 60.7 per cent for fixed-wing aircraft. However, accidents involving powerplant and other systems factors for helicopters totalled 17.3 per cent against 5.4 per cent for fixed-wing aircraft. On the other hand, airframe factors constituted only 1.4 per cent of the total helicopter factors assigned, compared with 11 per cent for the fixed-wing aircraft. The helicopter statistics were then re-examined in two equal periods, 1974–78 and 1979–83, to see whether there was any significant difference in the pattern of assigned factors before and after 1978. However, there were only minor differences between the two periods.

The 10 most important pilot factors out of a total of 39 assigned to helicopter accidents are listed below, in descending order of importance:

1. Attempted operation with known equipment deficiency
2. Inadequate pre-flight preparation and/or planning
3. Improper operation of primary flight controls
4. Improper level-off during landing
5. Did not see or avoid objects or obstructions
6. Did not maintain adequate rotor rpm
7. Diverted attention from operation of aircraft
8. Selected unsuitable area for takeoff or landing
9. Misjudged horizontal/vertical obstacle clearance
10. Inadequate supervision of flight with multi-crew

These 10 factors accounted for 64 per cent of all the helicopter pilot factors identified in accident investigations over the 10-year period 1974–83 (incl.). Similar information for the fixed-wing group is given below and it is evident that the two main helicopter pilot factors are also common there, i.e. 'attempted operation with known equipment deficiency' and 'inadequate pre-flight preparation and/or planning'. Except for these two factors, the order of importance of the remaining eight factors either tend to diverge between the two groups or are different factors altogether.

1. Inadequate pre-flight preparation and/or planning
2. Attempted operation with known equipment deficiency
3. Selected unsuitable area for takeoff or landing
4. Improper landing flare
5. Lack of familiarity with aircraft
6. Did not see or avoid objects or obstructions
7. Improper compensation for wind conditions
8. Did not obtain/maintain flying speed
9. Improper recovery from bounced landing
10. Attempted operation beyond experience/abilities

Because of the apparent change in relationship between helicopter total hours and accident rates around 1978, the pattern of assigned pilot factors was also re-examined in two 5-year periods in order to identify any changes between 1974–78 and 1979–83. Although there were minor changes in the order of importance of factors between the two periods, no really significant differences were identified. The three most important pilot factors in the two periods are given below:

1974–78 (incl.)

1. Improper operation of primary flight controls
2. Improper level-off during landing
3. Attempted operation with known equipment deficiencies) equal
   Diverted attention from operation of aircraft) equal
   Inadequate pre-flight preparation and/or planning)

1979–83 (incl.)

1. Attempted operation with known equipment deficiencies
2. Inadequate pre-flight preparation and/or planning
3. Did not see or avoid objects or obstructions) equal
   Improper operation of primary flight controls)

It is clear that common pilot factors between the two periods include: 'improper operation of flight controls', 'inadequate pre-flight preparation' and 'attempting operation with known equipment deficiencies'.

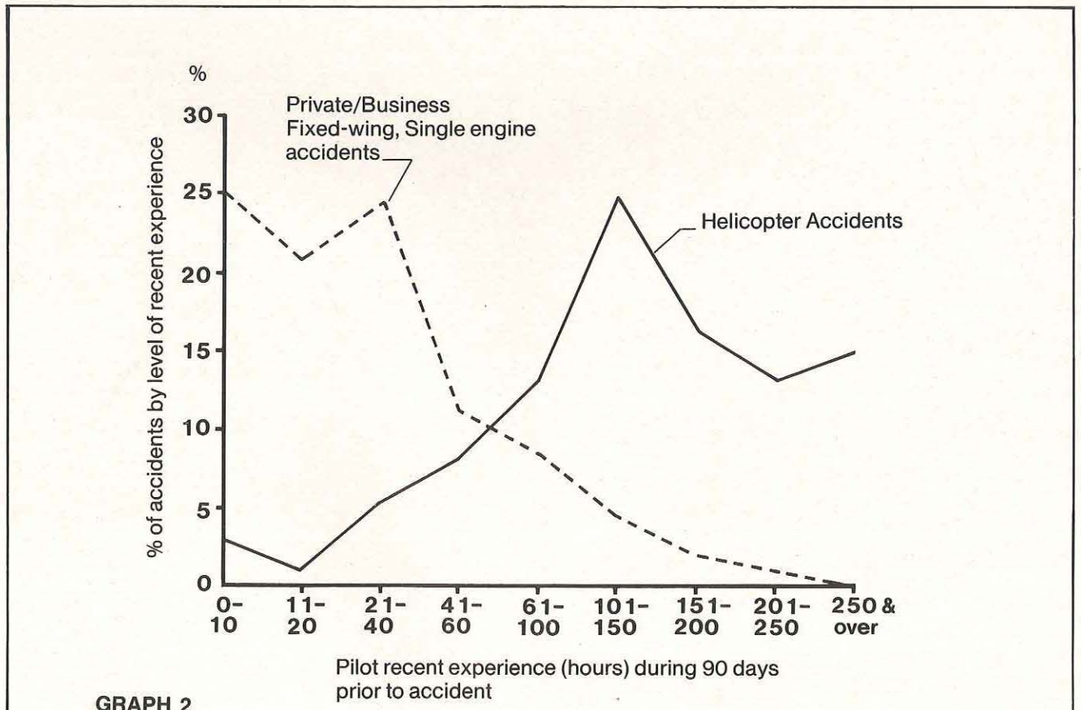
Pilot fatigue

The question of fatigue is sometimes raised by the helicopter pilot group in relation to accidents. This concern may be associated with the relatively high number of daily takeoffs and landings performed by many helicopter pilots. Certain human factors relating to pilot performance, such as fatigue, are assigned to accidents where appropriate. Computer data however revealed only two accidents 1974–83 where pilot fatigue was assigned as a factor. By coincidence both of these involved the Bell 47 model. The possibility of pilot fatigue was also mentioned in a number of accident reports, although it was considered there was insufficient evidence for fatigue to be assigned as a separate factor in those instances. Overseas studies have shown that the importance of pilot fatigue as a possible factor in helicopter accidents may not have been recognised in past investigations, and the low incidence of this factor amongst Australian statistics may simply reflect a similar position.

Recent experience

The amount of flying performed by helicopter pilots during the 90-day period preceding an accident was then compared with similar information for pilots of fixed-wing single-engine aircraft operating in the private/business category. This data is plotted in Graph 2 and illustrates some significant differences between the two groups. Training accidents were excluded from totals in each case, and a small private/business component removed from helicopter figures. The horizontal axis shows the hours groupings, while the vertical axis measures the percentage of accidents which fell into each hours category.

The comparison between two essentially different pilot groups was continued in order to highlight differences rather than identify similarities, and again 90.7 per cent of pilots involved in the helicopter accidents held Commercial or Senior Commercial Helicopter Pilot Licences, while 15 per cent of the private/business pilots held equivalent licences. The graph shows that in 25.2 per cent of the fixed-wing accidents, pilots had only flown 0–10 hours during the preceding 90 days. Helicopter pilots on the other hand experienced 2.4 per cent of their accidents in the same hours' group, while 22.9 per cent of their accidents occurred with 101–150 hours in the preceding 90 days. To some degree the contrasts between each group reflect differing levels of



GRAPH 2

Photograph by Mr Jason Medway

experience and qualifications. 80.4 per cent of helicopter pilots involved had in excess of 1000 hours total experience and 78.7 per cent of them had over 100 hours on the type in which they experienced accidents. By comparison 61.1 per cent of the private/business aircraft pilot group had 500 hours or less and 58.9 per cent of these had 100 hours or less on type. With regard to age, 39.5 per cent of the helicopter pilots were 35 or over, while 63.1 per cent of the second group were 35 or over. The peak in helicopter accidents at the 101–150 hours mark may be partly due to a common practice in some helicopter operations, whereby pilots fly high hours for four successive weeks then have a two-week break. Over a 90-day period this would tend to place them in this hours bracket.

The graph confirms that lack of recent experience is an important consideration in single-engine fixed-wing private/business aircraft accidents. The incidence of these accidents declines as recent experience grows, to the point where there were almost no accidents amongst pilots with substantial recent experience. This contrasts with helicopter pilots who had few accidents when they were low on recent experience. On the other hand the proportion of their accidents in the different hours brackets rose with increasing levels of recent experience before peaking at 101–150 hours.

The small proportion of helicopter accidents which occurred when pilots were low on recency may be partly related to their higher qualifications and greater experience. On the other hand the rising proportion of accidents which occurred with higher levels of recent experience may be associated with special factors, besides the generally hazardous environment in which helicopters operate. As a helicopter pilot's recent experience grows the number of daily takeoff and landing cycles is also likely to rise significantly, and the question of skill fatigue cannot be overlooked.

Helicopter piloting is normally a full-time hands-on task, and as the number of flying hours increases the likelihood of making errors also rises. Skill fatigue is defined as 'the deterioration in performance caused by work that demands persistent concentration and a high degree of skill'. It might therefore be anticipated that degradation in helicopter pilot performance would occur during sustained periods of concentrated flying. It is associated with memory failure, judgment, integrating ability and presence of mind, and may be accentuated by factors such as sleep loss. Skill fatigue also needs to be considered in conjunction with workload. Identical flying tasks may represent quite different workload levels to pilots with different individual levels of skill and experience. The characteristics of skill fatigue with a supporting article may be found in *Digest* 121.

Experience levels

The greater proportion of helicopter accidents was incurred by relatively experienced pilots. Of pilots who had accidents, 16.8 per cent had 101–300 hours on type, 14.6 per cent 301–500 hours, 16.4 per cent 501–1000 hours, and 24.3 per cent 1001–3000 hours. Amongst the last group i.e. those with 1001–3000 hours on type, the high level of experience did not mitigate against the proportion of pilot factors in their accidents. The three most common factors in accidents involving this sub-group were, in order of importance:

1. Did not see or avoid objects or obstructions
2. Diverted attention from operation of aircraft
3. Improper level-off prior to landing

The occurrence of these three pilot factors together assumes considerable significance when related to the symptoms of skill fatigue. For instance, two symptoms of well-developed skill fatigue are 'inattention' and 'errors in timing', each of which could be related to the three pilot factors listed above.

There were few accidents with very low or very high levels of pilot experience on type. This may be partly due to the fact that many ex-service pilots joining the helicopter section of civil aviation do so with considerable previous rotary-wing time. There may also be a tendency for very high-time civil helicopter pilots to move into other segments of aviation, or perhaps to leave the industry altogether. In addition, this would approximately coincide with the time when growing family and social responsibilities made prolonged absences from home on flying duty less acceptable.

Conclusion

The combination of a hazardous operating environment, large number of daily flight cycles, increased flying hours, and more subtle factors such as skill fatigue need to be given serious consideration by helicopter pilots and operators. In turn the principle of good airmanship remains a vital concept, particularly when the items raised under 'Assigned factors' above are taken into account ●

Aircraft accident reports

FIRST QUARTER 1986

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

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

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

Note 1: All dates and times are local

Note 2: Injury classification abbreviations

C = Crew P = Passengers O = Others N = Nil
F = Fatal S = Serious M = Minor
e.g. C1S, P2M means 1 crew member received serious injury and 2 passengers received minor injuries.

PRELIMINARY REPORTS (The following accidents are still under investigation.)

Date / Time	*Aircraft type & registration / Location (km)*	*Kind of flying / Departure point/Destination*	*Injuries / Record Number*
03 Jan 1715	Aerocdr 690A VH-AAG Brisbane Qld	Charter — cargo operations Mungeranie SA/Brisbane Qld	C1N 8611003

As the pilot was manoeuvring the aircraft prior to parking, the right wing tip area struck a steel fence corner-post. This post supported a 1.8 metre high chain wire fence topped with several strands of barbed wire.

04 Jan 1200	Cessna A185 E VH-KPF Rudall River WA	Aerial mapping/photography/survey Rudall River WA/Rudall River WA	C1N 8651007

The pilot was attempting a short field landing. When he flared the aircraft it landed heavily before the threshold on a rocky outcrop. The right maingear tyre deflated and the aircraft veered to the right and ran over a windrow, damaging the elevator.

06 Jan 2002	Bell 47-G2 VH-OCT Colson Camp NT 10N	Aerial mapping/photography/survey Colson Camp NT/Colson Camp NT	C1N, P2N 8641003

The aircraft was carrying out a survey in a remote area. When last light occurred the aircraft was still some distance from the base camp. The pilot decided to follow a road into the camp. Enroute the engine lost power and an autorotational descent was carried out for a landing on the road. During the landing roll the left skid struck a low dirt bank and the tail rotor struck the dirt bank on the opposite side of the road.

07 Jan 1252	Mooney M20 E VH-IJN Camden NSW	Non commercial — pleasure Camden NSW/Camden NSW	C1N, P3N 8621003

Approaching the circuit area the pilot selected the landing gear down, but the appropriate gear position light did not illuminate. The pilot then noticed that all electrical systems were inoperative. He subsequently advised that he checked the mechanical extension system and was satisfied that the gear was down. Witnesses observed the aircraft making a normal approach but then saw the gear collapse shortly after touchdown. Initial investigation revealed that the aircraft battery was fully discharged.

11 Jan 1800	Piper 38 112 VH-FTI Kempsey NSW	Instructional — dual Kempsey NSW/Kempsey NSW	C2N 8621005

The student was receiving training in crosswind take-offs and landings in 5 to 10 knot wind conditions. For the third take-off in the sequence a minimum ground roll technique was employed. The aircraft lifted off in a slightly nose-high attitude but did not appear to be climbing or accelerating. The instructor took control but was unable to improve the aircraft performance and the right wing and maingear collided with a fence. The gear leg was detached, and shortly afterwards the aircraft touched down in the paddock beyond the fence. The nosegear collapsed and the aircraft slid sideways to a halt.

14 Jan 1140	Cessna 182 P VH-WTR Bradshaw Stn NT	Non commercial — corporate/executive Tindal NT/Bradshaw Stn NT	C1N, P3N 8641002

After joining the circuit, the pilot noticed some cattle standing at the side of the strip. So as to avoid them should they suddenly decide to run onto the strip during the landing, he decided to carry out a short field landing. When the aircraft was about 15 feet above the ground on final approach, the pilot reported that it entered a rapid sink. He flared the aircraft and it landed prior to the threshold. During the landing roll the nosegear was torn off after it struck a drum that was being used as a strip threshold marker.

17 Jan 0930	Piper PA36-375 VH-OON Colleambally 8NE	Aerial agriculture Colleambally 8NE/Colleambally 8NE	C1N 8621006

During the take-off run the right gear leg failed shortly after the aircraft passed through a soft patch of ground followed by a grass tussock. The severed section of the leg punctured the right wing and the tailplane was the aircraft slid to a halt. Initial investigation indicated that the failure of the leg was caused by fatigue.

19 Jan 1830	Glasflugel Libelle VH-GGS Leeton NSW 28NW	Non commercial — pleasure Leeton NSW/Leeton NSW	C1N 8621007

The pilot was competing in the Australian National Gliding championships. An outlanding became necessary when thermal activity declined and an approach was made to a dry field which was used for irrigation. On the downwind leg of the circuit, the pilot noted that a ditch crossed the field, however this ditch was not visible to him on final approach. During the landing roll the glider collided with the ditch.

Date Time	Aircraft type & registration Location	Kind of flying Departure point/Destination	Injuries Record Number
21 Jan 1630	Piper 28 R180 VH-ASN Mansfield VIC 19E	Non commercial — pleasure Mansfield VIC 19E/Moorabbin VIC	C1N, P3N 8631006

The pilot had intended to carry out a photographic flight from Moorabbin to Mansfield and return. He subsequently advised that on arrival in the Mansfield area, one of the passengers was unwell and a decision was made to land on a grass strip. Take-off from this strip was commenced about 90 minutes later, and the acceleration was reported to be slower than expected. The aircraft was pulled into the air near the end of the strip, but it then descended, ran through two fences and collided with some disused farm machinery. It came to rest in a nearby river bed.

25 Jan 1515	Bell 47-G3B1 VH-UTX Well Tree Stn 2N	Test Well Tree Stn NT/Well Tree Stn NT	C1S, P2S 8641004

Following the first 50 hour oil change after a recent overhaul, the engineer who completed the overhaul and service arranged for he and his wife to accompany the pilot on a scenic flight of the local area. The flight proceeded normally for about 15 minutes until the engine suddenly lost power, it then ran roughly momentarily, before stopping. The pilot attempted to land the aircraft in a large clear swampy area but during the approach it struck a large tree and crashed into the swamp.

26 Jan 1705	Rolladen LS4 VH-GXG Benalla VIC 1NW	Non commercial — pleasure Benalla VIC/Benalla VIC	C1F 8631007

The pilot was a member of the French team competing in the "Austraglide '86" gliding championships. At the end of a cross-country exercise the pilot reported that he was 5 kilometres from the finish line. The pilot of another glider observed that when the subject aircraft was one kilometre from the line it was apparently low. Shortly afterwards the glider collided with power lines. The tailplane was cut off by this impact and the glider then struck the ground in a steep nose down attitude.

27 Jan 1802	Glaser-Dirk DG300 D-2870 Benalla VIC 50NE	Non commercial — pleasure Benalla VIC/Benalla VIC	C1N, O1N 8631008

The pilot was competing in the "Austraglide '86" international gliding championships. During a cross-country exercise a number of gliders were thermalling in the same area. The pilot noticed several gliders underneath his aircraft as he entered the thermal at about 4000 feet above ground level. His entry was made via a 45 degree bank right turn, but after turning through about 90 degrees the left wingtip contacted the forward under-fuselage area of a Discus B sailplane, VH-HNZ. This aircraft had been in a left turn with about 12 degrees angle of bank. Following the collision, both aircraft remained under control and were flown to the planned destination without further incident.

27 Jan 1300	Glasflugel Libelle VH-GZK Warwick QLD	Non commercial — pleasure Warwick QLD/Warwick QLD	C1S 8611004

During the aero-tow launch the right wing of the glider contacted the ground and the glider began to veer to the right. After travelling about 40 metres in this manner the glider was seen to climb steeply and roll to the left before impacting the ground nose first.

30 Jan 0945	De Hav D H82-A VH-BDX Bond Springs NT	Non commercial — pleasure Bond Springs NT/Alice Springs NT	C1N, P1N 8641005

During the take-off run, the pilot applied forward pressure to the control column to raise the tail. He then maintained a constant control position in order to allow the aircraft to become airborne in the selected attitude. About 450 metres from the start of the take-off run the aircraft became airborne but almost immediately sank back onto the ground. Shortly afterwards it veered sharply to the right, and the pilot was unable to regain directional control. The aircraft ran off the side of the strip and struck an embankment before coming to rest inverted.

01 Feb 1630	Piper 25 235 VH-KRT Flinders Island	Non commercial — aerial application survey Flinders Island/Flinders Island	C1N 8631011

The pilot was using his aircraft for agricultural operations on his own land. The aircraft had been performing normally during the day, however on this particular take-off the engine lost power when the aircraft had reached about 55 knots. There was insufficient strip length remaining for the pilot to stop the aircraft, which struck several fences before coming to rest in a ditch 50 metres beyond the end of the strip.

01 Feb 1545	Cessna 152 VH-TYA French Island VIC	Non commercial — practice Tyabb VIC/French Island VIC	C1N, P1M 8631010

The pilot was carrying out various manoeuvres in the training area. After about one hour of general flying, the pilot decided to conduct a practice forced landing approach to a disused strip on the island. At about 200 feet on final approach, the pilot moved the carburettor heat control to the cold position and applied full power to overshoot. The engine failed to respond normally, and produced only about 1500 rpm. The pilot exercised the throttle control without obtaining any further power increase, and he was then committed to a forced landing. Touchdown occurred in a cleared paddock and damage to the nosegear and propeller was sustained when the aircraft ran through a ditch.

01 Feb 1700	Glasair FH-2 VH-HRG Northam WA	Non commercial — pleasure Northam WA/Northam WA	C1N 8651002

As the aircraft touched down, the pilot felt the left maingear leg give way, he applied power, but was unable to keep the aircraft straight. To avoid colliding with trees outside the airfield boundary the pilot closed the throttle and landed the aircraft. The left maingear leg collapsed and the right wing was damaged when it struck small bushes.

02 Feb 1140	Piper 28 140 VH-WKE Lennox Head NSW	Non commercial — pleasure Pt Macquarie NSW/Coolangatta QLD	C1N, P2N 8621011

While the aircraft was cruising at 2000 feet above mean sea level the engine commenced to run roughly. Trouble checks failed to determine the source of rough running and the pilot elected to land at an enroute aerodrome. However before reaching this strip, the engine lost power completely and the pilot was committed to a forced landing. Because of crowds at an adjacent beach, the pilot attempted to land on a road. Touchdown was further along the road than expected because of a strong tailwind component, and the aircraft collided with a kerb before coming to rest. Initial investigation disclosed a number of mounting stud failures on one cylinder, together with an exhaust valve failure in the same cylinder.

06 Feb 1800	Transav PL12-T300A VH-ABU Nannup WA	Aerial agriculture Nannup WA/Nannup WA	C1N 8651003

The pilot was operating from a strip on top of a ridge line. Because of the slope of the strip, landings were being made with a quartering tailwind of about 10 to 15 knots. At the end of a landing roll, the pilot commenced to turn around prior to re-loading, when the wind gusted to about 25 knots. The pilot applied more power in order to assist the turn, but the nosewheel bounced into the air. The aircraft weather-cocked and ran off the side of the strip. It then ran down the slope of the ridge line until the nosewheel entered a large hole and the aircraft overturned.

08 Feb 1300	Hughes 269 A VH-GMD Brewarrina 56NNE	Aerial mustering Amaroo HS NSW/Amaroo HS NSW	C1N 8621014

The aircraft had been engaged in mustering cattle in flat, open country. The pilot elected to land near a utility van to obtain further instructions from stockmen in the vehicle. Approaching the vehicle, the aircraft suddenly commenced to vibrate severely and to lose height. The pilot was unable to avoid a collision with the utility, following which the aircraft struck the ground heavily and overturned.

Date Time	Aircraft type & registration Location	Kind of flying Departure point/Destination	Injuries Record Number
09 Feb 0840	Piper 38 112 VH-FTE Moreton Is QLD	Non commercial — pleasure Moreton Is QLD/Archerfield QLD	C1N 8611006

The take-off was attempted on a grassed sandy strip. The pilot reported that the aircraft seemed to accelerate more slowly than usual. At 50 knots he lowered half flap, and as the indicated airspeed approached 60 knots he realised that insufficient runway length remained to effect the take-off. The pilot pulled back on the control column but the aircraft did not rotate. He then closed the throttle but was unable to stop the aircraft in the remaining runway. The aircraft overan the runway and overturned.

09 Feb 0630	Bell 205 A1 VH-UHP Mt Beauty VIC 3SE	Activities associated with fire control Mt Beauty VIC/Mt Beauty VIC	C2N,P1S,P1M 8631012

Two firemen had finished a task in a fire-fighting area and were to be winched out. The helicopter hovered above them at about 60 feet while the men attached themselves to the dual winch hook. The operation then proceeded normally until the men had reached the skids of the helicopter. At this point the winch cable broke and the men fell to the ground.

11 Feb 1420	Hughes 269 C VH-WAA Cheviot Hills QLD	Aerial mapping/photography/survey Cheviot Hills QLD/Cheviot Hills QLD	C1N, P1N 8611007

The helicopter was being used as a platform for test equipment. Part of the test equipment included an aerial that was mounted vertically below the helicopter. This aerial could be retracted and stowed horizontally for landing by operating a control which was positioned in front of the technician. On this occasion the pilot inadvertently attempted to land the helicopter with the aerial extended. Just prior to touch down the helicopter began to vibrate, the pilot lowered the collective and the helicopter rolled onto its right side.

15 Feb 1502	Burkhart Astir CS VH-WVM Bunyan NSW	Non commercial — pleasure Bunyan NSW/Bunyan NSW	C1N 8621018

The pilot was making a landing approach and intended to touch down at the threshold of the strip. The strip had recently been mown and its edges were clearly defined, however it was surrounded by long grass. Touchdown occurred short of the threshold, the left wing entered the long grass and the glider ground looped.

16 Feb 1230	Beech 95-C55 VH-JZN Brampton Is 2SE	Charter — passenger operations Brampton Island QLD/Mackay QLD	C1M 8611008

The pilot reported that shortly after take-off he positioned the fuel selector to feed fuel to the right engine from the right auxiliary fuel tank. After levelling the aircraft at the cruising altitude of 1500 feet, he noticed the right engine falter, and immediately positioned the fuel selector for that engine to 'crossfeed'. The right engine then stopped. The right engine fuel selector was then positioned to draw fuel from the right main fuel tank, however the engine did not restart. The left engine then stopped, attempts to restart it were unsuccessful. The pilot transmitted a 'Mayday' call and ditched the aircraft.

20 Feb 1945	Airtract AT 301 VH-FRC Walgett NSW 65E	Aerial agriculture "Whitewoods" NSW/"Whitewoods" NSW	C1S 8621019

The pilot was making night spraying runs over a cotton crop. During the third run at about 50 feet above ground level, the engine suddenly lost all power. The pilot attempted a landing at slow speed in a flooded rice paddock. Almost immediately after touchdown, the aircraft nosed over and sank into the soft muddy surface. The pilot was able to extricate himself from the partly water-filled cockpit.

21 Feb 1715	Piper 18 150 VH-SQP Katherine NT 58SW	Non commercial — business Scott Creek NT/Scott Creek NT	C1N 8641007

Near the end of the landing roll the left wing rose and the aircraft lifted off the strip, then settled back onto the ground on the right mainwheel. The brakes were still applied and the aircraft turned sharply to the right and the right wing struck the ground. The aircraft rolled over and came to rest inverted.

23 Feb 0920	Piper 28-161 VH-AAS Alice Springs NT	Instructional — solo (supervised) Alice Springs NT/Alice Springs NT	C1N 8641008

After a dual check the pilot's instructor briefed the pilot to carry out two circuits, each with a full stop landing. Following the first circuit and landing, the pilot applied power to commence the take-off without bringing the aircraft to a stop. The aircraft veered sharply to the left, became airborne momentarily, before settling back onto the ground outside the flight strip. It then continued under full power across a stormwater drain for another 38 metres before coming to rest.

24 Feb 1000	Cessna 210 M VH-IDZ Caloundra QLD	Non commercial — pleasure Brisbane QLD/Caloundra QLD	C1N 8611009

The aircraft touched down just short of the sealed runway and bounced. The pilot applied power and the aircraft was landed, mainwheels first, on the runway. Towards the end of the landing roll, as the nose of the aircraft was lowered, the propeller contacted the runway and the aircraft came to rest with the nosewheel pushed back against the gear doors. Pieces of metal from the nosegear retraction mechanism were found along the runway.

26 Feb 0247	Cessna 402 VH-MWF Rockhampton QLD	Charter — cargo operations Rockhampton QLD/Mackay QLD	C1N 8611010

As the aircraft was climbing through 1000 feet the pilot noticed a reduction in manifold pressure and fuel flow readings for the right engine. He advanced the right throttle and found that the engine instruments indicated that the engine was performing as if normally aspirated. A short time later he saw flames coming from the right engine. He shut the fuel off to the engine but was unable to feather the propeller. The fire did not go out. However, the pilot was able to successfully land the aircraft at Rockhampton where the fire was extinguished. An inspection of the aircraft revealed that the number 4 cylinder was cracked and holed around the seat of the exhaust valve.

27 Feb 0935	Aerocdr 500-S VH-SDO Canning Dam WA 2N	Test Jandakot WA/Unknown	C2F,C1S 8651005

The flight was planned to check the onboard survey equipment. After departing Jandakot the aircraft operated to the south of the airfield for about 80 minutes, before the pilot advised that he would be be extending his operation to the east over the Darling Ranges. The aircraft was then sighted, by several witnesses, over the foothills heading in a easterly direction. These witnesses reported that the engines were not operating normally. A short time later, the aircraft was observed to pass over the dam wall at an altitude of about 25 feet, and head down a valley in a northerly direction before disappearing from sight.

An inspection of the wreckage indicated that the aircraft had collided with two 30 metre high trees, in a nose high attitude at a low forward airspeed, before falling to the ground below the trees. At impact neither engine was delivering power and the fuel system, which was found to be relatively intact, contained only 9 litres of fuel.

01 Mar 1645	Glasflugel H206 VH-GSA Bacchus Marsh VIC	Non commercial — pleasure Bacchus Marsh VIC/Bacchus Marsh VIC	C1N 8631014

During the turn onto final approach, the pilot noticed a tug aircraft apparently making an approach to the same strip. He continued his turn in order to avoid any conflict with the tug, and the aircraft touched down on a cross-strip. It then ran through a ditch before colliding with a fence.

Date Time	Aircraft type & registration Location	Kind of flying Departure point/Destination	Injuries Record Number
01 Mar 1630	Enstrom F28-F VH-IPE Narellan NSW	Charter — passenger operations Narellan NSW/Narellan NSW	C1N, P1N 8621020

The pilot had been carrying out a series of joy flights at a rural field day. Refuelling was taking place from 200 litre drums, which had been placed in the shade of a large tree. On the second occasion that fuel was required, the pilot hover-taxied to the drums, which were rolled out of the way on completion of the refuelling. As the pilot started to hover-taxi again, the helicopter suddenly rose higher than anticipated and the main rotor struck the overhanging branches of the tree. One rotor blade de-laminated, severe vibration occurred, and the helicopter struck the ground heavily.

03 Mar 1940	Piper 31 VH-WDY Derby WA	Non commercial — aerial ambulance Derby WA/Broome WA	C3N 8651006

The pilot commenced the take-off run and confirmed that full power was selected. At an indicated airspeed of 90 knots he rotated the aircraft and waited for the performance instruments to indicate that a positive rate of climb and the single engine climb speed had been achieved. The aircraft did not accelerate beyond an airspeed of 95 knots and a positive rate of climb was not obtained. The pilot retracted the gear to avoid the boundary fence, and then realised that the left engine was losing power and altitude was not being maintained. He closed the throttles and the aircraft landed in the runway overrun area.

03 Mar 1430	Partavia P68C-TC VH-TCU Orbost VIC 55ENE	Aerial mapping/photography/survey Orbost VIC 55ENE/Mallacoota VIC	C1N, P5N 8631015

The pilot reported that acceleration was normal during the take-off run and the aircraft was rotated at about 70 knots. He further stated that the aircraft experienced "a sudden loss of lift" and that he then released some of the back pressure on the control column. As the aircraft became airborne it struck the airfield boundary fence and the left mainwheel was dislodged. A circuit was completed and during the subsequent landing roll the left gear leg collapsed and the aircraft ran off the strip.

05 Mar 1759	Cessna 150 L VH-KOF Alice Springs NT	Non commercial — practice Alice Springs NT/Alice Springs NT	C1N, P1M 8641009

At the completion of a local pleasure flight the pilot decided to carry out three practice circuits. The first two landings were without incident but on the third landing the aircraft touched down on the right mainwheel and bounced. The pilot applied power in an attempt to stabilise the aircraft, but the angle of bank to the right increased and the right wing struck the ground. The aircraft cartwheeled onto the left wing and came to rest inverted 190 metres to the right of the runway centreline.

06 Mar 1130	Piper PA25-235 VH-JPT Archerfield QLD	Test Archerfield QLD/Archerfield QLD	C1N 8611011

The pilot was conducting a flight to check the output of the spray system fitted to the aircraft. During the take-off he heard a noise from the rear of the aircraft and noticed something moving away from the aircraft. He continued with the take-off and two spray runs before positioning the aircraft on a downwind leg for landing. As the aircraft was turned onto the base leg the pilot realised that he could not apply left rudder. The pilot stated that he then intended landing the aircraft on the base leg but found that cone markers blocked the path. The aircraft was then lined up with and landed on runway 22. An inspection found that a leaf spring which supported the tailwheel had failed.

11 Mar 1717	Piper 601 VH-CUO Lismore NSW	Charter — cargo operations Coolangatta QLD/Lismore NSW	C1F 8621023

When the aircraft arrived in the destination area, another aircraft was also in the circuit. The pilots agreed that VH-CUO would follow the other aircraft. However, insufficient separation was maintained and the pilot of VH-CUO initiated a go-around. Witnesses observed the aircraft operating apparently normally, but at a low height above the ground. A turn was then commenced, indicating to the witnesses that the pilot was intending to land in the opposite direction. The angle of bank was in the order of 60 degrees, and about three-quarters of the way through the turn the nose dropped rapidly. The aircraft then dived steeply into the ground, and was destroyed by the impact and subsequent fire.

12 Mar 1025	Bell B206 VH-BHY Adelaide SA	Non commercial — practice Adelaide SA/Adelaide SA	C2N 8641010

During the initial climb after take-off, before translational lift was obtained, the check pilot closed the throttle to simulate an engine failure. The aircraft touched down heavily on the rear of the left pop-out float and pitched forward onto the right float. It then rolled backwards bending the rear of the tail boom, which was then severed by the main rotor. The crew shut the helicopter down before evacuating the aircraft.

19 Mar 1028	Airparts 24 VH-AFN Armidale NSW 25SE	Aerial agriculture Enmore NSW/Enmore NSW	C1N 8621024

Before commencing the 17th spreading flight for the day, the pilot noted that one fuel tank indicated empty and the other indicated one quarter full. After a normal take-off and turn at about 150 feet above ground level, the engine lost all power. The pilot was committed to a landing in a small paddock with a downhill slope. Touchdown was made in light tailwind conditions, and during an attempt to turn the aircraft to lengthen the landing distance available, the right wing struck the ground. The aircraft partially ground looped, one tyre was rolled off its rim, and the aircraft came to rest within the confines of the paddock. The pilot then physically checked the fuel tank contents and found that only a few litres remained in one of the tanks, while the other was empty.

23 Mar 0945	Bellanca 8GCBC VH-PEV Harts Range NT	Non commercial — pleasure Bond Springs NT/Harts Range NT	C1N, P2N 8641011

During the landing roll both mainwheels entered soft areas in the strip surface. The aircraft swung through 120 degrees to the left then slid sideways for 17 metres before the right maingear collapsed. The wing struck the ground and was bent upwards.

28 Mar 0935	Osprey 2 VH-OLC Tyabb VIC	Non commercial — pleasure Tyabb VIC/Tyabb VIC	C1S, P1S 8631018

The aircraft had previously been flown to test a new propeller installation. Maintenance personnel then checked the propeller, after which the pilot taxied for a local flight. Shortly after take-off there was a sudden and complete loss of power. The pilot attempted a forced landing in a paddock, but the aircraft stalled at a low height and struck the ground heavily.

29 Mar 2044	Piper 28 161 VH-TVE Narrogin WA	Non commercial — pleasure Jandakot WA/Narrogin WA	C1N 8651008

The pilot, who held a Class Four Instrument Rating, had planned the flight as currency training. At Narrogin, he set the aircraft up on a long final approach but reported that on several occasions during the approach he found that the aircraft became low and he needed to adjust the flight path. About midway along final, the pilot stated that he felt a thump on the left side of the aircraft but the aircraft continued to operate normally, so he continued with the approach and landing. After parking the aircraft, damage to the left wing was noticed.

Date Time	Aircraft type & registration Location	Kind of flying Departure point/Destination	Injuries Record Number
31 Mar 0945	Piper 28 161 VH-BZB Lilydale VIC	Instructional — solo (supervised) Lilydale VIC/Lilydale VIC	C1N 8631019

The pilot was conducting her second solo flight. After a normal approach the aircraft landed heavily and bounced. The pilot was unable to correct the situation and a further two bounces occurred. When the aircraft was stopped, damage to the nosegear assembly and engine mounts was discovered.

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

Date Time Pilot licence	Aircraft type & registration Location (km)	Age	Kind of flying Departure point/Destination Hours Total	Hours on Type	Rating	Injuries Record Number
01 Jan 1423 Glider	Romainian IS-28B2 VH-IKZ Leongatha VIC	57	Non commercial — pleasure Leongatha VIC/Leongatha VIC 1043	3	Glider	C1N, P1N 8631001

The pilot, who was also the holder of a Private Pilot Licence, was conducting his first gliding flight for the day. The glider was aero-towed to 1100 feet above the aerodrome, but only weak lift was encountered in the area. The pilot elected to return for landing and commenced a normal circuit. On the downwind leg strong sink was encountered and the base turn was conducted at about 300 feet above the ground. Indicated airspeed at the time was reported to be about 55 knots. The pilot subsequently advised that the roll into the turn was normal, but he was unable to level the wings again, even with full opposite aileron. The aircraft continued descending in a wing-low attitude and struck the ground about 250 metres before the threshold of the strip.

Investigation revealed no evidence of any pre-impact defect or malfunction of the controls, and atmospheric conditions at the time were reported as being stable. When the sink was encountered on the downwind leg, the pilot had modified his circuit by flying closer to the strip. As a result, the angle of bank required for the base turn was steeper than normal. It was considered probable that the aircraft had stalled during this turn onto base, with insufficient height remaining to allow the pilot to recover control.

02 Jan 1245 Private	Cessna 172 N VH-UJS Agnes Waters Qld	34	Non commercial — pleasure Archerfield Qld/Great Keppel Is QLD 145	40	None	C1N, P1M 8611001

The aircraft was being operated on a VFR flight and was cruising at 1500 feet above ground level. The engine suddenly began to run roughly, and the rpm dropped to about half the normal setting. Emergency trouble checks failed to alleviate the problem, and the pilot transmitted a Mayday call as he tracked towards a nearby strip for a precautionary landing. The approach to this strip was too high and power was applied in an attempt to go around. However, severe engine vibration occurred, and the pilot was committed to a forced landing in densely forested, hilly terrain.

The power loss and vibration was caused by the partial separation of the exhaust valve head on one of the cylinders.

02 Jan 1515 Private	Cessna R182 VH-IVQ Albury NSW	49	Non commercial — pleasure Dubbo NSW/Albury NSW 179	6	None	C1N, P1N 8621001

The pilot carried out a normal approach and landing. The nosewheel was kept off the ground until the speed had reduced to a suitable figure. However, almost as soon as the wheel contacted the runway it became detached, and the aircraft skidded to a halt 97 metres further on.

The nosewheel assembly had failed from overload, which had probably resulted from a recent heavy landing. There was ample evidence to indicate that the damage had not occurred on this particular landing, and the date and circumstances surrounding the heavy landing could not be established.

02 Jan 1915 Commercial	Cessna A188B A1 VH-TZK Gunnedah NSW 25NW	25	Aerial agriculture Carroll NSW/Carroll NSW 1125	200	Agricultural class 2	C1S 8621002

The aircraft was engaged in spraying a cotton crop. The spray runs were being flown into the west in the afternoon. About three-quarters of the way into the treatment area a power line crossed the swath path at right angles. The line was carried on poles about 300 metres apart, and the aircraft had crossed under or over the line on about 8 occasions. With the sun shining directly in his eyes, the pilot found it difficult to see the markers. While concentrating on lining up the swath run, he temporarily forgot the presence of the power line. The aircraft collided with the cables and subsequently struck the ground in a steep nose-down attitude 57 metres beyond the run of the lines. The pilot sustained serious burn injuries in the post-impact fire which gutted the aircraft.

04 Jan 1145 Student	Piper 38 112 VH-MIR Swan Hill VIC	35	Instructional — solo (supervised) Swan Hill VIC/Swan Hill VIC 14	14	None	C1N 8631002

Following a dual check, the pilot was authorised to carry out a series of solo circuits and landings. Two landings had been completed successfully, however the pilot advised that on the next approach the aircraft was affected by a wind gust. Appropriate corrections were made, but another gust was encountered and the pilot applied power in order to go around. Almost immediately afterwards the left wingtip contacted the ground, followed by the left mainwheel. The nose gear collapsed when it struck the ground and the aircraft came to rest at right angles to the strip direction.

The wind at the time was generally down the strip at about 10 knots, with gusts to about 15 knots. The pilot had flown successfully in similar conditions in the past, but on this occasion had not been able to react sufficiently quickly when the left wing dropped.

05 Jan 1000 Commercial	Piper 25 235 VH-KLZ Willow Glen QLD	31	Aerial agriculture Willow Glen QLD/Willow Glen QLD 837	330	Agricultural class 1	C1N 8611002

As the aircraft approached the end of the landing roll the left main landing gear leg collapsed. The aircraft swung to the left before coming to rest in a left wing low attitude.

The landing gear leg had failed due to overload. The cause of the overload failure could not be determined.

Date / Time / Pilot licence	Aircraft type & registration / Location	Age	Kind of flying / Departure point/Destination	Hours Total	Hours on Type	Rating	Injuries / Record Number
06 Jan	Victa 115 VH-RSI		Non commercial — pleasure				C1N, P1N
0915	Pelican Field VIC		Pelican Field VIC/Trafalgar VIC				8631003
Private		47		350	150	None	

Shortly after a normal take-off, the pilot sensed that the engine was not delivering full power and the passenger commented that he could detect rough running. The pilot attempted to reach a clear area ahead, but the aircraft collided with 3 metre high scrub while in a nose-high attitude. It then spun through 180 degrees before coming to rest about 10 metres from the initial impact point. A fire broke out which destroyed most of the fuselage and part of the wings.

The investigation was hampered by the degree of fire damage, however no fault was found with the engine which might have explained the reported loss of power. Atmospheric conditions were conducive to carburettor icing, but whether this had in fact occurred could not be determined.

08 Jan	SZD 48 Jantar VH-UKQ		Air show/air racing/air trials				C1M
1851	Gawler SA 1N		Gawler SA/Gawler SA				8641001
Glider		62		1017	240	Glider	

The pilot was taking part in a gliding race. About 3 kilometres from the destination the pilot realised that he would not reach the aerodrome and that an outlanding would be necessary. He selected a small paddock with trees on the approach boundary, but sink was encountered and he found he was unable to clear these trees. The aircraft stalled either just before or coincident with colliding with the tree tops. The right wingtip then struck the ground 22 metres beyond the trees and the glider rotated through about 140 degrees to the right before the fuselage impacted heavily with the ground.

The decision to outland was left too late.

10 Jan	Beech C23 VH-ARF		Non commercial — pleasure				C1N, P3N
1040	Moruya NSW		Canberra ACT/Moruya NSW				8621004
Private		27		167	3	None	

After a normal approach, the pilot was surprised when the aircraft bounced on initial touchdown. A second bounce occurred, during which the pilot applied power to cushion the next touchdown. The power application seemed to have little effect and the nosewheel and propeller struck the ground heavily. The aircraft then ran off the side of the runway and collided with a fence.

The pilot had been given a check flight on the aircraft two days previously. During his check, he was advised to use less flap for landing than that specified in the Flight Manual. At the time of the accident, the aircraft was being operated in excess of the maximum permitted all-up-weight. The pilot advised that he had not carried out a weight and balance calculation because the hiring organisation had assured him that the aircraft could be operated with full fuel tanks and four persons on board. Following the bounced landing the pilot had not initiated a go around and directional control had been lost after the nosegear suffered damage on heavy contact with the runway.

10 Jan	Schleicher KA-6 VH-GTW		Airshow/air racing/air trials				C1N
1830	Temora NSW 5SE		Temora NSW/Temora NSW				8621012
Glider		30		130	40	Glider	

Towards the end of a 4 hour competition flight, the pilot realised that the aircraft would not reach the finishing line and that an outlanding would be necessary. After establishing the aircraft on final approach to the selected paddock, the pilot noticed a pile of stones obstructing the target touchdown area. While manoeuvring to avoid this obstruction the left wing of the aircraft struck the ground and a ground loop ensued.

The pilot had been suffering the effects of a head cold and sinus infection, and had probably become fatigued during the flight in demanding conditions. He had persisted in his efforts to reach the finish until the glider was too low to allow a more suitable paddock to be selected for the outlanding.

This accident was not the subject of an on-site investigation.

19 Jan	Schneider ES-60B VH-GYT		Non commercial — pleasure				C1N
1521	Ross TAS 8W		Woodbury TAS/Woodbury TAS				8631004
Glider		60		51	38	Glider	

The pilot had been soaring in wave conditions, when sink was encountered and an outlanding became necessary. The field initially selected was obstructed by a power line and the pilot manoeuvred towards another area. On late final approach the aircraft collided with a single strand power line and subsequently struck the ground heavily. The pilot later advised that he had seen a pole supporting the line but had thought it was aligned in another direction.

The large distance between the poles supporting the power line reduced the possibility of the pilot being able to accurately assess the direction of the line.

20 Jan	Rockwell 114 VH-DDY		Non commercial — pleasure				C1N, P1N
1705	Sea Lake VIC		Sea Lake VIC/Essendon VIC				8631005
Private		54		1000	100	Instrument rating 1st class or class 1	

Shortly after take-off the pilot's door opened. The passenger became very agitated and the pilot elected to carry out a low level circuit and landing. The passenger's condition deteriorated to the extent where the pilot was experiencing difficulty in concentrating on the approach. The aircraft touched down in a paddock 22 metres short of the aerodrome boundary fence, ran through the fence and came to rest near the strip threshold.

Atmospheric conditions at the time were conducive to the formation of downdraughts and willy-willies. It was possible that the aircraft was affected by such a disturbance at a time when the pilot was distracted by his passenger's condition.

24 Jan	Rockwell S2R VH-LGG		Aerial agriculture				C1N
1000	Griffith NSW 15ESE		Ag Strip 3 km NE/Ag Strip 3 km NE				8621008
Commercial		46		9000	4000	Agricultural class 1	

Shortly after an apparently normal take-off, engine power was lost and the pilot was committed to a landing straight ahead. Initial touchdown was in a flooded rice paddy, and the aircraft then struck a levy bank and ran through a fence, coming to rest inverted in an adjoining dry paddock. Investigation revealed that one cylinder head had become detached from the engine and had removed a section of the inlet manifold.

The cylinder head had failed as a result of fatigue cracking which had commenced at the edge of an exhaust valve insert.

26 Jan	Corby CJ1 VH-IHT		Non commercial — pleasure				C1F
0930	Busselton WA		NR Cowaramup 32SSW/Busselton WA				8651001
Private		41		490	152	None	

The aircraft was one of a number conducting a "fly-in" to the property. On arrival overhead the farm, the aircraft was observed to make a low pass over the homestead, during which the pilot attempted to drop flour bombs on the building. While the pilot was attempting to drop the bombs, the right wing of the aircraft struck a tree about five metres above the ground. The aircraft rolled to the right and collided with the ground beyond the tree.

An inspection of the wreckage did not reveal any defects that could have contributed to the accident. The pilot had recently been counselled by members of his Association regarding previous instances of low flying.

Date / Time / Pilot licence	Aircraft type & registration / Location	Age	Kind of flying / Departure point/Destination	Hours Total	Hours on Type	Rating	Injuries / Record Number
29 Jan	Hughes 269-C VH-IHV		Instructional — dual				C2N
1035	Moorabbin VIC		Moorabbin VIC/Moorabbin VIC				8631009
Commercial — helicopter		25		1146	900	Flight instructor grade 1 or 2	

The student had a total of 45 hours helicopter flying, and also had a Private Pilot Licence with 130 hours fixed wing experience. During a period of practice circuits and engine failures in 15 to 20 knot wind conditions the student required several practice autorotative landings in order to reach a satisfactory standard. These exercises were commenced about 700 feet above the ground. During this period, the Tower advised that the wind strength had increased to 35 knots. Conditions remained stable and the instructor elected to continue with the training. A further engine failure after take-off was simulated from about 400 feet, and on successful completion of this manoeuvre, the instructor simulated a failure at 100 feet. On this occasion a high rate of descent developed and the instructor took control. The touchdown was firm, and was on the heels of the skids. The helicopter rocked forward and the main rotor struck the tail boom.

It was considered probable that the aircraft had been affected by a reduction in wind speed at the time the engine failure was simulated. The low height at which the manoeuvre was being performed did not allow sufficient time for adequate corrective action to be taken to arrest the rate of descent.

30 Jan	Piper 25 235 VH-CPT		Instructional — solo (supervised)				C1M
1700	Cudal NSW 1NE		Cudal NSW/Cudal NSW				8621010
Other (Foreign, Military, etc)		36		2300	4	None	

The pilot was a Chinese citizen who was being trained, as part of an Australian Development Aid program, to a standard equivalent to that required for an Agricultural rating. His Chinese Commercial Licence was suitably endorsed to allow training in this country. The flight in question was authorised as a practice spraying exercise and was to be the pilot's last solo sequence before a flight test. At the end of the first practice spraying run the entry into the procedure turn was delayed, and the turn was then conducted at less than the normal angle of bank. This placed the aircraft in a wide and low turn, during which it collided with a tree. This collision occurred at about 50 feet above ground level, and the aircraft struck the ground 35 metres beyond the tree.

The pilot subsequently reported that the aircraft had been affected by a downdraught. However, other pilots and ground witnesses in the area indicated that excessive sink or downdraughts were unlikely to have occurred. The tree struck was prominent and contrasted well with the surrounding vegetation. It was likely that the pilot was looking back to check his flight path in relation to the spraying runs and had not seen the tree prior to the collision.

01 Feb	Cessna 182 B VH-MPM		Sport parachuting (not associated with an airshow)				C1N, P4N
1255	Toogoolawah QLD		Toogoolawah QLD/Toogoolawah QLD				8611005
Commercial		23		958	102	Instrument rating class 4	

During the take-off run, when the indicated airspeed was about 40 knots, the pilot saw three wallabies run onto the strip in front of the aircraft. He rotated the aircraft in an attempt to avoid the animals, but one of them collided with the tailplane. The pilot closed the throttle and landed the aircraft.

The fencing around the aerodrome was inadequate to keep out native fauna and there was high vegetation close to the sides of the strip. The pilot stated that he had not previously seen wallabies within the boundaries of the aerodrome.

This accident was not the subject of an on-site investigation.

06 Feb	Cessna A188A A1 VH-AIN		Aerial agriculture				C1N
0655	Narromine 23NE		Trangie NSW/Trangie NSW				8621013
Commercial		48		9000	250	None	

Spraying operations were planned to be conducted on two paddocks. A briefing on the operation was passed to the pilot by telephone by one of the owners of the property the previous evening. The briefing indicated that a particular power line was strung outside the boundary of the smaller of the paddocks, clear of the likely swath run approach path. Based on the information supplied, the pilot drew a map of the area. In fact, the line cut across the corner of the paddock.

Before commencing operations, the pilot carried out an aerial inspection of the area. However, he failed to detect the actual position of the power line. While descending for the first run over the paddock, the aircraft struck the line. The impact partially severed the left wing, and a fire broke out behind the engine firewall. The pilot was able to complete a semi-controlled landing in the adjacent paddock, and the fire was extinguished by the ground party.

10 Feb	Cessna A185 F VH-CWH		Activities associated with aerial agriculture				C1N
0845	Taralga NSW 16E		Gunning NSW/Taralga NSW 16E				8621015
Commercial		31		2631	237	Agricultural class 1	

Prior to his departure for the agricultural strip, the pilot had been assured that there would be no stock in the paddock containing the strip. As the aircraft was flared for landing, three sheep ran out from tall thistles adjacent to the strip. One of the sheep struck the right main gear leg and the pilot conducted a go around. He was informed that the leg was out of alignment, and elected to divert to a more suitable aerodrome. The gear leg folded during the landing run.

The person who advised the pilot that there was no stock on the strip had not made a thorough inspection of the area.

13 Feb	Piper 31 350 VH-RDA		Charter — passenger operations				C1N, P9N
1115	Broken Hill 15SE		Coonbah Stn SA/Broken Hill SA				8641006
Commercial		39		9757	350	Instrument rating 1st class or class 1	

Shortly after take-off the pilot noticed a 10 to 15 centimetre gap between the forward ends of the upper and lower cowlings on the left engine. He elected to continue the flight at reduced airspeed and engine power. About 15 kilometres from the destination the upper cowling became detached and struck the horizontal stabiliser. It remained wrapped around the stabiliser and resulted in severe vibration and a temporary loss of elevator control. The pilot was able to regain control, and during the turn onto a long final approach elevator control returned to normal when the engine cowling fell free.

The cowling did not become detached until well after departure. It was likely that an uneventful landing could have been carried out had the pilot returned to the departure aerodrome as soon as he noticed the problem. The detached cowling was not found and the reason for the failure of the latches to hold it in place was not determined. However, the surface of the departure strip was reported as rough and the aircraft had flown about 12 hours since the cowlings were last disturbed.

Date / *Time* / *Pilot licence*	*Aircraft type & registration* / *Location*	*Age*	*Kind of flying* / *Departure point/Destination* / *Hours Total*	*Hours on Type*	*Rating*	*Injuries* / *Record Number*
16 Feb / 1215 / Glider	Romainian IS-28B2 VH-WVU / Richmond NSW	26	Instructional — dual / Richmond NSW/Richmond NSW / 350	70	Glider	C2N / 8621016

The flight was intended to give the student practice in the procedures required in the event of a breakage of the tow line. The instructor released the glider from the tow at about 350 feet above ground level. The student manoeuvred the aircraft towards the strip. On final approach both pilots realised the aircraft was low, but they expected it to land within the confines of the strip. However, the left wing struck a tree some 19 metres from the aerodrome boundary. This impact slewed the aircraft, which then collided with a fence before striking the ground while travelling backwards.

The pilot of the tug aircraft had not complied with the pre-flight briefing, which required him to maintain runway heading after take-off. The tug had turned to the right at about 200 feet above ground level. This action placed the glider in a less favourable position for the pilot being checked to employ the standard procedure for returning to the field when the cable break was simulated. Although he was an experienced glider pilot, this was his first cable break exercise for three years and he was not in current flying practice. At the time the pilots realised that the glider was low, suitable areas for an outlanding were available, but the instructor relied on the other pilot's judgment and allowed the approach to continue.

17 Feb / 1845 / Commercial	Beech D55 VH-CLA / Sydney NSW	32	Charter — cargo operations / Bankstown NSW/Sydney NSW / 1500	120	Instrument rating 1st class or class 1	C1N / 8621017

The pilot advised that during the landing run, he inadvertently selected the landing gear up instead of the flaps. The nose and right gears retracted and the aircraft slid to a halt on the edge of the runway.

The landing was the last in the pilot's duty period and he subsequently advised that he had relaxed after achieving a good touchdown in crosswind conditions. For the previous two weeks he had been operating another aircraft type in which the gear and flap selectors were in the opposite locations to those in this aircraft.

18 Feb / 1242 / Private	Piper 32 300 VH-RRZ / Flinders Island	19	Non commercial — pleasure / Essendon VIC/Flinders Island / 173	16	Instrument rating class 4	C1N, P4N / 8631013

On arrival at the destination, the pilot noted that the wind was from the west-south-west, but joined the circuit for landing into the north-east. On final approach the aircraft was high and fast, and touched down with only 330 metres of the 1100 metre strip remaining. At this time the pilot realised he was landing downwind, and shortly afterwards applied full power in an attempt to go around. However, the aircraft collided with the aerodrome boundary fence and came to rest on its belly after crossing a road and striking another fence.

20 Feb / 1015 / Private restricted	Cessna 150 H VH-KQR / Koonmarra Stn 20W	45	Non commercial — aerial application/survey / Mt Hale WA/Koonmarra Stn WA / 189	183	None	C1N / 8651004

The pilot was engaged in sheep spotting. The aircraft had been refuelled two days prior to the flight and before departure the pilot had checked the fuel contents gauges, which indicated full fuel. After about two hours of the planned three hour flight, the pilot noticed that one of the fuel contents gauges indicated empty and the other almost full. As he was near one of the property airstrips, the pilot decided to land the aircraft and dip the tanks. Having apparently satisfied himself that sufficient fuel remained he continued the flight. An hour later, as he was returning to the Station airstrip, the engine stopped. The aircraft was landed on a road but during the landing roll the left wing struck a tree and the aircraft ran off the road and into the bush, sustaining further damage.

An inspection of the aircraft revealed that the engine had stopped after the usable fuel had been exhausted. The fuel gauge for the right fuel tank was found to overread by 10 litres, however the reason the fuel had been exhausted after a flight time of only three hours could not be positively determined.

02 Mar / 1130 / Private	Cessna A185 E VH-RKZ / Warkworth NSW	39	Glider towing / Warkworth NSW/Warkworth NSW / 2100	300	None	C1N / 8621021

During the daily inspection prior to a series of glider towing operations, the pilot noticed that the brake linings were worn. During the landing roll following the third of these operations, the right brake failed and the aircraft ground looped before coming to rest.

The brake had failed following the loss of hydraulic fluid from the seal for the brake caliper piston. This was caused by excessive piston travel, associated with severely worn brake linings. When the assembly was dismantled, it was found that the linings had worn completely off the backing plate, and those on the pressure plate were only 1.1 millimetres in depth. Both brake discs were pitted from the effects of corrosion, which would have caused the excessive wear in the linings.

09 Mar / 1420 / Commercial	Cessna 150 M VH-PIG / Geelong Airport	23	Instructional — dual / Geelong Airport VIC/Geelong Airport VIC / 1000	450	Instrument rating 1st class or class 1 with instrument rating	C2N / 8631016

The flight was intended to be a revision exercise in cross-wind circuits and landings. The first landing was completed satisfactorily and the student subsequently advised that the flaps were raised to the take-off setting and full power was applied. However, the instructor reported that only partial power was applied and he said to the student 'I've got the flaps'. The student believed the comment was 'Take it off', and she responded by closing the throttle. The instructor took control and continued the take-off, but the tail tie-down ring struck the boundary fence and the aircraft then collided with mounds of soil beyond the fence.

The investigation was unable to resolve the apparent confusion which existed in the cockpit with regard to the amount of power the student applied or the phraseology which was used by the instructor. At the point where the student closed the throttle, the instructor considered that insufficient strip distance remained to stop the aircraft.

09 Mar / 1120 / Student	Cessna 172 M VH-BAW / Walcha NSW	34	Instructional — solo (supervised) / Walcha NSW/Walcha NSW / 26	13	None	C1N / 8621022

At the conclusion of a dual check flight, the student landed the aircraft into a light north-easterly wind. The landing roll was completed about half way along the 853 metre strip, and the pilot turned the aircraft around preparatory to taxiing back to the upwind threshold. The instructor left the aircraft at this point, after briefing the student on the solo sequences he wished him to practice. Shortly afterwards, full power was applied as the student commenced a take-off downwind. The aircraft failed to become airborne, collided with a fence and overturned.

The student was subsequently unable to give any reason for his decision to commence the take-off roll from other than the threshold of the strip.

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.)

Date / *Time*	*Aircraft type & registration* / *Location (km)*	*Age*	*Hours Total*	*Pilot Licence* / *Hours on Type*	*Rating*	*Record Number*
28 Jun 84 / 1410	Cessna 210 L VH-KWW / Kalgoorlie WA	46	934	Private / 234	None	8451017

When the pilot selected the gear up after take-off, the retraction cycle took longer than normal. The gear was selected down prior to the next landing and although the gear up light extinguished the gear motor did not operate and the gear down light did not illuminate. Attempts to lower the gear using the manual system were unsuccessful and the aircraft was diverted to a more suitable airfield. During the subsequent landing roll the main gear, which was only partially extended, collapsed.

Although the pilot was experienced on the aircraft type and carried out a trouble check of the gear system, he did not reset the hydraulic pump circuit breaker, which had tripped. The circuit breaker had probably tripped during the retraction cycle after the previous take-off. The reason the manual extension did not operate could not be determined.

29 Sep 84 / 1045	Cessna A188B A1 VH-EVU / Coreen QLD	42	1845	Commercial / 20	Agricultural class 2	8411043

The strip being used was aligned south-east and the wind of 15 kt was swinging from south-east to south-west. On the second take-off for the day acceleration was sluggish and the pilot kept the main wheels in contact with the strip surface for longer than normal before allowing the aircraft to become airborne. Shortly after liftoff the aircraft mushed and the wheels contacted the ground. The pilot abandoned the take-off attempt and the aircraft came to rest 240 metres beyond the end of the strip after sustaining damage to the left wing and landing gear.

The pilot had limited experience on the type and did not appreciate that the engine was not developing full power during the take-off attempt. The mixture control cable outer sheath was found to be broken, in such a position that it could randomly prevent full travel of the mixture control, with subsequent reduction of fuel flow to the engine.

23 Nov 84 / 2210	Cessna 210 L VH-EDE / Parkes NSW	54	2150	Private / 1000	Instrument rating class 4	8421066

Prior to departure for a nearby aerodrome the pilot decided to carry out some practice night circuits. He subsequently advised that all necessary checks were completed for the first landing, however the aircraft landed with the gear retracted. When the aircraft came to rest the pilot noted that the gear hydraulic pump motor was still operating. It was determined that the aircraft had touched down on the gear doors, which were open at the time.

Although the main gear doors had completed their extension cycle, a defect in the gear control valve spool prevented the gear itself from extending. Contamination of the hydraulic system was also evident, probably resulting from ineffective filtering of the fluid. The pilot had evidently not checked the gear position indicator lights prior to landing.

17 Jan 85 / 0900	Cessna A185 E VH-SWE / Bendemeer Stn QLD	57	15000	Senior Commercial / Unknown	Agricultural class 1	8511004

After a normal touchdown a swing to the right developed. The swing was controlled initially with rudder but as brake became necessary the pilot lost directional control. After the aircraft had swung through about 120 degrees the left wheel was dislodged. The left main axle assembly had separated from the leg because a bolt had failed and a section of the broken bolt had jammed between the brake unit and the brake disc, locking the left wheel. The locked wheel caused the remaining bolts to fail.

The bolt that failed was found to have been worn by fretting. The aircraft had only operated 20 hours since servicing was carried out to the gear legs. The failed bolt had not been changed at that service.

16 Feb 85 / 1520	Cessna 172-B VH-CRB / Rylstone NSW	56	586	Commercial / 297	None	8521012

Witnesses reported that after take-off in hot and gusty crosswind conditions the aircraft did not climb away normally. It passed over the boundary fence at a low height and then remained at about tree-top height for about one kilometre. The aircraft was then seen to turn sharply to the left before disappearing from view. It was subsequently discovered to have struck the ground while in a steep nose-down attitude, and been completely destroyed by a post-impact fire.

No evidence was found of any pre-impact defect or malfunction of the aircraft which might have contributed to the accident. The take-off had been attempted with the aircraft approximately 20% above the maximum allowable weight. It was considered that the combination of aircraft weight and ambient weather conditions caused a significant reduction in the aircraft climb performance. The available performance was insufficient to allow the aircraft to clear rising ground beyond the aerodrome boundary.

07 May 85 / 1755	Cessna 310 N VH-KOM / Cudal NSW	21	1035	Commercial / 227	Instrument rating 1st class or class 1	8521028

On the two previous landings the pilot noticed a nose wheel shimmy during the landing roll. As his next stop was at his company's maintenance base, he advised the company of the problem. No nose wheel shimmy was noticed on landing, however, the aircraft was inspected by service personnel. During the subsequent take-off, a violent shimmy developed and the pilot abandoned the take-off as the nose leg strut fractured.

The nose leg strut had failed from overload, most probably induced by the sudden onset of severe shimmy. The reason for the shimmy could not be positively established.

09 Jun 85 / 1411	Piper 28 140 VH-MAM / Wedderburn NSW	56	1150	Private / 350	None	8521036

As part of a club competition, the pilot was required to carry out a practice forced landing on the strip. On the downwind leg the height of the aircraft was lower than desired and the pilot adjusted his tracking in order to converge with the strip. A continuous turn from downwind to final was attempted, during which the left wing suddenly dropped and the rate of descent increased. The pilot was able to regain partial control but the aircraft struck the ground heavily and ran off the side of the strip, colliding with rocks and scrub.

After misjudging the height and distance to the selected touchdown point, the pilot elected to continue the approach. During the latter stages of the turn onto final, the aircraft probably encountered mechanical turbulence, which resulted in control difficulties and an increased rate of descent. It was likely that the pilot was influenced by the competition atmosphere existing at the time.

Date / Time	Aircraft type & registration / Location	Age	Hours Total	Pilot Licence / Hours on Type	Rating	Record Number
13 Jun 85	De Hav DHC2 VH-IME			Commercial		8521038
1600	Dorrigo NSW 17W	28	3118	1380	Agricultural class 1	

The pilot reported that shortly after take-off the elevator control jammed. He then noted that the horn end of the left elevator was hanging about eight centimetres below the horizontal stabiliser. The load was jettisoned as the pilot prepared to land but increasing difficulty was experienced in keeping the aircraft nose-up. On short final approach the left elevator separated from the aircraft but despite the lack of elevator control the aircraft was landed without further damage.

Investigation revealed damage to the leading edge of the left elevator horn. It was probable that this area had been struck by an object while the elevator was in the full nose-up position, i.e. with the horn pointing downwards. The object which caused the damage was not identified, however the impact allowed the inboard hinge pin to become dislodged from its bearing. This in turn led to the jamming of the elevator controls and to the subsequent detachment of the left elevator.

19 Jun 85	Piper 38 112 VH-UAL			Student		8521039
1130	Bankstown NSW	32	18	18	None	

On return from his third solo flight, the pilot was attempting to complete a 180 degree turn in a confined area between two hangars. He positioned the aircraft on the left extremity of the concrete apron prior to starting the right turn. The left outer wing section struck a vertical support for the hangar located adjacent to the apron.

22 June 85	Robinson R22 VH-HBL			Private — helicopter		8511027
1057	Charters Twr 66SE	25	372	286	None	

After helping to herd cattle to a yard, the pilot turned the helicopter and accelerated away along a creek. The helicopter struck a powerline, which crossed the creek at right angles, and impacted the ground on its right side. One of the main rotor blades bounced backwards into the cabin and almost severed the pilot's right foot.

The powerline was difficult to see against the background of the surrounding countryside. The pilot, who has no memory of the accident, was aware of the location of the powerline but now believes he must have temporarily forgotten about its presence.

24 Jun 85	Conaero LA4 VH-EJX			Commercial		8511028
0955	Townsville QLD	47	8000	50	Instrument rating 1st Class or class 1	

The student pilot was receiving instruction for an endorsement on the aircraft type. Following a touch and go landing, the instructor closed the throttle to simulate an engine failure. The subsequent landing was firm and the right wheel broke off. The aircraft ground looped through 180 degrees before coming to rest. Inspection of the gear leg revealed severe corrosion in the internal section of the leg.

The right maingear leg failed on landing due to corrosion. This corrosion apparently had not been detected during the most recent periodic and major inspections, and there was no evidence that the bore of the maingear leg had been coated and sealed to prevent ingress of moisture.

05 Jul 85	Cessna 310 L VH-EDK			Commercial		8521042
2218	Sydney NSW	56	4200	1000	Instrument rating 1st class or class 1	

The pilot stated that he selected gear down but did not check for a down and locked indication. After having kept sufficient power applied to land well down the runway, the pilot heard the gear warning horn immediately prior to touchdown, but could not prevent the aircraft landing with the gear retracted.

When the pilot purchased the aircraft it had been fitted with an unguarded switch type circuit breaker adjacent to the gear selector handle, and a receptable for a remote gear switch. These modifications, which had not been approved by the Department of Aviation, were apparently designed to allow the gear to be raised or lowered from outside the aircraft during maintenance checks when the aircraft was supported by jacks. When selecting the gear down on this occasion, the pilot had evidently knocked the circuit breaker to the "off" position, removing electrical power to the circuit. Neither the pilot nor the passenger, who held a current Commercial Pilot Licence, realised that there were no aural or aerodynamic indications associated with the extension of the gear into the airstream when the gear was selected down.

13 Jul 85	Bell 47-G2 VH-SRE			Commercial — helicopter		8531018
1630	Balliang VIC	36	889	113	Instrument rating class 4	

A group of pilots had travelled from a property strip to a nearby dam in order to complete training exercises on a float-equipped Bell 47 helicopter. VH-SRE was not fitted with floats but had been used to ferry some of the pilots to the area. At the conclusion of the training operation the pilot arranged to ferry VH-SRE back to the property strip. After take-off a practice autorotation was conducted over the dam and was followed by some unauthorised low flying in the vicinity. On arrival at the strip low level runs were performed along the strip with torque turns at each end. Control of the aircraft was lost during the third of these turns and the aircraft struck the ground in a steep nose-down attitude. Fire broke out on impact and engulfed the wreckage.

The subsequent investigation did not reveal any evidence of a pre-impact defect or malfunction of the aircraft which might have contributed to the accident. Several of the pilots who observed the flight reported that the final manoeuvres performed were outside the normal operating parameters of the helicopter, and were conducted at an unsafe height above the ground. It was, however, not possible to establish which of the pilots was flying the aircraft at the time of the accident.

17 Jul 85	Bell 206 B VH-FJR			Commercial — helicopter		8551015
1920	Lancelin WA	41	12000	7000	Instrument rating class 4 with flight instructor	

The pilot was positioning the helicopter before carrying out a medical evacuation from a ship. Prior to departure he had arranged to land on the school oval at Lancelin, to refuel, and to have two vehicles positioned at the oval to provide lighting for the landing. During the subsequent night approach to the oval the helicopter collided with sand dunes.

Witnesses reported that during the approach the aircraft descended to a low altitude and disappeared from sight behind the sand dunes before impact. An inspection of the wreckage revealed that apart from the altimeter no other faults were found with the aircraft that could have contributed to the occurrence. Examination of the altimeter found that it was outside operating limits and during operation the aircraft was likely to have been erratic in its indications. No such erratic indications were reported by the pilot or his passenger, who was also monitoring the altimeter.

The weather at the time of the occurrence was reported as overcast with light drizzle and a light wind. The visibility was 20 kilometres although the night was dark and the only source of light in the area was from the town and the headlights of the two vehicles being used to light the landing area. These conditions are conducive to the pilot suffering from visual illusions and it is possible that these illusions caused the pilot to misjudge the altitude of the helicopter during the approach.

Date / Time	Aircraft type & registration / Location	Age	Hours Total	Pilot Licence / Hours on Type	Rating	Record Number
20 Jul 85	Ryan STM VH-CXR			Commercial		8551016
1655	Wyndham WA	38	13600	140	Instrument rating 1st class or class 1	

The pilot had been requested to carry out an aerobatic display over a fair being conducted at the local racecourse.

During the display three spins were completed, with each being entered at about 1500 feet agl and recovery effected by 500 feet agl. The display appeared to be finished when the pilot made a low pass from behind the crowd at approximately 100 feet agl and then climbed out for what looked initially like a normal entry to the circuit at nearby Wyndham Airport.

However, as the aircraft approached 1000 feet agl it was observed to carry out a spin entry similar to that used on the three previous spins. A spin to the left started and four turns were completed before recovery appeared to commence at about 200 feet agl. The aircraft struck the ground before recovery was complete, still yawing to the left and with the nose attitude about 24 degrees below that required for level flight.

Whether or not the entry to the final spin was deliberate could not be determined. The pilot was not approved to carry out aerobatic manoeuvres below 3000 feet agl, however, reports indicate that he had previously conducted low level aerobatic displays.

02 Aug 85	Beech V35 MK2 VH-DYS			Private		8541013
0738	Mataranka HS NT	62	1018	688	Instrument rating class 3	

The pilot was conducting an around Australia holiday with three friends. On the day of the accident he intended flying the aircraft to Tindal, a distance of about 90 kilometres, to refuel prior to departing for his Queensland destination.

After the aircraft was taxied from the parking area to the threshold of the runway, witnesses reported hearing the engine being run-up. The aircraft was then observed to take off in a north-westerly direction and climb to about 150 feet above the strip. It then entered a steady, wings level descent and collided with trees, 400 metres beyond and 100 metres to the left of the strip. The aircraft was destroyed by impact forces and the ensuing fire.

The examination of the wreckage was hampered by extensive fire damage. However, with the exception of the vacuum pump, which was probably unserviceable at the time of the accident, no evidence was found to suggest that the aircraft was not capable of normal operation. There was no evidence to indicate that the pilot had suffered any sudden illness or incapacity, and the cause of the accident remains undetermined.

03 Aug 85	Hiller UH12-E VH-FFX			Commercial		8511034
0755	Hughenden QLD	35	4600	4550	None	

At about 400 feet agl on climb, the helicopter suffered a partial loss of engine power. The pilot decided to use the available power to carry out a landing on the airfield. At about 50 feet agl, the engine stopped and the aircraft was subsequently landed heavily, collapsing the skids.

The engine had seized. An inspection revealed that the condition of the engine was consistent with that of having been operated without oil. There was no evidence of inflight oil loss or of any component failure which might have caused the loss.

When the engine began to lose power the helicopter was climbing at an airspeed of 60 knots. When the engine stopped the helicopter no longer had sufficient performance to allow the successful completion of an autorotational approach.

05 Aug 85	Cessna 182 Q VH-TQJ			Private		8511036
1220	Townsville 128SSE	70	5121	2500	None	

After touchdown, the pilot applied gentle braking but believed the aircraft was not decelerating. To avoid running off the end of the strip he attempted a ground loop, however, the aircraft ran off the side of the strip and struck a derelict vehicle.

An inspection of the aircraft did not reveal any pre-existing defect that could have contributed to the occurrence. It is probable that the pilot misjudged the speed of the aircraft and the distance to the end of the strip when applying the brakes during the landing roll. He was not wearing the sash component of the seat belt and received facial injuries when he struck the control column during the collision with the vehicle.

09 Aug 85	Cessna 182 N VH-EKF			Private		8511038
1545	Burketown 25NW	36	220	57	None	

Approaching the destination, the engine began to run roughly. As the aircraft was losing altitude the pilot selected a track running through the scrub as the only suitable landing area. During the landing roll both wings struck trees and the aircraft ran off the track.

Rough running was caused by a worn carburettor float valve assembly, which in turn stuck closed and then too far open. Consequently the engine first ran too lean, and then too rich. Once rough running began the pilot selected the mixture to full rich. This did not resolve the problem, but the pilot left the control in full rich instead of attempting to adjust the mixture through the full range available.

13 Aug 85	Cessna 182 H VH-KMM			Private		8551020
1027	Ord River HS WA	22	191	92	None	

The destination was served by two landing sites — an ALA near the homestead and a licensed strip 12 kilometres to the north. The pilot elected not to use either, but made an approach to a road adjacent to the homestead. The usable length of this road was 450 metres and the width was less than 3 metres. The approach was made over a shed in light downwind conditions. Touchdown occurred about 200 metres from the end of the road, and the pilot then attempted to go around. During this attempt the aircraft struck two wire fences before colliding heavily with a tree. Fire broke out and gutted the wreckage.

The reason the pilot elected to land on the road and not one of the available ALAs could not be determined, although it is possible his decision was influenced by one of his passengers.

Once the pilot elected to go around, it seems likely that he became concerned about avoiding a 10 metre high tree located directly ahead of the end of the road. Witness reports and wheel marks indicate that a slight left turn was made almost as soon as the aircraft lifted off, presumably to miss that tree. However, the left turn took the aircraft towards the line of fences which ran almost at right angles to the flight path, just off the road. These fences would have been difficult to see, and it is unlikely that the pilot was aware of their presence. Control of the aircraft was lost when it struck the fences.

20 Aug 85	Cessna 182 K VH-KRH			Commercial		8541017
1720	Batchelor NT	22	218	30	Instrument rating class 4	

As the four parachutists were preparing to jump from the aircraft, the reserve parachute of the parachutist who was standing on the wing strut of the aircraft deployed. The reserve parachute was ejected forward over the leading edge of the wing causing the parachutist to be dragged over the wing before falling from the aircraft. This resulted in the buckling of the inboard section of the leading edge of the wing. During the subsequent descent the parachutist released the main parachute which failed to fully deploy. In an effort to reduce his high rate of descent he steered towards a large tree, contacting the branches before falling to the ground.

Sections of the reserve parachute were lost during the descent and it was not possible to determine the reason for inadvertent deployment of the reserve parachute. The main parachute did not fully deploy because one of the steering toggles and some suspension lines became tangled with the streaming reserve parachute lines.

Date / Time	Aircraft type & registration / Location	Age	Hours Total	Pilot Licence / Hours on Type	Rating	Record Number
24 Aug 85	Cessna 310 L VH-KVY			Commercial		8521046
1700	Harden NSW	20	270	23	Instrument rating class 4 with flight instructor	

About 20 minutes after take-off on the return leg of a charter flight and while cruising at 4500 feet amsl, the right engine suddenly lost all power. The pilot reported that he was unable to restore power, and he elected to land at a nearby ALA. From the downwind position a continuous left turn was flown to align the aircraft with the strip. On short final approach the left engine also lost power and the aircraft touched down short of the strip boundary. It ran through two fences and the nosegear collapsed after striking a dirt bank.

The flight was the first one in the aircraft type for the pilot in an unsupervised capacity. Investigations carried out at the accident site revealed that there was adequate fuel remaining in the main tanks, although the auxiliary tanks were virtually empty. Both engines were started and ran normally, and no fault was subsequently found with them that might have explained the power losses. The pilot did not have a detailed knowledge of the fuel system, and it was considered likely that he had mismanaged the system.

26 Aug 85	Cessna 210 M VH-RQD			Commercial		8551021
1625	Pumnu WA	19	1281	71	Instrument rating 1st class or class 1	

About 150 metres after touchdown, when the brakes were applied, the aircraft began to veer to the right. Despite the application of heavy braking the pilot was unable to stop the aircraft and it ran off the end of the strip, through a gully and collided with a tree. While the aircraft was being vacated, a fire was noticed around the right wheel area. This fire was controlled by use of the portable extinguisher. A subsequent examination of the strip revealed marks indicative of heavy, intermittent braking forces being applied to the right wheel during the landing roll.

Inspection of the aircraft revealed that the left brake had failed due to fatigue cracking of the brake hydraulic line. The cause of this fatigue could not be determined.

02 Sep 85	Cessna 182 Q VH-DER			Private		8521048
1118	Wagga NSW	60	1055	444	None	

During his pre-flight inspection, the pilot detected water in the fuel samples from the various drain points. Further samples were taken until no trace of water was evident. The subsequent flight of almost 90 minutes was uneventful, until the pilot selected full flap on final approach to land. At this point the engine lost all power and during the ensuing forced landing the aircraft collided with a fence post. Investigation revealed that the fuel caps were not providing adequate sealing, and a substantial amount of water remained in the fuel system. Prior to the flight the aircraft had been parked in the open for some days and considerable amounts of rain had fallen.

The water in the fuel system had most probably been trapped in wrinkles in the left fuel bladder, and had entered the engine following the attitude change associated with selection of full flap. During the previous scheduled maintenance, a mandatory inspection and leak test of the fuel tank filler caps was not carried out. The owner/pilot had frequently found evidence of water during pre-flight inspections, but had not specifically instructed the maintenance organisation to investigate and rectify the problem.

06 Sep 85	Piper 32 TR300T VH-CXX			Private		8521049
1205	Mudgee NSW	Unknown	145	30	None	

Shortly after take-off a loud banging noise was heard from the inboard area of the right wing. The pilot elected to fly a low level circuit and land to investigate the noise. On short final approach heavy sink was encountered, and despite the application of power the aircraft touched down about 100 metres short of the runway. It ran through the airport boundary fence and came to rest near the flight strip with the gear collapsed. Investigation revealed that a section of the door seal had become unstuck and had trailed in the slipstream, beating against the door.

The pilot had believed that the aircraft had suffered a serious malfunction and was anxious to land as soon as possible. Her husband, who occupied the right front seat, was a more experienced pilot. However, he did not offer to take control of the aircraft. It was possible that the airspeed during the approach was less than the optimum. When sink was encountered, the power and control inputs which were applied were insufficient to prevent the aircraft striking the ground in a semi-stalled condition.

06 Sep 85	Avnspier Robin-R2160					
1245	VH-NRK			Private		8521050
	The Oaks NSW 4NE	30	152	8	None	

The pilot was conducting a flight in the local training area. He reported that as he applied power to climb from 2000 to 3000 feet amsl the engine suddenly stopped completely. Efforts to regain power were unsuccessful and during the ensuing forced landing the right wing struck a dead tree.

A piece of silastic material was found to be blocking the main discharge tube of the carburettor. Spectroscopic analysis indicated that the silastic was similar to that used to seal the radio inspection hatch against water ingress. It was probable that when the hatch was opened for radio maintenance some of the sealing compound fell into the engine area below. Maintenance records revealed that the carburettor bowl was removed for repair on the day preceding the accident, however it could not be positively determined whether the silastic entered the carburettor on this, or on some other occasion.

07 Sep 85	Rand KR2 Turbo VH-LLL			Private		8521051
1230	Camden NSW 10NE	40	400	70	None	

The pilot reported that while the aircraft was in cruising flight it suddenly began to vibrate heavily. The pilot closed the throttle but the violent vibration continued. The surrounding terrain was generally unsuitable for a forced landing, and in the latter stages of an approach towards a small paddock the right wing struck a tree. The aircraft then dived into the ground and was destroyed. It was subsequently determined that more than half of one of the two propeller blades had separated in flight.

The propeller had failed as a result of fatigue cracking. A similar crack was discovered in the other blade. The propeller had only operated for 42 hours total time before the failure occurred. During the approach to land, the pilot's vision was affected by the violent vibration caused by the propeller imbalance. As a result, he was unable to accurately judge his flight path between two trees on the edge of the selected paddock.

23 Sep 85	Aerocdr 500 A VH-ICE			Commercial		8551024
1702	Port Hedland WA	38	3448	100	Instrument rating 1st class or class 1	

After the gear was selected down, no down indication was received for the right gear leg. The pilot decided to divert to Port Hedland where engineering advice was available. When it was decided that all the options were exhausted, the pilot landed the aircraft. As the right wheel contacted the ground the leg collapsed and the aircraft slid to a stop.

The right maingear retract ram had become disconnected from the body of the gear leg when an improperly secured clevis caused the failure of the body fitting to which it was connected. The components had been incorrectly assembled during previous maintenance.

25 Sep 85	Cessna 152 VH-FUR			Student		8511043
1205	Archerfield QLD	26	15	15	None	

On the third landing of the exercise, the pilot stated that the aircraft touched down on all three wheels and bounced. The aircraft was then observed to land on the mainwheels then the nosewheel. The nosegear collapsed and the aircraft skidded for 33 metres on the lower engine cowl before coming to rest.

After the aircraft bounced the pilot did not take any corrective action prior to the second touchdown.

Date / Time	Aircraft type & registration / Location	Age	Hours Total	Pilot Licence / Hours on Type	Rating	Record Number
04 Oct 85	Piper 24 400 VH-EDM			Private		8531019
1204	Launceston TAS	36	340	60	Instrument rating class 4	

The pilot reported that as the aircraft became airborne, he noticed a loss of engine power and believed the aircraft may have touched the ground after the landing gear was selected up. He was subsequently unable to obtain a gear down and locked indication, although the gear appeared to ground observers to be fully extended. During the landing roll the right main gear collapsed.

The right gear did not fully retract or extend because of damage sustained by the retraction mechanism, probably as a result of ground contact after the down lock had been released. The cause of the partial power loss reported by the pilot was not determined.

05 Oct 85	Jodel D9-A VH-SJZ			Private		8511046
1130	Gatton QLD	58	442	242	None	

After completing a circuit, the aircraft was flown along the strip at an altitude of 50 feet. An airspeed of 50 knots was maintained with a low power setting. Towards the end of the strip the pilot attempted to apply climb power but the engine did not respond. The pilot selected a clear area straight ahead and landed the aircraft. During the landing roll the aircraft struck a tree stump which was hidden in the tall grass.

The contact spring was missing from the distributor cap, which caused the output from the magneto to short circuit to ground and as a result of which the engine lost power.

09 Oct 85	Hiller VH12-E VH-AGL			Commercial — helicopter		8531020
1415	Cape Portland 10S	31	372	235	None	

The pilot reported that while he was hovering the helicopter at about 25 feet agl, the engine suddenly lost power. He placed the helicopter in an autorotation but maintained the throttle setting that had been set while the aircraft was hovering. Just as the skids were about to contact the bushes, the engine momentarily regained power. The helicopter impacted the ground on its right hand side and fire broke out. Both the occupants escaped from the helicopter before it was destroyed by fire.

An examination of the engine revealed that both valves in one cylinder had been striking the top of the piston, and the inlet valve was badly chipped. It was likely that when the inlet valve failed, a flashback occurred in the induction system, resulting in a complete loss of engine power. The engine regained power momentarily when the mixture build-up again reached a combustible level. Had the pilot closed the throttle when the engine initially failed, the sudden power surge should not have affected his ability to control the autorotation.

09 Oct 85	Cessna 150 G VH-KPP			Private restricted		8551027
1030	Nookawarra HS WA	20	128	120	None	

After the aircraft had been airborne about 90 minutes, the engine began to run roughly. The pilot's attempts to restore full power were unsuccessful and the engine stopped. During the latter stages of the subsequent landing roll, the aircraft struck a dead tree and damage was caused to the left wing and lower engine cowl.

Before commencing the flight the pilot had checked the fuel contents gauges, they indicated that both tanks were about half full. He did not, however, visually check the fuel quantity in each tank nor did he specifically plan the duration of the flight. The loss of engine power was caused by fuel exhaustion.

12 Oct 85	Hughes 269 C VH-SBR			Commercial — helicopter		8551028
1410	Kununurra 97NNE	28	190	80	None	

The pilot was requested, by the passenger, to land the helicopter on the mud flats to the north of Kununurra. He decided to make a run on landing as he believed he may have difficulty in hovering the helicopter. As the aircraft approached the touchdown point, the pilot allowed it to yaw into wind, but it contacted the ground still moving sideways. The left skid caught in the dry mud and the helicopter rolled onto its side.

The pilot was inexperienced in the operation of helicopters and had experienced difficulty in hovering the aircraft when he departed Kununurra that morning. The approach to land on the mud flat was poorly planned and the pilot misjudged the altitude of the aircraft during the turn into wind.

14 Oct 85	Robinson R22-ALPHA					
1000	VH-HBQ			Private — helicopter		8541018
	Warooka SA 5S	37	802	99	None	

The pilot positioned the helicopter on the downwind leg of the circuit at an altitude of about 300 feet agl. The wind was gusting between 30 and 35 knots. Towards the end of the downwind leg the pilot noticed that the helicopter was yawing to the right and that a high rate of descent had developed. The pilot applied full power and lowered the collective slightly. The helicopter continued to descend and the pilot applied full up collective, but the helicopter struck the ground heavily and bounced. On the second touchdown, the tail rotor struck the ground and broke off.

At the point of turning downwind, the helicopter was being flown at an indicated airspeed of 30 knots. On downwind it is probable that the pilot unwittingly allowed the indicated airspeed to decrease well below translational lift because of the rapid increase in groundspeed, resulting from the 30 knot tailwind. Had the helicopter touched down at zero indicated airspeed, when travelling downwind, it would have contacted the ground at 30 knots groundspeed and travelled a considerable distance along the ground. However, the helicopter travelled only about 12 metres after the first point of touchdown. This indicates that the helicopter was probably flying backwards in relation to the airmass in which it was flying, prior to touchdown. In such a situation the power available would not have been sufficient to arrest the rate of descent.

26 Oct 85	Hughes 269 C VH-MSL			Commercial — helicopter		8551029
1705	Karratha WA 61SE	24	750	560	None	

As the helicopter was cruising at 1000 feet agl, the engine suffered a complete loss of power. An autorotation was commenced and the pilot headed the aircraft towards a clear area to land. At the completion of the landing flare, the heel of the skids dug into the ground and the main rotor blades struck the tail boom.

An examination of the engine determined that the fuel regulator diaphragm stem had suffered a fatigue failure. This allowed the diaphragm to shut off fuel flow to the engine. The pilot elected to carry out a zero speed touchdown because he believed that the terrain was unsuitable for a run-on landing, but he misjudged the landing flare.

10 Nov 85	Westland Scout VH-NVY			None		8521062
1950	Schofields NSW	32			None	

The helicopter had been transported by road to Schofields to form part of the static display associated with an air show. Although it was airworthy, the helicopter was the only one of its type in the country and had not been approved for flight at the show. At the conclusion of the show, one of the persons responsible for the restoration of the aircraft became concerned for its security, and he elected to hover taxy the helicopter a short distance onto Naval property. He had never received any formal helicopter flying instruction and control of the aircraft was lost shortly after it became airborne. The helicopter struck the ground while moving backwards and came to rest on its side some 60 metres from the parked position.

Date Time	Aircraft type & registration Location	Age	Hours Total	Pilot Licence Hours on Type	Rating	Record Number
13 Nov 85	Beech 95 B55 VH-MLC			Commercial		8521063
1103	Hunthawang NSW	54	16285	5215	Instrument rating 1st class or class 1	

Shortly before the aircraft landed a tractor had finished slashing the strip. The driver had not noticed any soft areas, and the strip appeared to be of a uniform colour. As the aircraft decelerated to about 20 knots during the landing roll, the nosewheel suddenly broke through the strip surface and sank to a depth of some 30 cm. Shortly afterwards the wheel snapped off near the bottom of the strut, which then folded rearwards and the aircraft skidded to a halt on its nose.

The strip was in regular use, however this had been the first landing since isolated heavy rain had fallen over the area two days previously. It was probable that the rain had affected a small section of the strip, but not to the extent where the soft patch was detectable by aerial or ground inspection.

13 Nov 85	Robinson R22 VH-UXE			Commercial — helicopter		8551031
1555	Whim Creek WA 37S	55	12259	350	Agricultural class 1	

The pilot was mustering a herd of cattle across a tree-lined dry creek bed, when the mob scattered. He positioned the helicopter at tree top height to block the escape of the cattle from the creek. The rotor RPM rapidly decayed and the pilot was unable to prevent the aircraft sinking and landing heavily on the bank of the creek.

The pilot had attempted to bring the helicopter to a hover in a 15 knot downwind. At the time the helicopter was being operated near to the maximum all up weight in ambient temperatures of about 45 degrees celsius. Insufficient power was available to maintain flight in these conditions.

16 Nov 85	Piper 25 235 VH-SPB			Commercial		8531023
1145	St Arnaud VIC 24N	38	3300	2450	Agricultural class 2	

At the end of each spray run, the aircraft was flown under a power line before the turn to change direction was commenced. Several runs had been completed when the pilot climbed the aircraft to commence the turn and the aircraft collided with the power line. The pilot dumped the remainder of the load and the aircraft continued to fly, trailing the power line. After travelling a short distance the aircraft apparently stalled and struck the ground in a nose down attitude. A fire broke out and completely engulfed the wreckage.

The pilot subsequently advised that he had temporarily overlooked the presence of the power line. It was probable that on this particular spray run a pole supporting the wire was no longer in the pilot's field of vision. The severed wire became entangled around the right wing and lift strut, resulting in bending of the strut and probably inducing stalling of the wing.

17 Nov 85	Beech A36 VH-RNM			Private		8531024
1910	Lilydale VIC	37	200	26	None	

On arrival in the destination area the pilot encountered deteriorating weather conditions, including rain and turbulence. Strong sink was experienced on the base leg of the circuit and the pilot found it was necessary to increase power and raise the landing gear in order to maintain adequate control of the aircraft. The approach was continued but the pilot forgot to re-select the gear down. The warning horn sounded just before ground contact and the aircraft slid to a halt on the strip.

18 Nov 85	PA36-375 VH-JND			Commercial		8521064
1200	Griffith NSW 26SW	30	5700	200	Agricultural class 1	

The pilot was carrying out the first spraying run in the particular paddock. Towards the end of the run he was distracted when a large flock of birds suddenly flew up in front of the aircraft. The pilot descended in order to fly under the birds, but temporarily forgot that there was a power line in the vicinity. As he pulled up at the end of the run, the main gear snagged the wire. The wire cutters fitted to the gear did not sever the wire and the aircraft subsequently struck the ground 82 metres beyond the run of the power line.

21 Nov 85	Beech B24 R VH-DJD			Private		8511051
1510	Emerald QLD 35N	35	356	16	None	

After having inspected a property, the pilot and his passengers returned to the aircraft to prepare for departure. A storm was approaching the strip from the north and a 10 to 15 knot crosswind prevailed at the strip. A take-off into the east was commenced, the aircraft became airborne and as it crossed the upwind end of the strip, it was affected by a sudden gust of wind. The aircraft yawed to the right, lost altitude and struck the ground before coming to rest in a ploughed paddock.

At the time of the attempted take-off the location of the approaching storm was conducive to the presence of strong downdraughts or possibly microbursts in the vicinity of the strip. The pilot elected to commence the take-off because he was concerned that heavy rain at the strip would have rendered it unserviceable.

22 Nov 85	De Hav 82 VH-MDV			Commercial		8521065
0740	Camden NSW	60	3000	200	Instrument rating 1st class or class 1	

The aircraft had been refurbished during the preceding months, and at the completion of this work the pilot intended to carry out a short test flight. He subsequently reported that as soon as the aircraft became airborne after a normal take-off roll, it veered sharply and the right wing dropped. Corrective control inputs had no effect, the wing and propeller struck the ground and the aircraft overturned, coming to rest about 200 metres from the start of the take-off roll.

The surface wind was reported to be varying up to 30 degrees off the runway direction, and gusting up to 15 knots. Because of the degree of damage sustained however, it was not possible to determine whether the wind conditions or the rigging of the aircraft was the major factor contributing to the accident.

22 Nov 85	Cessna 172 N VH-UWD			Private		8511052
1030	Quilpie QLD 32SSW	33	107	77	None	

At about 200 feet agl after take-off, the engine began to vibrate and lose power. The pilot turned the aircraft to the right to position over more suitable terrain. The aircraft was stalled into small trees and bushes before touching down heavily on the nosewheel, which broke off. The aircraft then overturned and came to rest inverted.

The power loss was caused by two engine exhaust valves sticking open. Although the valves were found to have been set at the minimum recommended clearance a build up of combustion residue was present which probably restricted valve movement. Operations in high ambient temperatures involving slow flight and reduced engine cooling at rich mixtures can promote a combustion residue build up reducing valve guide clearance and resulting valve sticking. The aircraft had been operating in the western Queensland summer conducting sheep survey operations.

Date Time	Aircraft type & registration Location	Age	Hours Total	Pilot Licence Hours on Type	Rating	Record Number
23 Nov 85	Cessna 402-C VH-UEZ			Senior commercial		8541024
1345	Pulparee SA	25	3900	779	Instrument rating 1st class or class 1	

The flight had been arranged to take passengers and freight from Pulparee, a seismic exploration field camp, to Brisbane. Just after the aircraft became airborne the right wing struck two men who were working on the top of the cabin of a truck. A section of the right wing was torn from the aircraft, however, the pilot was able to land the aircraft at Pulparee without further incident. The truck was located approximately 24 metres to the right of the centreline of the strip.

From the point where the take-off was commenced the strip met the criteria for an authorised landing area. The vehicle was struck 1110 metres from the start of the take-off and about 200 metres after the aircraft became airborne. At the time the surface wind was gusting from the left and there were dust devils in the area. Shortly after becoming airborne, the pilot felt that the aircraft was not performing normally, and he looked into the cockpit to check the instruments. During this time, the aircraft diverged from the strip direction and the right wing dropped. The pilot heard the impact as the men were struck, and then looked out to see that the right wingtip had been severed.

No evidence was obtained to indicate that the aircraft was not capable of normal operation. The pilot had been working in direct sunlight in temperatures of about 40 degrees Celsius for four hours prior to the flight. It was therefore likely that he experienced some degree of heat stress. One of the effects of heat stress is that the time taken to integrate information is increased. It is considered probable that when the pilot looked at his instruments he required longer than normal to assimilate the information presented by the instruments. It was during this period that the aircraft was affected by the crosswind and possibly a dust devil and drifted off the intended flight path while travelling the distance to the truck. It was probable that the correct climb attitude was not maintained.

30 Nov 85	Ayres S2R-T15 VH-WBE			Commercial		8521067
1830	Moree NSW 4N	36	6514	2100	Agricultural class 1	

The pilot intended to spray a cotton crop. A power line crossed the area at an oblique angle, and at the point where the aircraft passed under the wire there was a head ditch one metre high, dividing two paddocks. On the first spraying run the pilot misjudged the clearance under the wire and the mainwheels struck the top of the ditch. The aircraft remained controllable and an uneventful landing was subsequently carried out at the destination aerodrome. Damage was confined to the gear truss points and shock absorbers.

05 Dec 85	Beech C23 VH-IHP			Student		8511055
0830	Cairns QLD	56	78	30	None	

The pilot was carrying out a period of solo circuit training, after having completed three check circuits with an instructor. On the second landing, the aircraft bounced, then touched down again heavily on the nosewheel. The nosegear leg failed due to overload and the aircraft ran off the runway.

The pilot was attempting to carry out a short field landing and misjudged the flare. He stated that following the bounce, the nose of the aircraft dropped and he was unable to regain the landing attitude before the nosewheel struck the runway.

This accident was not the subject of an on-site investigation.

13 Dec 85	Cessna A188B A1 VH-UDV			Commercial		8531026
1200	Koo Wee Rup 18NE	42	7500	3000	Instrument rating class 4	

The pilot was spraying a potato crop in a paddock which had a power line running along one boundary. Spray runs were conducted at right angles to the wires, and the pilot was flying under the wires on each run. At the end of one run the pilot pulled up, conducted a procedure turn, and was then slightly distracted by noise on his CB radio. While adjusting the squelch on the set, he forgot the presence of the power line and the aircraft struck the wires about 32 feet agl. The aircraft remained under control and the pilot was subsequently able to make a normal landing at his destination strip.

15 Dec 85	Comwlth 28 C VH-SSY			Commercial		8531027
1700	Wangaratta VIC	58	2254	4	None	

A fly-in had taken place to the site of an aviation museum. At the conclusion of the organised activities, it was decided to position the Ceres in such a manner as to allow it to be photographed against the background of the museum hangar. Shortly after start-up, the engine stopped of its own volition, and after the restart it faltered again prior to normal take-off. During the flight the engine again lost power and the pilot was committed to a forced landing. The only area suitable for landing had a group of Tiger Moth aircraft at the far end, and after touchdown the pilot initiated a ground loop in order to avoid these aircraft. The left gear leg collapsed and the aircraft slewed to a stop short of the parked aircraft.

Examination of the fuel system revealed that seals in the hand-operated fuel pump had deteriorated and cracked. This allowed air to enter the system and cause fuel starvation.

19 Dec 85	Cessna 182 P VH-TSA			Private		8511057
1625	Miles QLD 2E	26	715		None	

As the aircraft was being taxied for take-off, the nosewheel struck a small termite mound. The nosegear was broken off and the aircraft came to rest on the lower engine cowl.

The strip was normally slashed every two weeks, a process which cut the grass and removed termite mounds. Because of recent dry weather which had inhibited grass growth, slashing had not been done for 4-5 weeks, and small termite mounds had built up. Several of these mounds were not noticed during the pre-flight strip inspection. The low colour contrast between the mounds and the strip surface, and the sun angle at the time, made the mounds difficult to see.

20 Dec 85	Cessna A 152 VH-THF			Student		8531028
1700	Tyabb VIC	34	12	12	None	

Following a period of dual instruction, the student was authorised to conduct a series of solo circuits and landings. On the first approach he lowered 30 degrees of flap and the aircraft touched down normally. After travelling about 50 metres, the aircraft veered sharply to the left, ran off the side of the strip, and came to rest in a shallow ditch just outside the boundary of the strip.

The approach and landing had been conducted in light crosswind conditions. While compensating for these conditions, the pilot had probably inadvertently applied excessive forward pressure to the control column and a "wheel-barrow" situation developed. The elevator trim was found to be in the take-off position, which would have compounded the nose-down tendency during the landing roll.

21 Dec 85	Cessna R182 VH-MQG			Private		8511059
0815	Bowen QLD	19	137	34	None	

On landing the aircraft bounced about four times before the nose gear broke off. The aircraft overturned, coming to rest on the runway.

Gusty wind conditions prevailed at the time of landing. When the aircraft bounced on the initial touchdown, the pilot did not take suitable corrective actions and a porpoising situation developed until the nose gear failed.

Date Time	Aircraft type & registration Location	Age	Hours Total	Pilot Licence Hours on Type	Rating	Record Number
26 Dec 85 1530	Piper 25 235 VH-CKL Meander TAS	37	2000	Commercial 900	Agricultural class 1	8531029

The pilot was spraying a small paddock, to the south-east of which the ground rose steeply. All spraying runs were being conducted towards the south-east, with the pilot carrying out left hand orbits at the end of each run in order to reposition the aircraft. However, manoeuvring in this manner was taking the aircraft close to houses in a noise sensitive area. The pilot therefore decided to carry out a procedure turn and conduct a run into the north-west. About half way around this turn the aircraft lost performance, probably as the result of a downdraught, and then stalled at about 100 feet above the ground. There was insufficient height available for the pilot to effect recovery and the aircraft struck the ground in about a 30 degree nosedown attitude.

The pilot subsequently advised that he was aware that downdraughts were likely to be present in the prevailing conditions. However, he had been concerned to avoid the noise sensitive area, and had not considered the possibility of downdraughts as he manoeuvred over rising terrain. When he was attempting to recover from the stall situation, the pilot had not dumped his load because there were valuable animals in the paddock below the aircraft.

27 Dec 85 0746	Pazmany PL4-A VH-URR Parafield SA	56	300	Private 1	None	8541026

The pilot had built the single seat aircraft himself and had previously only flown it on one occasion. After completing the first circuit, the aircraft was taxied back to the threshold and the second take-off commenced. Just after lift-off the aircraft was observed to pitch nose up. The right wing dropped and the aircraft turned to the right before impacting the ground.

When the aircraft tail came up during the take-off roll, the pilot became concerned that it was too high and that the propeller might strike the ground. In attempting to avoid this, excessive back pressure was applied to the control column. The aircraft became airborne prematurely and then stalled.

28 Dec 85 1930	Burkhart Astir VH-WQL Parkes NSW 30N	18	80	Glider 12	Glider	8521076

The purpose of the flight was to achieve the cross-country distance requirements for the upgrading of the pilot's qualifications. He had been airborne for over 6 hours when further lift could not be found and an outlanding became necessary. While manoeuvring towards the selected area, the pilot misjudged the strength of the wind and was forced to turn onto final approach at a low height above the ground. During the turn the right wingtip struck a tree and the aircraft rotated about 110 degrees to the right before striking the ground.

It was considered likely that the pilot's performance was affected by fatigue resulting from the length of the flight and his exposure to direct sunlight for a period of more than 10 hours.

This accident was not the subject of an on-scene investigation.

29 Dec 85 1530	Cessna P206 VH-MYD Medlow Bath NSW	23	336	Commercial 17	Instrument rating class 4	8521007

During the pre-landing checks, the pilot noted that no pressure was available from the left brake pedal. The strip has a slight slope, and the pilot elected to land up the slope in light quartering tailwind conditions. The aircraft bounced twice after touchdown and the pilot commenced a go-around. The aircraft veered off the strip and collided with several trees before coming to rest 50 metres from the centre of the strip.

The left brake had lost pressure because a worn seal had allowed air into the brake line. The pilot advised that the brake problem did not affect the selection of landing direction. It was considered that directional control was lost during the attempted go-around when the aircraft was affected by a wind gust at a critical stage of the flight.

30 Dec 85 0950	Cessna 152 VH-SDT Cooranbong NSW	27	21	Student 8	None	8521078

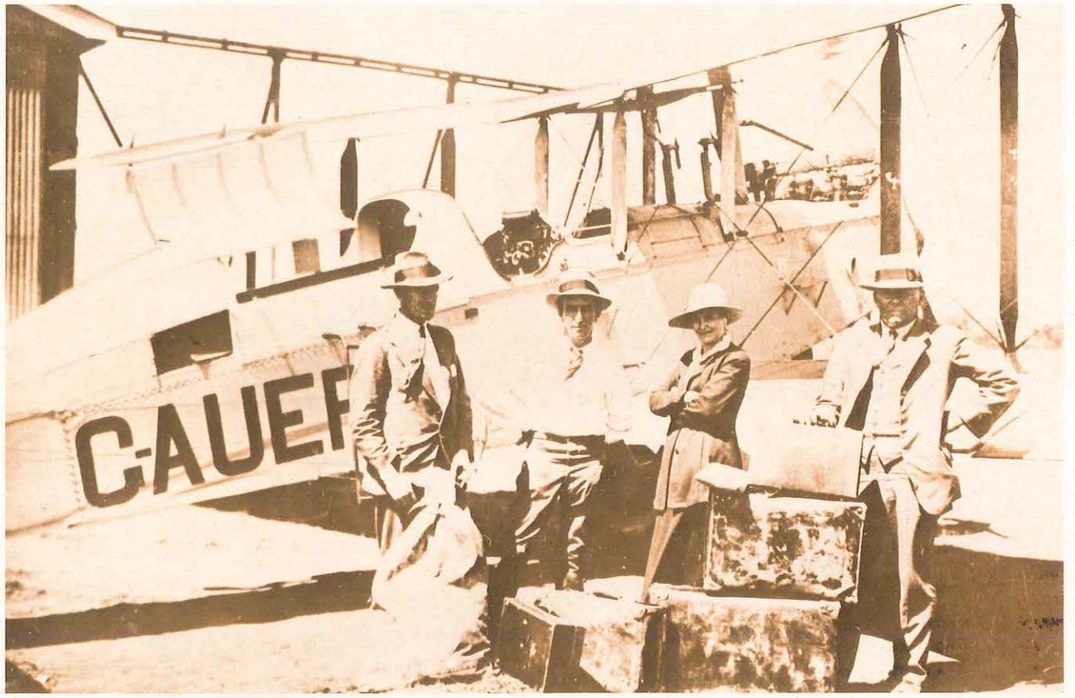
Following a dual check, the pilot was authorised to carry out three solo circuits and landings. The first of these was completed satisfactorily, but on the next landing the aircraft bounced and the pilot applied full power in order to go around. Shortly afterwards the aircraft sank, struck the ground with the nosewheel and the left wing, and overturned. The pilot later advised that he had held the control column fully back during the go-around attempt, and he had not raised the flaps from the fully lowered position.

31 Dec 85 1000	Transav PL12 VH-MLJ Bridgport TAS 10W	22	1820	Commercial 1000	Agricultural class 1	8531030

The aircraft was being operated from a strip which had been cleared in a hay paddock. The pilot was aware that the strip was of marginal length and had therefore reduced the load to be carried. On take-off, the aircraft accelerated normally to about 40 knots but the performance then appeared to stagnate. The pilot attempted to dump the load, but only partial dumping was achieved before the right main gear struck a fence post as the aircraft became airborne. The impact displaced the gear, however the aircraft remained under control and the pilot diverted the aircraft to a more suitable aerodrome. The right main gear became completely dislodged during the landing.

A subsequent inspection of the strip revealed that it had a soft sandy surface, covered with short and thick grass. Heavy rain had fallen in the area during the night and early morning, and the grass was very wet at the time of the take-off. When calculating the load he could safely carry from the strip, the pilot had not appreciated the degree to which the surface conditions would affect the take-off performance.

Looking after your passengers



Evidence from air safety investigations indicates that it is the well-prepared passenger who is most likely to escape from a wrecked aircraft, or to take the correct actions during an inflight emergency. In this context, the extent to which passengers are well prepared is closely related to the advice given to them by the pilot-in-command during his preflight briefing.

Among the many responsibilities attaching to the position of pilot-in-command is that for passenger safety: as the relevant Air Navigation Regulation states, 'In addition to being responsible for the operation and safety of the aircraft during flight time, the pilot-in-command shall be responsible for the safety of persons and cargo carried and safety of members of the crew'.

An important component of this responsibility is the passenger briefing, which should be an integral part of the pilot's preflight activities, regardless of whether the intended flight is with fare-paying passengers on an international jet, or with family or friends in a single-engine GA aeroplane.

Printed below is a list of items which GA pilots should consider before giving their passenger briefing. The list is comprehensive and clearly too long to be used on every flight. It is up to the pilot to decide what is appropriate for any particular occasion.

For all briefings a pilot should use simple language as some phrases (e.g. leading edge, trailing edge, port, starboard) may be unfamiliar to his passengers. It may also help passengers who have flown in passenger jets but not in light aircraft to highlight some of the main differences between regular public transport and GA flying.

Before boarding

- Advise passengers to beware of other aircraft (and their propellers) when going to and from the aircraft.
  - Propellers and helicopter rotors are extremely hazardous and should be avoided at all times, even when stationary.
  - Rotating propellers and rotors (particularly tail rotors) may be very hard to see, especially from the side.
  - The hazard can be masked if other nearby aircraft have engines running.
  - Propeller-driven aeroplanes must always be approached and left from behind the wing. The only exceptions are a small number of types with pusher propellers or entry doors forward of the wing. With these aeroplanes the engine(s) must always be stopped when passengers are boarding or leaving. Passengers must never step forward off the wing leading edge towards a propeller.
- Someone must be in charge of children, particularly small ones, both in flight and when going to and from the aircraft.
- Beware of the hazards under the wings of high-winged aircraft, such as struts, and pitot tubes.
- Passengers should be instructed on the use of any steps or hand-holds. If there are wing walk-ways, make sure that passengers know where they must not step because of the risk of holed fabric or dented skin.
- Passengers should know how to operate external door catches and locks. A door suddenly opening,

helped by the wind, can cause injury to passengers and crew or damage to the door hinges.

- Luggage must not be overweight, must be properly stowed and should not contain hazardous items, such as:
  - flammable liquids and solids, e.g. fire lighters, paint
  - explosives, e.g. fireworks, toy gun caps
  - magnetic materials, e.g. loudspeakers
  - compressed gases, e.g. camping gas, aqualung cylinders
  - corrosives, e.g. acids, alkalis, wet-cell car batteries.
- Advise passengers if there is any restriction on smoking in or near the aircraft.
- Passengers should wear sensible clothing, e.g. bare limbs or thin nylon are hazardous if there is a fire. In winter, warm clothing should be available for use in any diversion or forced landing; high ground in winter is no fun in shirtsleeves.
- Advise on the effect of flying when ill, or when recovering from illness or a cold.
- Make sure your passengers know they must not fly when they are drunk.
- Tell passengers not to distract the pilot at critical times, e.g. by asking questions in the middle of the Vital Actions, or by interrupting the pilot's navigation or monitoring of the flight by excessive conversation.

When on board

Make sure your passengers:

- Are familiar with how to fasten, adjust and release seat belts or harnesses. Suggest they keep them fastened throughout the flight in case of turbulence.
- Know about the closing, locking and opening of doors or canopy. Locks and handles should be left well alone once the doors are closed.
- Do not obstruct the controls with objects such as cameras, handbags, knees or feet, do not put metallic or magnetic objects near the compass, and do not interfere with the controls in flight.
- Can use the intercom, if fitted, and know how to communicate if there is no intercom.

Emergencies

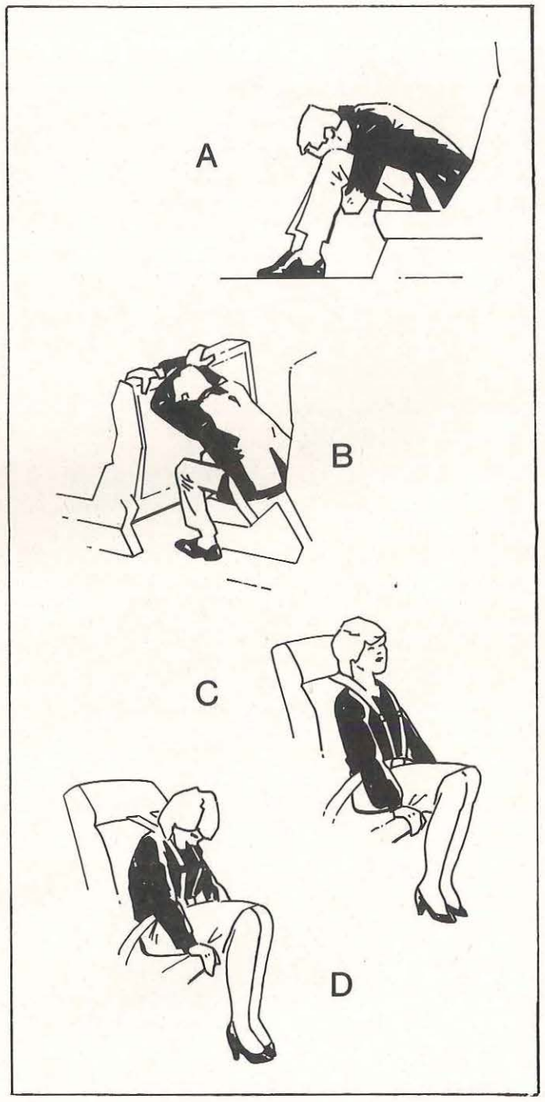
Forced landing and ditching

Before flight, instruct passengers that they should brace themselves if impact or ditching appears likely. There are two prime reasons for this:

- to reduce secondary impact which may cause injury
- to reduce flailing of the body.

Secondary impact can be reduced by placing the body, particularly the head, against the surface it would be likely to strike during impact. Flailing can be reduced by flexing, bending or leaning the body forward over the legs.

Where there is room, passengers should adopt position A, resting their heads and chests against their legs. Flailing is reduced by grasping the legs or ankles, or by wrapping the arms under the legs. If there is no room for position A, passengers should put their heads and arms against the seat or bulkhead in front of them as per position B. In aft-facing seats, adopt position C. Front-seat passengers with upper torso restraint should use position D, with their chins resting on their chest, but if an inertia reel system is fitted position C is better. (Incidentally, much of this advice is equally applicable to car passengers.)



Decide the order in which the aircraft should be abandoned.

Harness and belts should be tight, and headsets removed and stowed.

Brief passengers to unlock the cabin doors just before landing or ditching, but not to unfasten doors before impact.

Keep seat belts fastened until the aircraft has stopped, undo belts, open doors and get out fast.

Make sure that passengers know how to operate the front seat-back release (which releases rear-seat passengers in some aircraft) and door locks. If the pilot is unconscious it is too late to ask.

Tell passengers to kick or force out a window if the doors or canopy cannot be opened, or if the aircraft has overturned.

Extra precautions when ditching

LIFEJACKETS

Before flying over water in a single-engine aircraft, make sure that passengers are wearing lifejackets, know how to inflate them and how to use any ancilliary items e.g. light, whistle. If the aircraft is twin-engine, point out the location of lifejackets and how to put them on. If one engine stops, get the passengers to put on their lifejackets — it is now a single-engine aircraft.

Impress on your passengers that lifejackets should NOT be inflated until outside the aircraft.

LIFE RAFTS

Decide which passenger is responsible for getting the life raft out — it is too late when the aircraft has sunk with it still in the aircraft. The life raft should not be left unsecured on top of the baggage where it can strike people's heads during deceleration. Passengers should know how to inflate the life raft and what emergency equipment it contains, e.g. fluorescent dye, flares.

Tell passengers to swim away from the aircraft before inflating the life raft so that there is no danger of its being holed. When inflated, make sure it does not blow away, leaving some or all of the passengers still in the water.

Above all, impress on your passengers not to panic. There will be a lot of water flying around, perhaps through a broken windscreen, but there is usually at least one to two minutes to get out.

Passengers unfamiliar with light aircraft

Those who have not flown before, or who are more used to package holiday jets, may find a light aircraft a very different experience. No one wants an early return with a sick or frightened passenger. Chat to them beforehand about:

- The higher noise level — cotton wool in the ears may help.
- Turbulence — the light aircraft will be more affected. Don't fight it, relax and go with the motion.
- Pressure changes and the ears — most light aircraft are unpressurised and climb quite slowly and the ears automatically compensate. During fast descents, holding the nose and blowing it with the mouth closed will work, or follow the practice of some airlines and have a few sweets handy.
- Mention the stall warning horn and other aural warnings. A sudden unexpected blast on landing will not help passengers' nerves.
- Lookout — discuss the usefulness of a second pair of eyes when joining the circuit.
- What to do if feeling unwell, but don't mention the word sick. (Make sure there are sick bags on board.)
- The lack of a toilet, even in some larger twin-engine aircraft.

Summary

Passengers are your responsibility, so make sure you look after them properly ●

Lap-sash belts

A student pilot had been authorised to carry out a period of solo circuits and landings. His last flight had been 21 days earlier when he had completed a dual check before going on his third solo. Conditions were fine: CAVOK, the wind light and variable and a temperature of +15° C.

Four uneventful circuits were carried out in the PA28. On the fifth circuit the pilot flew a normal approach and landing. At about 40 knots on the roll-out, as he was about to reintroduce engine power to take off again, he applied pressure to the right rudder to counter the anticipated swing. The Cherokee immediately swung to the right in a rapidly increasing skid.

Departing the runway about 127 metres beyond the initial touchdown point, the aircraft skidded across a grass surface for a further 90 metres before sliding into a drainage ditch 2.5 metres deep and 6 metres wide.

Comment

The accident was attributable to incorrect operation of the rudder controls by the pilot at an early stage of his training. This was a matter for him to sort out with his instructor.

What emerged of general interest was the fact that the pilot suffered minor facial lacerations during the impact because he was not wearing the sash component of the aircraft's lap–sash seatbelt. Looking at the accident photograph, it is clear that the injuries sustained could easily have been worse. The reason given for not using all of the belt was comfort, although this is a little difficult to understand given that the sash was connected to a serviceable inertia reel. The pilot also stated that he had worn the full belt only once, which is a poor reflection on that aspect of his training.

Seatbelts are a proven life-saver; it is in every pilot's interests always to use them properly ●

Power towing

A Cessna 401-A on an IFR charter flight arrived in the circuit at a country airport for landing. Sarwatch was cancelled and prelanding checks carried out. However, the pilot was unable to obtain a nose gear 'down and locked' indication.

After checking the indicating system the pilot electrically cycled the undercarriage about four times, without success. A manual extension was then attempted, and it too was unsuccessful. The pilot retracted the undercarriage, advised the Flight Service Unit of his problem, and passed details of his intention to divert to a GAAP airport, where emergency services and technical assistance were available.

After an uneventful flight the Cessna entered the GAAP Control Zone, where an attempt was again made to lower the nose gear. The indications were the same as before, and during a fly-past for inspection, a LAME confirmed that the nose gear was in an unsafe position, being only partially extended.

The pilot therefore discontinued attempts to lower the nose gear and decided to make a landing on the mainwheels only. In clear conditions and with a headwind component of about 5–10 knots, a smooth touchdown was made. Initially the nosewheel was held off. At a low forward airspeed the C401 settled onto the nosewheel, which collapsed rearwards and allowed the nose of the aircraft to impact with the landing surface.

Technical investigation

A specialist examination of the nosewheel undercarriage actuating system showed that material failures had occurred in the fuselage nose section structure supporting the retraction linkage.

The nose gear section of the aircraft was substantially damaged during the emergency landing. However, detailed technical inspection showed that fatigue cracking of the torque tube mounting bracket assembly and support bracket was present. Chafe marks on an adjacent angle bracket, caused by the movement of the outboard bellcrank, confirmed that the fatigue cracks in the support brackets had been present before the emergency landing.

These support brackets absorb the major torque reaction loads in the nose gear section, during:

- undercarriage extension
- undercarriage retraction
- ground handling.

On the available evidence, it appeared that the fatigue cracking had been progressive, and had probably originated from a section of the torque tube mounting bracket adjacent to the end of a stiffener. In time, the crack progressed vertically downwards through most of the material, allowing the forward section of the bracket to move under load.

This caused the adjacent support bracket to flex, resulting in a fatigue crack emanating from the angled vertical section and progressing horizontally to the lightening hole.

As the structural integrity of the section decayed, it could be expected that the downlock and uplock tensions would decrease. This in fact had been the case: it was found that these tensions had required frequent adjustment, with the most recent having been made 20 hours before the accident. These adjustments had, however, been within specified tolerances, and so were not considered abnormal.

Eventually the mounting bracket supporting the outboard bellcrank and its associated support bracket failed completely, which resulted in 'lost motion' and ineffectual cranking of the nose gear operating system. Under these circumstances the nose gear could not be locked down either by normal methods or emergency hand cranking.

The pilot was therefore committed to an emergency landing with the nose gear in an unsafe position. This was duly carried out in a competent manner, resulting in minimal damage.

Analysis

On the available evidence it was not possible to identify a particular event which precipitated the onset of fatigue cracking. However, the assessment of investigators was that, most probably, the cracking was the result of stresses imposed on the torque mounting bracket over a prolonged period.

Stresses on the nose gear components are imposed as a matter of course by the normal extension and retraction of the undercarriage. Additionally, stress can be applied by:

- operations from rough surfaces; and
- power towing of the aircraft during maintenance operations using a rigid towbar attached to the nose gear.

Discussion

About 5 per cent of this aircraft's takeoffs and landings were made on relatively rough surfaces, all of which were considered by the operators to conform with acceptable standards.

It was normal workshop practice to tow the C401 using a motor driven tug. A large, adjustable towbar was used for this purpose. The towbar was not equipped with any shock-absorbing device or shear pins.

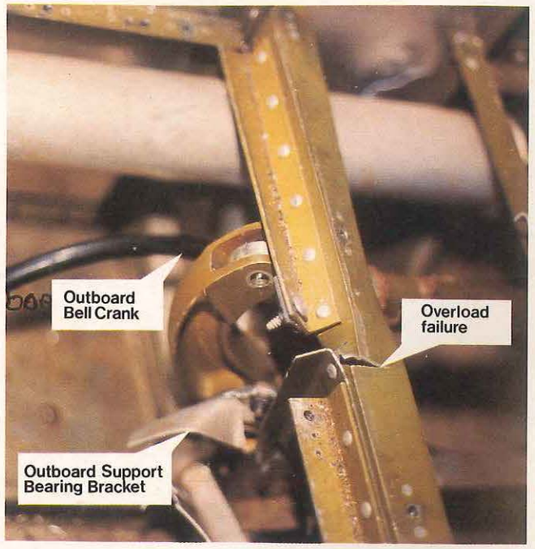
The service manual for the 401 includes the advice that:

> Power towing is not recommended. However, aircraft can be power towed to move aircraft over soft or muddy ground or in emergencies by attaching a rope harness to the main landing gear. Do not power tow aircraft with towing vehicle attached to nose gear or the tail skid. When power towing station a crew member in the aircraft to apply brakes in case of emergency. Use extreme caution to avoid jerky motions, as serious structural damage can result.

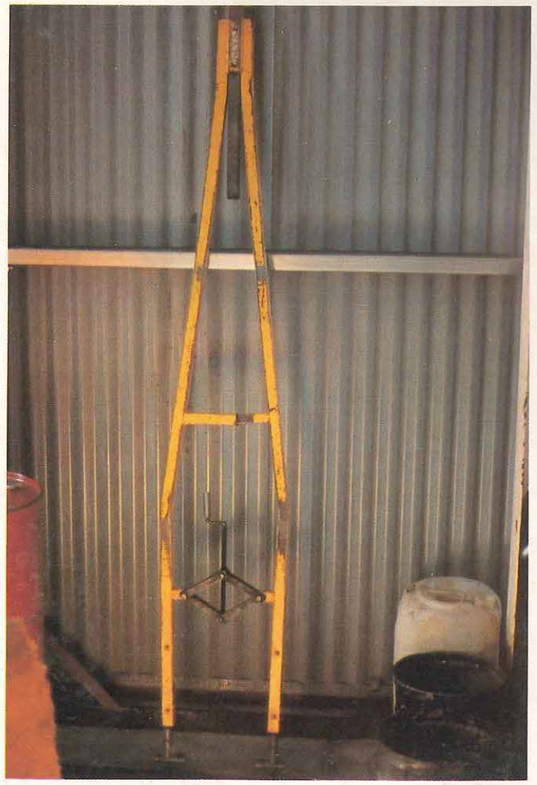
It is possible that shock loads transmitted through the nose gear to the actuating mechanism may have caused fatigue in the torque tube mounting structure, or at least accelerated the rate of crack propagation.

Comment

Following the accident to the Cessna 401, the company decided to modify its towbars to include shock absorption and steering limit shear pins ●



Fuselage nose section structure showing outboard bellcrank and failed outboard support bearing bracket in situ.



Rigid towbar used for power towing during maintenance operations.

In brief

Shoulder harnesses will be installed as standard equipment on all forward facing seats in all U.S. personal and business General Aviation aircraft that are manufactured after 1 January 1985. The non-regulatory agreement by the manufacturers is the latest step in a joint effort by the General Aviation Manufacturers' Association and the Aircraft Owners' and Pilots' Association to encourage pilots and passengers to use shoulder harnesses. The two associations claim that serious injuries and fatalities would be reduced 35 per cent if aircraft occupants wore shoulder harnesses. General aviation aircraft are required by regulation to have shoulder harnesses, but only for their front seats.

* * * *

A pilot under training took off in a Cessna 172 on a solo navex. One of the turning points in the navex was within 10 nm of the edge of his topographical map. During the course of the exercise the pilot became unsure of his position. In fact, he had overshot the particular turning point, and had 'gone off the edge' of his map. As he was not carrying the adjoining map, he was unable to fix his position visually. However, with the help of ATC, he was eventually repositioned back on his map and was able to conclude the flight.

It was later noted that, in addition to not ensuring that the pilot was carrying all relevant maps, the supervising instructor had allowed his student to take off with an incomplete flight plan — true airspeed, wind velocity and lowest safe altitude were all missing.

* * * *

Having lined his Auster up on runway 25, a British pilot ran the engine at 1800 rpm in order to clear some rough running which he attributed to having taxied at a low power setting. When the throttle was opened fully at the start of the takeoff run the engine misfired once but then ran smoothly. After the tail had lifted and the aircraft had become airborne the engine misfired badly. The pilot landed back on the runway at a point half-way along its total length. Braking was impaired by brake fade, especially on the right hand side. The aircraft ran into some concrete blocks which were positioned at the south-western end of the runway to prevent vehicular access. The pilot and passengers escaped injury.

Subsequent examination of the engine revealed that the number 4 exhaust valve was sticking in its valve guide. None of the valve guides had been correctly reamed out after their installation in the engine.

* * * *

A typical propeller on a piston engine idling at 900 rpm has the kinetic energy of a 5 lb brick travelling at about 250 mph.

Human factors and aircraft instruments

Adapted from an article by Prof. E. Edwards in Aerospace, *Journal of the Royal Aeronautical Society.*

Instruments may rightly be called the 'brains' of the aircraft, for it is upon their indications that the pilot depends for flight safety and the efficient operation of his plane. Instruments and instrument flying are a major branch of aviation and all personnel are required to have knowledge, in varying degrees, of this important branch. The time is past when a superficial understanding of simply the general purpose of the instruments was sufficient. Today a thorough knowledge of instruments and their use is a necessity and a distinct step in advancement for pilots, groundmen, mechanics, and in fact all engaged in aviation.

(G. C. De Baud, *Pilots and Mechanics Aircraft Instrument Manual,* Ronald Press Co., New York, 1942)

The primary function of aircraft instruments is the transfer of operational information to the pilot. The accuracy of pilot interpretation of an instrument display is influenced by the quality of the presentation, and the degree to which human factors interfere with an accurate transfer of the information. In quiet moments on the ground when time is available, pilots should take a long slow look at the manner in which information is presented on cockpit instruments. Which way does a pointer move, what are the graduation units, what do different colour markings mean, what lighting is available to each dial, and what happens if power or the excitation source fails? In a well-known and frequently quoted experiment, an American investigator R.B. Sleight invited people to note the readings on a number of dials. Five different dial formats were used, viz. vertical, horizontal, semi-circular, circular and open-window, as illustrated in Figure 1. The scale length, pointer width, graduation marks and numeral design were the same in each case. The participants were shown several examples of each dial with different readings, each presentation being of only 120 milliseconds duration. The pointer always appeared on a graduation mark, so that interpolation was unnecessary and each response was clearly either right or wrong. Errors were totalled for each display in order to compare the relative efficacy of the five formats. The results are shown in Figure 2.

Many people might feel confident they could predict the outcome of the experiment in advance. The application of 'common sense' however does not always provide either the correct answers or sufficient detail where human performance is concerned, and there is ample evidence to show that this is the case. Designing instrumentation for pilots is an activity which demands valid data both from applied research, operational experience, and accident investigation. Instrument design has undergone enormous change over the past 70 years, due almost exclusively to a combination of systematic experimental studies and a wealth of operational experience. Basic deficiencies in a design may be masked

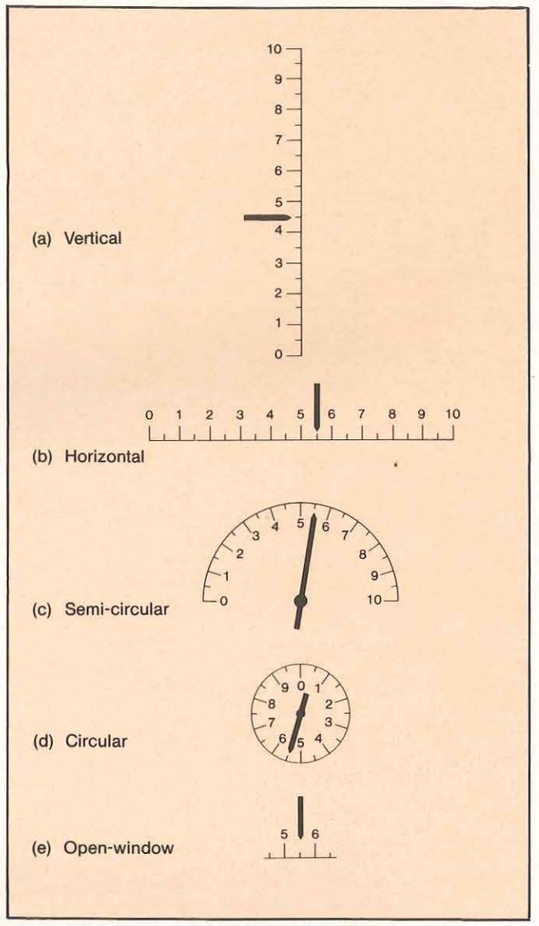


Fig. 1. The five dial shapes used in the experiment by R. B. Sleight.

and only become apparent later, for example in an emergency, when individual differences in dealing with an unusual situation produce varying pilot error rates in instrument interpretation. It is impossible to present information on an instrument in a way which will entirely cope with the infinite variety of situations which arise in aircraft operations. Factors such as reduced speed of pilot performance, fatigue or low morale may interfere with instrument interpretation even though certain instrument design features may reduce the probability of errors over a broad band of anticipated conditions. Consequently, it is important that pilots are familiar with the characteristics of their instruments, in order to improve interpretative performance in a variety of circumstances.

A serviceable aircraft instrument steadfastly supplies the pilot with information regardless of the pilot's skill, knowledge, stress, fatigue and environmental pressures. The almost infinite variety of circumstances in which an instrument must provide information to different pilots

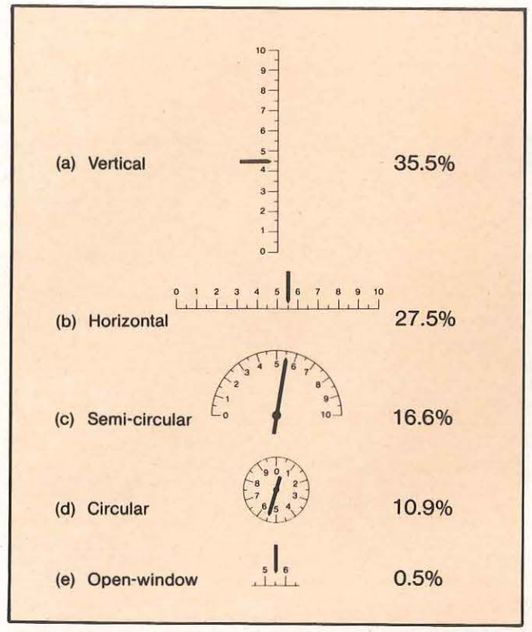


Fig. 2. The errors committed by the 60 people who took part in the dial experiment.

places limitations upon the capacity of an instrument design to cope with every circumstance. For instance, pilot performance is adversely affected by discomfort, which may have a variety of environmental causes, including:

1. Thermal environment: wide variations in temperature, humidity, and air movement are discomforting. so that clothing is a relevant consideration.
2. Lighting: brightness, glare, reflections, colour and colour changes may affect performance.
3. Noise: loud or intermittent noises may cause discomfort and distraction, or even damage to hearing; very high noise levels may be debilitating.
4. Other environmental hazards: radiations, low atmospheric pressures, vibration, acceleration, hypoxia.

In the dial-reading experiment, different people made different forecasts about the outcome of the experiment before the results were known, and many of these forecasts were incorrect. In other words, there is no 'common sense' knowledge which permits armchair solutions regarding possible human performance. The importance of proper evaluation is highlighted by the results for the vertical and open window dials which attracted 35.5 per cent and 0.5 per cent of all errors respectively, or a ratio of errors between them of 70:1. It might be concluded that the experiment provided a strong indication of optimum design. However, this is not really so, as the most appropriate instrument design depends upon the particular application. In the laboratory experiment, the best design was the open window, but once a specific application is defined, a quite different arrangement may have provided optimum pilot interpretation. Today's aircraft manufacturers should avail themselves of the latest developments in the human factors aspects of visual displays so that the design of instruments matches the particular task. Nevertheless, pilots should become familiar with the design features of cockpit instruments as a counterbalance for those occasions where pilot performance is impaired.

The pioneering work on instrument errors was carried out by Fitts and Jones in the U.S.A. after the Second World War. One section of their work concerned the psychological aspects of aircraft instrument displays, the objective being to modify the design of aircraft instruments to improve the efficiency of the system. From the data they collected, errors made by pilots were divided into nine categories as follows:

Type of error	*Proportion of total (%)*
1. Errors interpreting multi-revolution instruments (the most common specific error was misreading the altimeter by 1000 feet)	18
2. Reversal errors, where the interpretation of an instrument indication was reversed, and subsequently applied corrective measures served to aggravate the condition	17
3. Signal interpretation errors, e.g. misunderstanding the message conveyed by warning horns or lights	14
4. Legibility errors, usually due to the difficulty of reading an instrument scale distinctly enough to obtain a correct reading	14
5. Substitution errors: mistaking one instrument for another, confusing which engine or system an instrument refers to, or failing to locate an instrument when needed	13
6. Using an inoperative instrument	9
7. Scale interpretation errors, due to difficulty in interpolating between numbered graduations on a scale, or failure to interpret a numbered graduation correctly	6
8. Errors due to illusions, e.g. misconceptions of attitude because of differences between body sensations and instrument indications, or due to illusions which occur under instrument or marginal conditions of weather	5
9. Forgetting errors: failure to refer to or properly check an instrument prior to takeoff or during flight	4
	100

Accident investigations show that these categories cover all instrument interpretation errors made by pilots today. Whenever a pilot makes an instrument interpretative error, it will fall into one of these categories.

One finding made by Fitts and Jones was that the difficulties they exposed in interpretation of aircraft instruments posed a greater variety of problems for researchers than did errors in using aircraft controls. With the passage of time an enormous amount of research has occurred in this area, which is of great significance in advanced technology cockpits. The advent of microprocessors, digital systems and cathode ray tube displays on the flight deck are bringing about a dramatic change in the pilot's working environment. Different aircraft types, whether large or small, may attract different and specific considerations regarding instrument interpretation, but pilots generally should consider carefully how the instrumentation of the particular aircraft type(s) they operate may be prone to the kinds of errors categorised above ●

Low cloud base, rising terrain

Aviation Safety Digest 122 contained an article entitled 'Freud, Jung and all that' in which the author suggested that a connection exists between the subconscious and the 'press-on must-get-through' attitude which seems to be at the root of many weather-related accidents involving VFR pilots. The article argued that, when most of us plan a flight from A to B, we program our subconscious to get to B. We usually have no doubt about getting to B. All our thoughts and expectations are of a positive nature; we think only about getting there, and work out how to do it. We rarely plan to get part-way there and turn back.

This kind of mental state seems to have been a significant factor in an accident in which a Grumman AA5A made a controlled entry into mountainous jungle terrain.

Pressing on

Not long after the Grumman took off, the pilot noticed low cloud obscuring the tops of a mountain range which he intended crossing. Approaching the range he had to fly around some hills to stay under the cloud. A little further on he flew over a ridge where the gap between the treetops and the cloudbase was about 300 feet. Having squeezed through that gap he found his progress blocked by a hill, which necessitated a left turn—whereupon he was confronted by another ridge. Again, a narrow gap existed between the terrain and the cloud base. With full power applied the pilot attempted to 'outclimb' the ridge and escape from the trap into which he had placed himself. However, he had left it too late. The performance simply was not available: the Grumman flew into the jungle canopy in a wings-level attitude about 200 feet below the top of the ridge line.

Analysis

Not the least of the safety lessons to emerge from this accident was that of the pilot's low experience level. He had flown only 230 hours over a ten year period. For most of us a combination of limited experience and a slow rate of accumulation of that experience has obvious consequences for the development of judgment, particularly in demanding circumstances.

Just as interesting was the pilot's refusal to accept the obvious, i.e. the actual conditions. In discussions after the accident the pilot commented that it was apparent when he was approaching the mountains that the track he wished to fly was going to be 'difficult' or 'unlikely'. Yet he continued 'for a closer look', even though all his energies had to be directed towards remaining clear of terrain and cloud, and other tasks such as navigation had to be ignored.

As is almost always the case with this sort of accident, opportunities to turn back in time were ignored. Even as late as the final left turn towards the ridge it seems likely that a turnback could have been made. However, the pilot allowed himself to be drawn on by the 'gap' ahead.

Two other factors are worth mentioning. First, in deciding to make the final left turn, the pilot misjudged the distance and height to the ridge line. This kind of misjudgment is common in VFR/IFR accidents. The point to absorb here is that making a correlation between the conditions and your aircraft's performance capabilities can be difficult, particularly if you are under stress and inexperienced. Second, the pilot did not know the performance parameters to achieve the best angle of climb for his particular aircraft.

Summary

The pilot subsequently mentioned that he suffered from a mental block during the latter stages of the flight; clearly, this would have impaired his decision-making capabilities. As Freud, Jung and company observed so long ago, this potentially dangerous behavioural characteristic—from which few, if any, of us are immune— can be related to attitude. For aviators the key to overcoming the problem lies primarily in preflight planning, and inflight understanding of one's equipment, environment and limitations ●

Overstressed

Those pilots who have lost control of an aircraft know what an alarming experience it can be. Because of the stress which the pilot will almost certainly experience when control is lost, sometimes it is difficult to assess how much of another kind of stress—namely, that on the airframe—was applied during attempts to regain control. With the adrenalin pumping and the airspeed possibly increasing rapidly, the actual aerodynamic load can often be well in excess of that which the pilot, through his 'feel' of the aircraft, believes he is applying. As structural damage often is either not easily detected or in fact is all below the surface, it is good airmanship to have your aircraft thoroughly inspected if you have had to 'pull out' following an inadvertent loss of control. Failure to do otherwise can place subsequent users of the aircraft at risk.

An IMC circuit

The first leg of what was to be a long, combined business and pleasure trip was initially conducted in visual meteorological conditions. However, as the Warrior approached the circuit at the first planned landing point, low cloud began to close in. The pilot joined the circuit at 500 feet agl, intending to land on runway 19, but, when he rolled out on final, he saw that he was in a gross overshoot and made a go-around. He then adjusted his flight path to join for runway 11, but midway downwind lost sight of the strip because of rain and low cloud. A right turn was carried out towards the nearby township in an attempt to give himself time and space to sort things out; instead, however, the PA28 entered cloud.

Experiencing temporary confusion over interpreting the information displayed on the flight instruments, the pilot lost control of the aircraft. With two notches of flap selected, the airspeed built up to about 120 knots before control was regained. The pilot later estimated that the force he applied was about the same as that needed to hold a level, 60 degree banked turn, i.e. 2g. After two minutes in cloud the Warrior emerged in the clear, about 1000 feet lower than the height at which it had entered: fortunately for those on board it had been tracking towards lower terrain.

Because of the rapidly deteriorating weather conditions, the pilot decided to land at an agricultural strip about five miles from the township; this he completed uneventfully.

Following this occurrence the trip was resumed and about 18 hours were flown before the PA28 returned to its home base. A further 8.5 hours were then flown by a number of other pilots. Despite numerous daily and preflight inspections, no damage was noticed by any of the pilots.

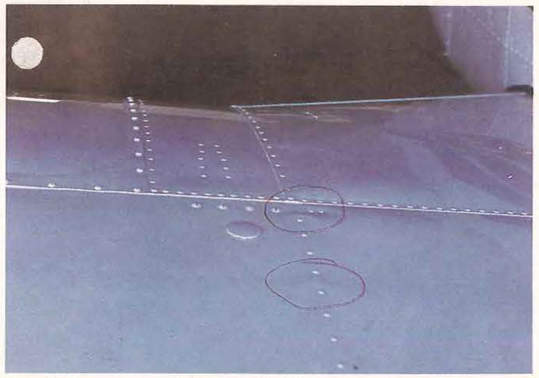
However, on a subsequent periodic inspection, both wings were found to be bent upwards as a result of applied aerodynamic loads. The maintenance report stated that both the left and right wing upper inboard skins aft of the spar showed signs of extreme stress, with the skin being cracked in several places.

Comment

Discussions with the pilots who flew the aircraft after its return indicated that none of them had placed unusual demands on the Piper. Thus, while a definite conclusion could not be drawn, it seemed probable that the damage had been done following the loss of control in cloud.

Two main safety lessons can be drawn from this occurrence. First, the PA28 airframe has a limiting maximum positive load factor in the utility category of 3.8. The pilot thought he applied about 2g; however, as both wings were bent upwards, they obviously had been subjected to much more than that. As anyone who has flown aerobatics, and therefore monitored a direct-reading g-meter in flight, can attest, when it's 'all happening', it is very easy to apply far more g than intended. Clearly, this is likely to be the case during a recovery from loss of control. Indeed, there are numerous recorded occurrences of inflight breakup of GA aircraft because of extreme aerodynamic loads having been applied during attempted recovery manoeuvres. The point is that, following this sort of occurrence, there is good reason to have a thorough inspection made of the aircraft by a suitably endorsed LAME.

Second, any damage can be hard to detect. A number of pilots failed to see the surface indications of airframe damage on this Warrior (see the photograph). This reinforces the need to have a specialist inspect the machine ●



In brief

Delay in initiating a go-around (that is, making the choice too late) is as prominent a cause of landing accidents as is failure to perform the manoeuvre and, according to U.S. National Transportation Safety Board reports, is far more likely to result in serious injuries and fatalities.

Reader contribution: Asleep on the job

The article entitled 'Fatigue on the midnight express' *(Aviation Safety Digest* 125) reminded me of an experience I had, and which I would like to share with your readers as warning against the possible effects of fatigue in the cockpit, particularly at night.

The incident

During one of the periodic refuelling strikes which took place a few years ago I was asked to fly a Piper Aztec from Archerfield to Sydney and return. Due to the fact that the flight would not terminate at Archerfield until the early hours of the morning of my seventh day of duty, a dispensation was obtained from the Department to conduct this flight. My preceding tours of duty were not particularly tiring, and if the flight had proceeded as originally planned I doubt that I would have experienced any undue fatigue.

However, as often happens in such cases, there were delays in the arrival of my aircraft following a previous trip to Sydney and return, so that we did not actually depart until some hours after the original ETD. The problem was then compounded by the fact that refuelling was required at Coffs Harbour after the normal hours of operation of the refuelling service, and quite a few other aircraft were also waiting their turn to be refuelled at Coffs. It was therefore already very late in the evening by the time I had obtained the necessary fuel and departed Coffs for Sydney.

There was considerable wind and thunderstorm activity over the route, so that by the time I arrived over Mt McQuoid VOR it was close to midnight, and I was feeling pretty tired with the effort of continuous IFR flight in rough conditions.

From Mt McQuoid I was cleared via the Hawkes intercept to the 16 ILS approach. The distance from Mt McQuoid to Hawkes is only 21 nm, and takes only about seven minutes in an Aztec. In that seven minutes I had to review the approach plate, tune and identify the aids, complete my approach checks, and continue to fly the aircraft in the rough conditions existing.

Having carried out all these necessary items I then sat back to relax for a minute or two until the intercept at Hawkes was reached. I think that it must have been at this point during that brief period of relaxation, that I literally fell asleep with my eyes open!

I can distinctly recall seeing the localiser needle leave full scale deflection and, incredible as it may seem, I also remember just watching it as it traversed the deflection scale to centre and then out to full scale on the opposite side, and thinking 'Now isn't that interesting!' Why I did not react to the indication I do not know, as I clearly saw what was happening. A few seconds later Sydney Approach advised, 'Radar has you through the localiser and diverging'. *Even then I did not react!* I merely picked up the microphone and acknowledged their transmission. As I was replacing the microphone in its clip, I suddenly woke up to what I was doing — or rather, what I was NOT doing. If I remember correctly I think that I then said, 'My apologies — it's too late at night. Request a radar vector back to the localiser'.

This was given and acted upon, and I then re-intercepted the localiser without difficulty.

Having reported established and then visual at about 2000 ft, I was instructed to call Sydney Tower, who advised me to 'continue approach, expect late landing clearance'. In front of me were the bright approach lights and the lights of the city, and these seemed to have a kind of hypnotic effect, because once again my mind drifted off the job in hand. The next thing I remember was flaring over the end of the runway and the Tower controller's voice: 'I say again, cleared to land'.

I simply do not remember flying the final approach — I seem to have been flying completely automatically with only the subconscious part of my mind operating!

While taxiing in at Sydney the SMC controller asked me for my ETD for Archerfield. When I advised that I was cancelling the return flight in order to have some sleep first, his reply (in somewhat less than standard R/T phraseology!) was that he thought that would be a . . . good idea! The return flight later that day after a few hours of sleep was uneventful.

Analysis

I am sure that it was only my subconscious reactions, due to having a reasonable amount of flight experience, which prevented a more serious situation from developing. I certainly cannot claim any credit for *conscious* flying technique!

In retrospect, there were several things which I could have done to avoid this situation, and which I would now do in similar circumstances.

First, there was the original fatigue associated with previous tours of duty. Although under the original flight plan this was not a significant factor, once it became apparent that departure from Archerfield was going to be considerably delayed I should have either cancelled or postponed the flight until the next day.

Second, while in cruise from Coffs Harbour to Mt McQuoid I could have turned up the cockpit lights to full bright for, say, ten minutes, and carried out some simple stretch and flex exercises. There would have been ample time to regain good night vision after turning the cockpit lights back down again.

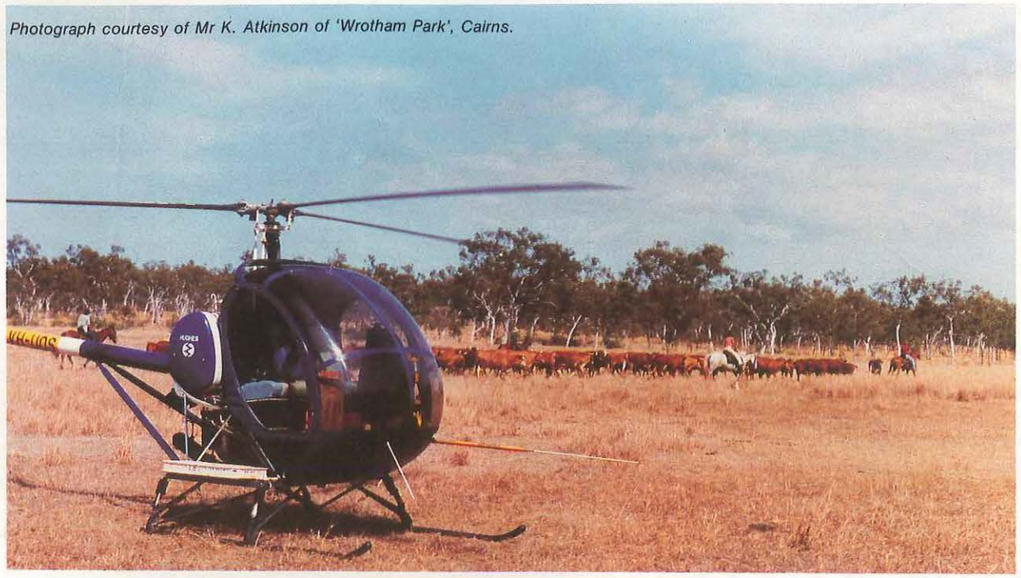
Third, I could have attempted a conversation with the passenger sitting alongside me, who was awake and reading a book, instead of just idly monitoring instruments while the aircraft flew on autopilot. Although I was unaware of it at the time, the fact that I just 'couldn't be bothered' to talk to him was actually an indication of the fatigue I was suffering.

Finally, and probably most significantly from an operational viewpoint, I should have anticipated the ILS approach and reviewed the procedure well before Mt McQuoid. This would have reduced the workload in that short leg to Hawkes. I believe that the sudden burst of concentrated cockpit activity followed by a minute or two of idleness before the intercept of the localiser would have tended to be the 'last straw' to an already overtired mind.

(Continued on next page)

The herd strikes back

Photograph courtesy of Mr K. Atkinson of 'Wrotham Park', Cairns.



While cattle mustering in the Northern Territory the pilot of a Hughes 269 helicopter suddenly found himself confronted by a cow which refused to move in the desired direction. The pilot dropped down to a few feet agl whereupon the cow began walking slowly towards the herd. It then stopped again and the pilot edged closer. The cow spun around, reared on its hind legs, and attacked the helicopter, catching one of its horns in the skid area. The cow was too much for the helicopter and pilot, and seemed to push the helicopter over in its fury. The helicopter then pitched forward, rolled to the right, and struck the ground causing substantial damage. The tail rotor assembly, major sections of the vertical stabilizer, sections of drive shaft, tail boom and large sections of perspex were scattered up to 9 metres from the main wreckage. When Bureau investigators attempted to find the offending cow to examine its horns, they learned it had been shot and butchered for the evening meal on the day of the accident.

Investigation revealed that the pilot had been properly endorsed in cattle mustering, but was low on experience. In addition the operator's check and training organisation did not provide the pilot with adequate support to shepherd him through his early mustering work. The pilot was in proper control of the helicopter, which responded to his inputs of cyclic to the left, collective up, and additional power. The pilot later stated he had been unaware that the cow would turn on him, otherwise the accident may not have occurred. In the helicopter mustering industry it is considered necessary to get down low in order to control some animals, although it is also common for them to turn against the helicopter.

Cattle being mustered by helicopter tend to become 'stirrey' and sometimes take a while to settle down after forming into a herd. Some herds have become used to helicopter mustering and their familiarity may easily encourage them to turn against their oppressor. In this accident the pilot was also motivated by a need to muster every single animal in order to make a TB eradication program successful ●

Conclusion

I have been 'tired' on other occasions during my flying career, but this was the first and (as far as I am aware the only) time that I have been acutely fatigued.

The *Aviation Safety Digest* is to be congratulated on the article on fatigue which prompted this letter — that article should be mandatory reading for every pilot. It *can* happen to you! ●