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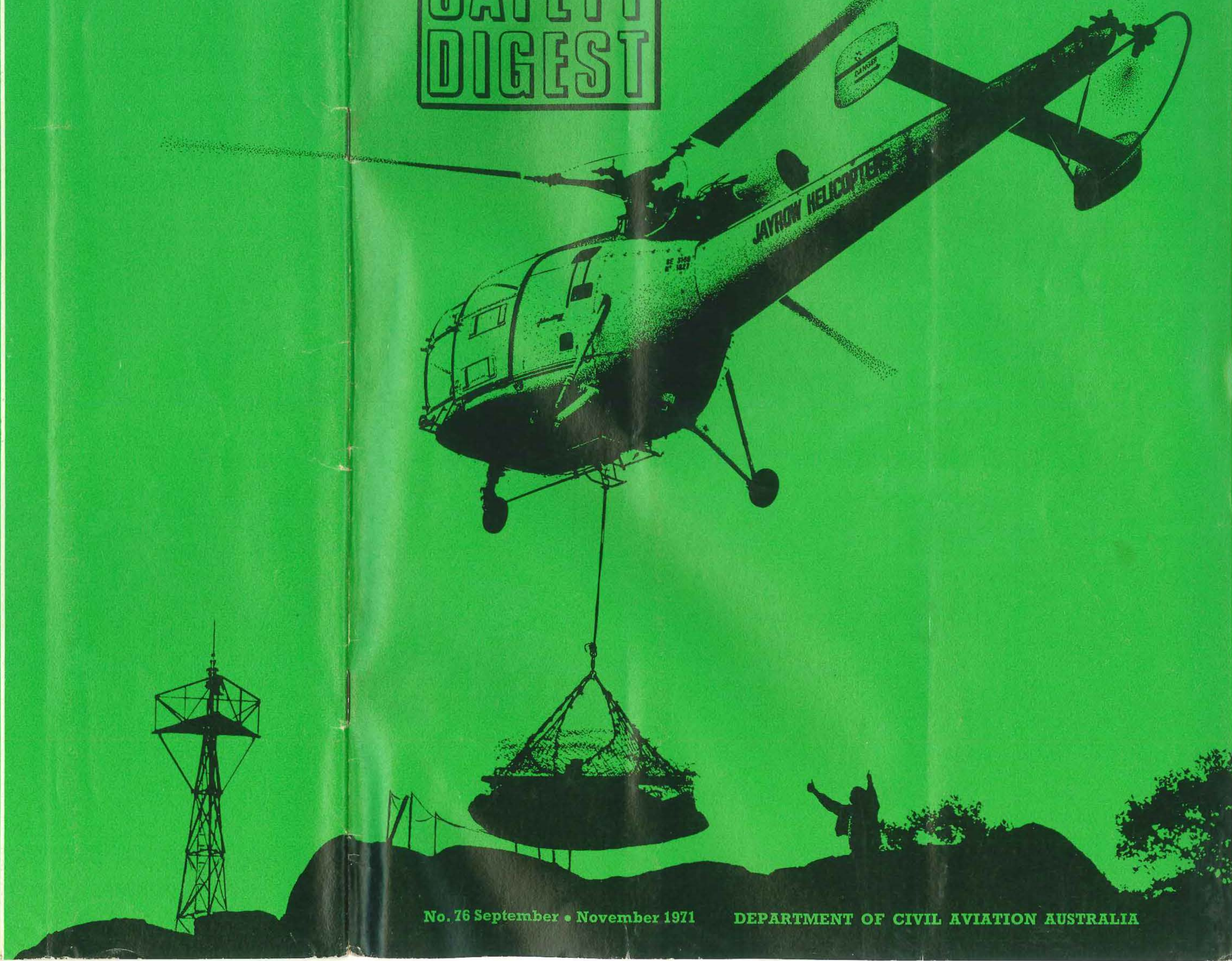
AVIATION SAFETY DIGEST



No. 76 September • November 1971 DEPARTMENT OF CIVIL AVIATION AUSTRALIA

AVIATION SAFETY DIGEST

No. 76 September • November 1971

DEPARTMENT OF CIVIL AVIATION AUSTRALIA

COVER AND ABOVE: Jayrow Helicopters' Sud Alouette unloads equipment at a rocky "helipad" in the You Yang Ranges, Victoria, during the construction of an aeronautical hazard beacon on Flinders Peak.

—D.C.A. Photographs by T. Martin

Contents

AUSTRALIA

Design: N. Wintrip. Artwork: N. Clifford, R. Percy, N. Wintrip, C. Palmer.
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A New Policy

Over the past eight years, the circulation of the Aviation Safety Digest has more than trebled and at present stands at the impressive figure of 26,000. A growth rate of this order would be heartening indeed to any magazine editorial staff, let alone to those of a government publication!

In truth, however, Aviation Safety Digest cannot take too much credit for these seemingly spectacular results. The fact is that a large proportion of this increase is simply a reflection of the expansion that has taken place in the Australian aviation industry in recent years. For, until now, the distribution of the Digest has been very largely a statutory one, made to licence holders and others with a vested operational interest in the industry, whether they like it or not! Our present circulation figures thus are not prima facie evidence of interest and effectiveness.

At the same time, having qualified our apparent success in this way, it might not be immodest to admit there is considerable evidence that the Digest has also enjoyed a real growth in public acceptance and that it is meeting a genuine need in the complex world of aviation. Apart from the many "statutory" readers who have indicated their continuing interest by offering comments on our articles and presentation, we have had a great number of enquiries and distribution requests from other interested parties, both in Australia and from overseas.

Though we have done our best to meet as many of these additional requests for the Digest as possible, this has not been an easy task. One of the main administrative difficulties has been the concept of the Digest as it was originally seen in 1953, which was simply to promote air safety within Australia by placing safety educational matter directly in the hands of those primarily concerned with the maintenance and operation of aircraft and for whom the Department has a responsibility. A wider function or coverage was not then envisaged.

On such a basis, to have made a charge for the material would have been to defeat its purpose and, in accordance with this policy, no administrative machinery was set up to promote and sell the Digest. Thus, as the reputation of the Digest widened and other intending readers asked to be included on its distribution list, it was constantly necessary to pose the question, "can this request be met in the spirit of the Digest's intention?"

Interpreting this principle as liberally as the limitations of our budget has allowed over the years, we have managed to include, on request, non-licensed persons or organisations connected with aviation in Australia, student pilots who had demonstrated that they "meant business", and a considerable number of overseas aircraft operators. But with the best will in the world, a limit has to be reached sometime, and this additional demand for the Digest has now reached the stage where our budget is not capable of any further stretching. And this takes no account of the requests for subscriptions we have received from individual pilots overseas, or from the great many non-licensed persons within Australia whom, in the past, we have had no alternative but to refuse.

It is not only difficult, but also a pity to have to refuse what seems a perfectly reasonable request. This is particularly so when the information sought is likely to be beneficial generally. Obviously, the effectiveness of any safety education programme is in direct proportion to the coverage it achieves — clearly, the more people who know something of the problems, the greater the probability of something being done about it — even if some of those people are only on the periphery of the subject.

To avoid having to discriminate, seemingly unfairly, against some categories of intending readers; to overcome the problem of our ever-stretching budget; and to provide a service to all who wish to have access to the safety education content of the Digest, an important addition is now to be made to our distribution policy. The original free distribution to licence holders and registered aircraft owners, as well as to certain overseas aviation authorities, will continue as before, but, beginning with our next issue (No. 77, January 1972) the Digest will in addition be available on a subscription basis. Subscriptions and sales will be handled by the Australian Government Publishing Service, and full details are set out on the back cover.

Obviously this change of policy will require some rationalisation of our existing distribution list for other persons but no one currently receiving the Digest on personal distribution, need be concerned that he will be struck from the list without warning. Where the policy does call for change we will write to the readers concerned and we are confident that they will understand and accept the motives prompting the change. We also hope they will accept our invitation to remain on our distribution list by taking out a subscription.

One particular category of readers to be affected to some degree by this change will be our student pilots. In the past we have made a bulk distribution to licensed flying schools to permit them to make a selective sub-distribution to those students who gave evidence of a lasting interest in flying. This policy was an obvious source of anomaly and inequity but was dictated by our resources. In future we will make a distribution to licensed flying schools which will be adequate to met their "library" needs but students wanting a personal distribution will need to take out a subscription. Of course, as soon as a student qualifies for a private licence, he will be transferred to the "statutory" free distribution list.

One final word of explanation. As many of our readers know well, the production of the Digest has been running late for some time past because of pressure of work within the Air Safety Investigation Branch. This has not affected the safety educational coverage achieved to any degree because the actual content of the Digest is only rarely related to the date of the issue in which it appears. Even so, primarily out of regard to those of our readers who have their copies of the Digest bound into volumes, we had hoped to "catch up" this lag without omitting any issues. Unfortunately this has not been possible and, with the imminent change in distribution policy, we feel that we must now take steps to bring the publication dates into line. For this reason, this issue is being styled "September-November" and will be the final one for 1971.

WATCH IT!

While making a localiser approach to land in daylight at Charleston, West Virginia, U.S.A., a FH-227B* descended below the final approach path and crashed into steeply sloping ground short of the runway. All but two of the 32 occupants were killed and the aircraft was destroyed by impact forces and the ensuing fire.

At the time a layer of fog obscured the runway threshold and part of the runway approach lighting system. Beyond the area of fog, visual conditions existed.

The aircraft was making a scheduled passenger flight from Louisville Kentucky, to Roanoke Virginia, with en route stops at Cincinnati and Charleston. The flight departed Louisville at 0720 hours local time, and was normal in every respect until the aircraft was approaching Charleston. At 0835 hours, the aircraft called Charleston Tower to request the latest weather and was informed that the sky was partially obscured, visibility was half a mile in fog and smoke, but on the runway visibility was less than one eighth of a mile. In response to the crew's advice that they would arrive in about 15 minutes, the tower replied that the runway visibility by that time might have improved to about half a mile.

At 0841 hours the aircraft contacted Charleston Approach Control, and reported leaving 6000 feet. The aircraft was then radar vectored to the holding pattern at the ILS outer marker for Runway 23. At 0850 hours the aircraft was informed that the runway visibility was now seven eighths of a mile, and was cleared for an ILS approach. When the aircraft acknowledged the clearance, the controller advised the crew that the glide path component of the system was out of service. Shortly afterwards the aircraft was instructed to call Charleston Tower.

The tower cleared the aircraft to land, and at 0854 hours the aircraft reported passing the outer marker and requested a wind check. This was reported as 230 degrees at four knots. A minute later, in response to an enquiry from the aircraft, the tower informed the crew that the approach lights were turned fully up, and said there was a little fog off the end of the runway. Once past the fog however, visibility on the runway was more than a mile and a half.

There were no further transmissions from the aircraft.

A minute later, the tower controller saw dense smoke from the burning aircraft rising from near the approach end of the runway and sounded the crash alarm.

* * *

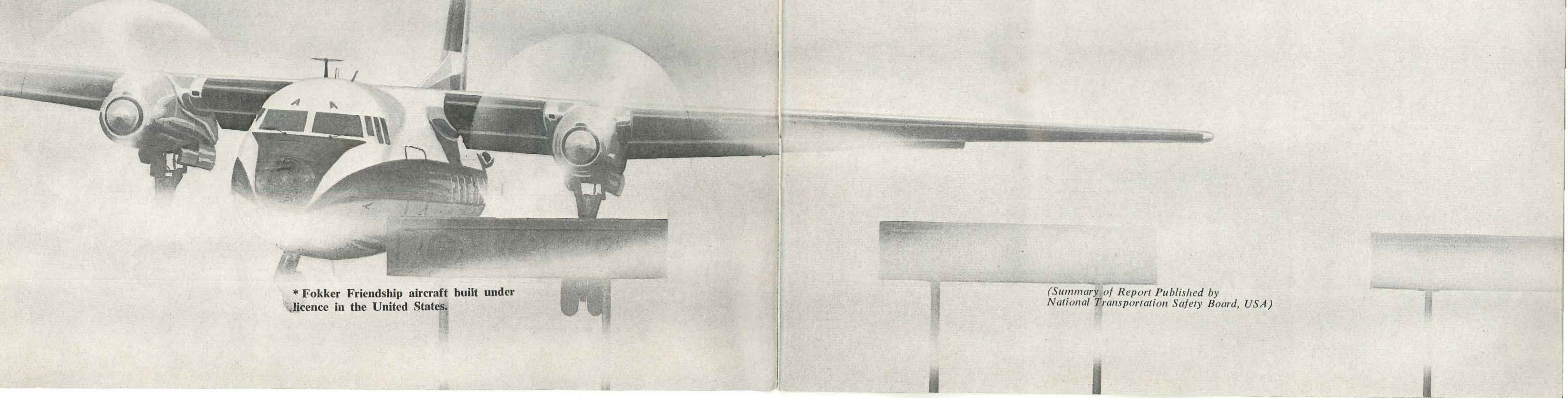
The airport on which the aircraft was landing has an elevation of 982 feet AMSL. Its Runway 23 has a bitumen surface and is 5,600 feet long. Two hundred feet short of the threshold of this runway, the terrain descends steeply into a valley nearly 300 feet deep, then rises again to about runway height near the middle marker. From this point the ground continues to rise in a northeasterly direction to a height of about 120 feet above the runway. The high intensity approach lighting system for the runway begins 3,000 feet from the threshold and is supported on staunchions bridging the valley. (See Fig. 1).

The outer marker serving the instrument landing system for Runway 23 is 4.3 miles from the runway. The middle marker is 0.6 of a mile out. The ILS approach procedure for the runway is to cross the outer marker inbound at 2,300 feet AMSL on a heading of 230 degrees. At this point, descent to the authorised minimum altitude is commenced. The minimum descent altitude with the glide slope inoperative is 1,582 feet AMSL (i.e. 600 feet above the airport elevation) but with the glide slope operating, the decision height is 1,382 feet AMSL (i.e. 400 feet above the airport elevation).

The aircraft's first impact was with trees about 360 feet from the runway threshold and eight feet below its elevation. The aircraft then struck the steeply sloping ground 250 feet short of the threshold and 33 feet below its elevation. From this point momentum carried the wreckage uphill on to the airport itself where it finally came to rest beside the runway threshold. At the time of first impact, the aircraft's attitude was about five degrees nose down and slightly banked to port.

The major portion of the airframe and all control surfaces were found in the main wreckage area. There was no evidence of any failure or malfunction of the flight control system before impact, and at the time the undercarriage and the flaps were fully extended. Both engines had separated from the aircraft at impact and were recovered in the main wreckage area. A detailed examination of both engines and propellers indicated that they were capable of normal operation before impact.

The aircraft was fitted with a flight data recorder and a cockpit voice recorder, both of which were recovered from the wreckage in a satisfactory condition. The flight data record showed that the flight had proceeded in accordance with its clearances and that four minutes and eight seconds before impact, a descent from 2,500 feet commenced and was continued at about 620 feet per minute, for almost three and a half minutes. During this time, the aircraft maintained a heading of 235 degrees and the airspeed was reduced from 140 to 110 knots. The aircraft then levelled off at an altitude of 1,250 feet AMSL (i.e. 268 feet above runway elevation). Thirty-two seconds afterwards, the aircraft commenced its final descent and an airspeed of 120 to 123 knots was maintained until impact 12 seconds later.



* Fokker Friendship aircraft built under licence in the United States.

(Summary of Report Published by National Transportation Safety Board, USA)

A transcription of the cockpit voice record indicated that the approach was normal until after the crew asked the controller if the approach lights were turned up. Shortly after this and 28 seconds before impact, the first officer called that he had the lights in sight "down low". Power was reduced as the captain acknowledged that he also had the lights in sight. Eight seconds afterwards, the captain called for landing flap. Ten seconds later again, the first officer asked the captain if he still had the lights in sight and the captain replied in the affirmative. Power was reduced, but then increased again almost immediately, and two seconds later the first officer called out "Watch it!" The sound of impact followed.

A witness who was in the valley about half a mile from the approach end of the runway when the accident occurred, said that a bank of fog was obscuring the hill top on which the airport is situated. Although he did not see the aircraft at any time during its approach, its engines sounded normal and the first sign of the accident was when he heard an explosion.

The pilot and the front seat passenger of a PA23 that was holding on a taxiway adjacent to the approach end of runway 23, while awaiting a clearance to take off, said that the visibility at the end of the runway was close to zero, and that although they were looking in the direction of the incoming aircraft, they could not see the approach lights because of the fog. Their first sight of the aircraft was after the impact, when it suddenly appeared out of the fog over the end of the runway. At this stage the wreckage was on fire and it came to rest on the opposite side of the runway, about 300 feet away.

A pilot flying a light aircraft, who had taken off from runway 23 just before the accident, said that there was a fairly solid bank of fog, about 150 feet thick, over the approach end of the runway, which appeared to be covering the first 300 feet.

The first officer of another airline aircraft, which had commenced an ILS approach to runway 23 behind the ill-fated FH-227, said that weather conditions in the area were mostly VFR, but that a fog bank was clearly visible over the approach end of the runway. As they approached the airport, they could see the first half of the approach lights extending out of the fog, while the remainder of the lights and the approach end of the runway itself were obscured. The far end of the runway was visible. After passing the outer marker, they could see smoke rising through the fog in the vicinity of the airport. The tower then instructed them to carry out a missed approach. The wreckage of the crashed aircraft first became visible through the fog as they passed over it at about 600 feet.

* * *

It was obvious from all the evidence that the cause of the accident lay with operational factors involved in the approach, and with circumstances that might have influenced the pilot to initiate a steep descent when only 200 feet above the level of the airport.

One of the most significant factors affecting the conduct of the approach was the weather conditions existing at the time. Apart from the fog which severely restricted visibility on the airport and on the approach to runway 23, the ceiling was unrestricted with only high clouds. During the time that the aircraft was making its approach, visibility over most of the airport was improving rapidly. Just before the accident, the visibility from the tower had improved from half a mile to one mile, and the runway visual range measured adjacent to the runway, some 400 feet in from the threshold, had increased from zero to one and a half miles. One reason for this variation in visibility was that, in addition to the lifting effect of solar radiation, a light south-westerly wind was moving the airport fog to the north-east. In conjunction with this movement, a fog lying in the valley between the threshold of runway 23 and the middle marker, was also in the process of lifting. The result was the formation of a dense blanket of fog over part of the approach lighting structure and the runway approach area.

Pilot witnesses estimated that the fog was lying over the area from the middle of the approach light structure to about 300 feet beyond the runway threshold, and was between 100 and 200 feet thick. It is probable that the flight would have been conducted in visual conditions to a point just beyond the middle marker, but the crew would have then experienced rapidly deteriorating visibility as the aircraft descended into a wispy layer of smoke and haze and then into the top of the fog bank itself. Dense fog and extremely poor visibility would have been encountered from this point on.

The cockpit voice recorder showed that the crew sighted the approach lights before reaching the middle marker and still had them in sight as they passed over the beginning of the approach light structure. It is evident that, to this point, the crew were conducting the approach partly by visual reference, rather than on instruments alone. This was supported by a reconstruction of the aircraft's flightpath over the ground, which showed a displacement of over 200 feet to the left of the ILS localizer course, until the aircraft was beyond the middle marker and abeam the beginning of the approach light system.

The aircraft had descended to 1,225 feet AMSL after passing the outer marker, and this altitude was maintained until after it had passed the middle marker. At this point, 18 seconds before impact, a descent of approximately 625 feet per minute began and was maintained until 6 seconds before impact. The descent rate during this period was very close to that of a normal glide slope descent and the flightpath remained slightly above that of the electronic glide slope normally projected for the runway. (See Fig. 1).

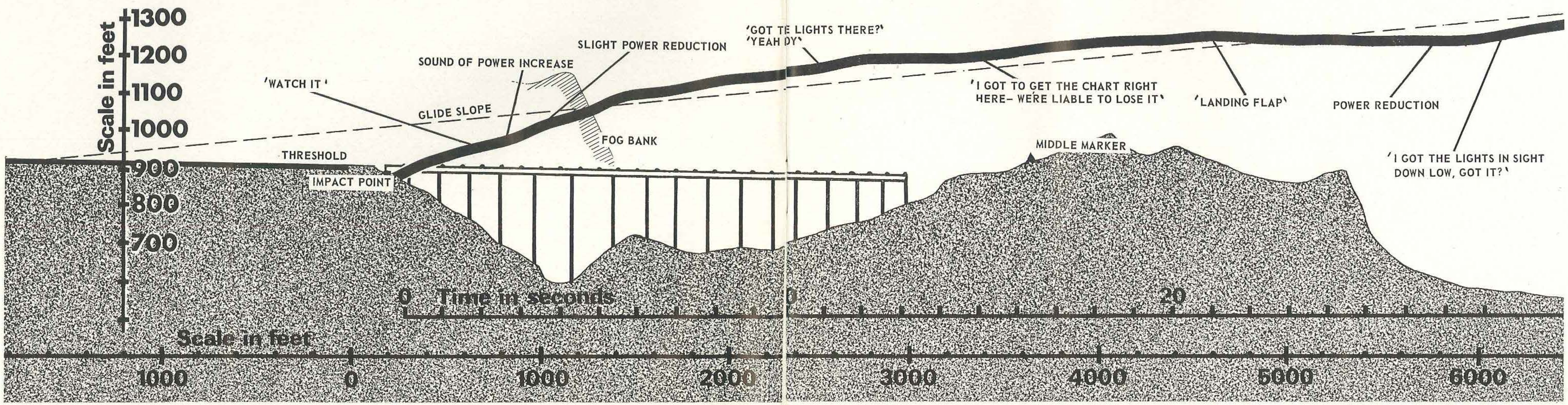
Six seconds before impact and at an altitude of 1,075 feet AMSL, or 175 feet above the approach lights, the aircraft's descent steepened to over 2,000 feet per minute and continued at this rate until impact. The aircraft's position at this time, over the middle of the approach light system corresponds closely with the point where it would have encountered the dense fog and where ground visibility from the cockpit would have been sharply reduced. In the absence of any evidence to the contrary, it is clear that some phenomenon associated with the reduction in visibility on entering the fog, affected the pilot in such a way that he steepened the descent to the extent that a recovery could not be effected.

The amount of visual guidance that a pilot can obtain from the ground in fog is a function of the visual range, the cockpit cut-off angle and the height of the aircraft, and is known as the "visual guidance segment" (See Fig. 2). Once having entered a "deep" fog, the visual guidance segment will normally increase as the altitude decreases. In the case of a "shallow" fog however, where visual contact with the ground has been established before the aircraft descends into the fog layer, the guidance segment will decrease as the aircraft descends towards the fog, reaching a minimum at the moment the aircraft enters the fog layer. As the descent continues, the guidance segment then increases as in a "deep" fog penetration.

The height of the aircraft thus plays an important part in determining the amount of guidance segment visible. With a visual range of 500 feet in fog, and a fog depth of 500 feet, the guidance segment will obviously be zero if the aircraft is 500 feet or higher above the ground. Because of the cockpit cut-off angle, the guidance segment may be zero even at altitudes of less than 500 feet. However, as the aircraft's height decreases, the guidance segment will increase, reaching its maximum at or near ground level, where the full 500 feet visual range will be obtained.

Little data is available on the problem of conducting approaches in low visibility conditions. Even the sparse amount of information that exists on minimum acceptable visual ranges has been obtained by controlled testing under ideal conditions, and relates only to stabilised ILS approaches in aircraft with approach speeds of less than 110 knots.

FIG 1: Profile of aircraft's final approach path as derived from flight data and cockpit voice recorders. The diagram shows terrain below approach path, approach lighting structure extending into the valley, runway threshold above valley slope, and estimated position of fog bank.



From such testing however, it is considered that an experienced pilot requires a guidance segment of at least 500 feet (i.e. 2.7 seconds at 110 knots) to continue an approach by visual reference alone. For turbine aircraft with approach speeds higher than 110 knots, such as the FH-227 or F27, the minimum visual range requirement would be greater.

Although it was not possible to positively determine the actual visual range that was available to the crew in this case, it can be safely assumed that it would have been no more than 500 feet, and was probably less. To attempt to determine the amount of visual guidance that would have been available to the crew during their approach, a table was compiled, setting out the guidance segment visible at various stages of the approach. For this purpose a visual range of 500 feet, and an arbitrary 45 degree slope to the face of the fog, beginning 1,500 feet from the runway threshold was assumed. This is shown in Fig. 3.

It can be seen that, as the aircraft approached the fog, the guidance segment (in this case the segment of approach lights visible) would have decreased rapidly, reducing from 220 feet to 37 feet in 1.6 seconds. It is also apparent that, although the guidance segment would have increased again as the aircraft continued its descent, the "minimum" of 500 feet would never have been attained.

Shallow fog of this sort is particularly hazardous, because the sudden shortening of the guidance segment may leave the pilot with insufficient visual reference for proper guidance, especially in the vertical plane. It seems quite likely in these conditions that a pilot could have a guidance segment which is adequate for azimuth guidance, but inadequate for assessing height, descent angle or aircraft attitude. Studies have shown that the sudden reduction in visual range on entering the fog can also be misinterpreted as pitch-up in aircraft attitude. Pilots encountering this situation will thus tend to steepen their angle of descent, especially if they are unfamiliar with the phenomenon.

Studies of low visibility approaches conducted by the Royal Aircraft Establishment indicate that lateral displacement from a ground pattern can easily be recognised as soon as one approach light crossbar comes into view. Reductions in visual range thus have little effect on azimuth guidance at low altitudes. Displacement in the vertical plane however, results mainly in an extension or compression of the guidance segment and is not indicated by any change in symmetry of the ground guidance pattern. Also, unlike the obvious lateral displacement which is so effective for azimuth guidance, there is no simple connection between changes in angle of descent and apparent movement of any of the elements of the perspective pattern. In summary, a pilot can detect a small lateral error, and see in a few seconds whether it is increasing or decreasing, but can detect a height error only if it is large, and will not know for many seconds whether it is increasing or decreasing. In fact, vertical visual guidance from the approach lights may become adequate only after the aircraft has descended as low as 100 feet.

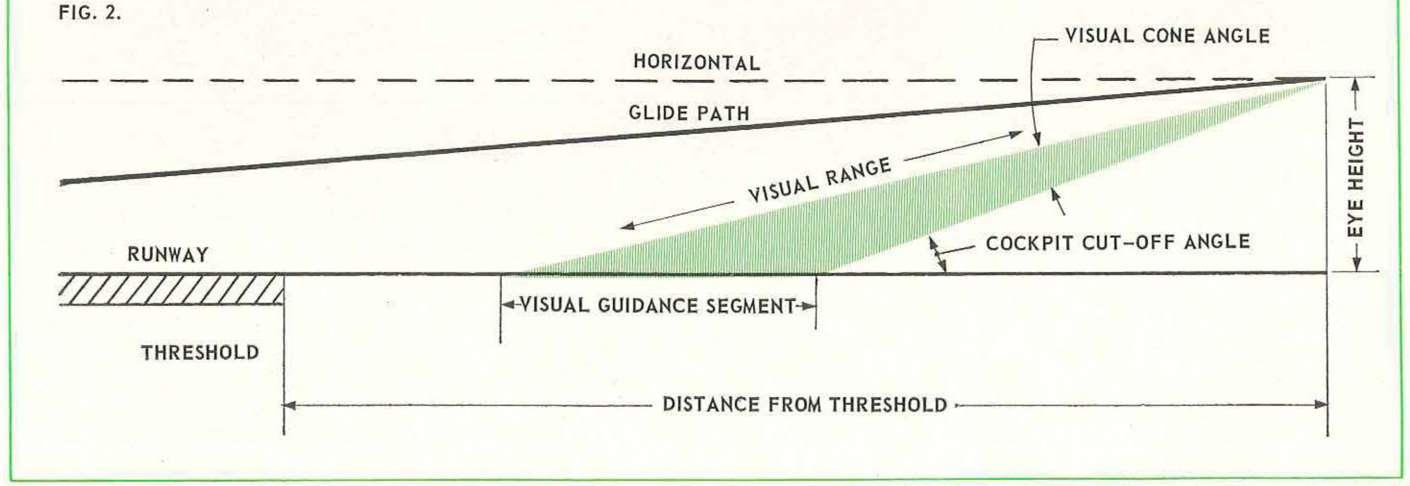
Because the vertical situation is so difficult to assess, a pilot will attempt to check his judgement by other means. At low altitudes, it is possible to estimate height from a knowledge of terrain features such as trees, buildings and roads, and to a lesser extent from the size and spacing of the approach lights. A pilot will then compare this height with his estimated distance from touchdown. But in approaches over sloping or mountainous terrain, which present a false impression of the real horizon, these additional cues can be misleading. Statistics show that accident rates are higher in such areas. The problem of vertical assessment is further compounded by any turns a pilot makes to correct for azimuth displacement.

In this case, as already mentioned, the aircraft entered fog about six seconds before impact and as far as can be determined, experienced a sudden and severe reduction in the previously established guidance segment. The rate of descent increased and about two seconds later, there was a slight engine power reduction. A power reduction at this time strongly indicates that the pilot wanted to lose height. At this point, with the aircraft only 175 feet above the approach lights, the only possible reason for wanting to lose height at the rate shown by the flight recorder is that the pilot thought the aircraft was higher than it was. The one plausible explanation is that the shortening of the guidance segment on entering the fog gave the pilot the illusion of being too high above the lights.

The approach path in this case crosses directly over a valley with the runway threshold situated immediately above a steep slope. Thus, if the pilot had attempted to obtain additional visual

Diagram illustrating "Visual Guidance Segment".

FIG. 2.



cues from the terrain directly below the aircraft, the illusion of being high may have been even more pronounced.

Although a visual range of 500 feet has been assumed in assessing the visual guidance segment available to the pilot, it seems possible, in view of the close proximity at which the aircraft passed over the lights, that the visual range was much less than this. If this were the case, the vertical guidance would have been even worse than assumed, and could account for the crew's obvious lack of awareness of their danger until it was too late.

The Federal Aviation Regulations provide that, on an instrument approach, a pilot may not descend below the minimum descent altitude unless the approach lights or other markings identifiable with the approach end of the runway are clearly visible. If any of these requirements are not met at the missed approach point or any time afterwards, the pilot must immediately execute the prescribed missed-approach procedure.

The demands of safety are presumably satisfied by these provisions on the reasoning that if the pilot can clearly see the approach lights or other features identifiable with the approach end of the runway, he will be able to descend and land safely. Conversely, if at any time he loses sight of the ground or the approach lights, he can safely execute a go-around. The National Transportation Safety Board believes that there are deficiencies in this thinking, in that the expression "clearly visible" is not defined, and the minimum ground reference or guidance segment, necessary for non-precision approaches in low visibility, has never been established. Even the limited information referred to here has not been widely distributed, nor is it included in airline or other pilot training manuals. In consequence, a pilot is forced to make a purely subjective determination of the adequacy of the visual guidance segment available, whenever visibility in the approach zone is less than the reported prevailing visibility, or the runway visual range. Under the present regulations, a pilot may elect to continue on approach if he has only one or two light bars of the approach light system in sight at the minimum descent altitude.

In most instances, during an approach in low visibility conditions, the guidance segment first observed will continue to improve as the descent continues. Thus, by experience, a pilot is conditioned to expect an increasing ground guidance segment once visual contact has been established. However, the reverse of this is true when an aircraft proceeds from visual conditions into a fog layer. In these circumstances, the visual guidance segment that at first seemed adequate will decrease as the top of the fog is approached, and will reach its minimum value at the moment of penetration. For this reason, a pilot's appraisals of the adequacy of the ground guidance segment can be made accurately only at this time. The pilot's decision, whether to continue or abandon the approach, must then be instantaneous and precise. Continuing a descent into shallow ground fog with marginal ground guidance, can obviously be deceptive and hazardous. From a safety standpoint therefore, deficiencies in the regulations are apparent, since under the conditions described, a pilot can place his aircraft in a position where a recovery might not be safely accomplished.

Probable cause

The Safety Board determined that the probable cause of the accident was an unrecognised loss of altitude orientation during the final portion of an approach into shallow, dense fog. The disorientation was caused by a rapid reduction in the ground guidance segment available to the pilot, at a point beyond which a go-around could not be successfully effected.

* * *

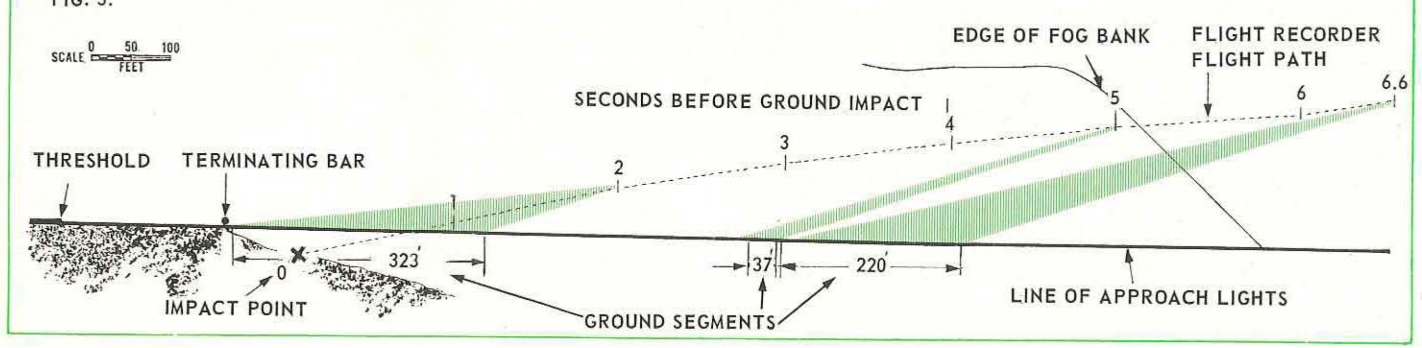
As a result of this accident the National Transportation Safety Board has made a number of recommendations to the United States Federal Aviation Administration. These include a research project on instrumentation necessary to provide slant visual range information.

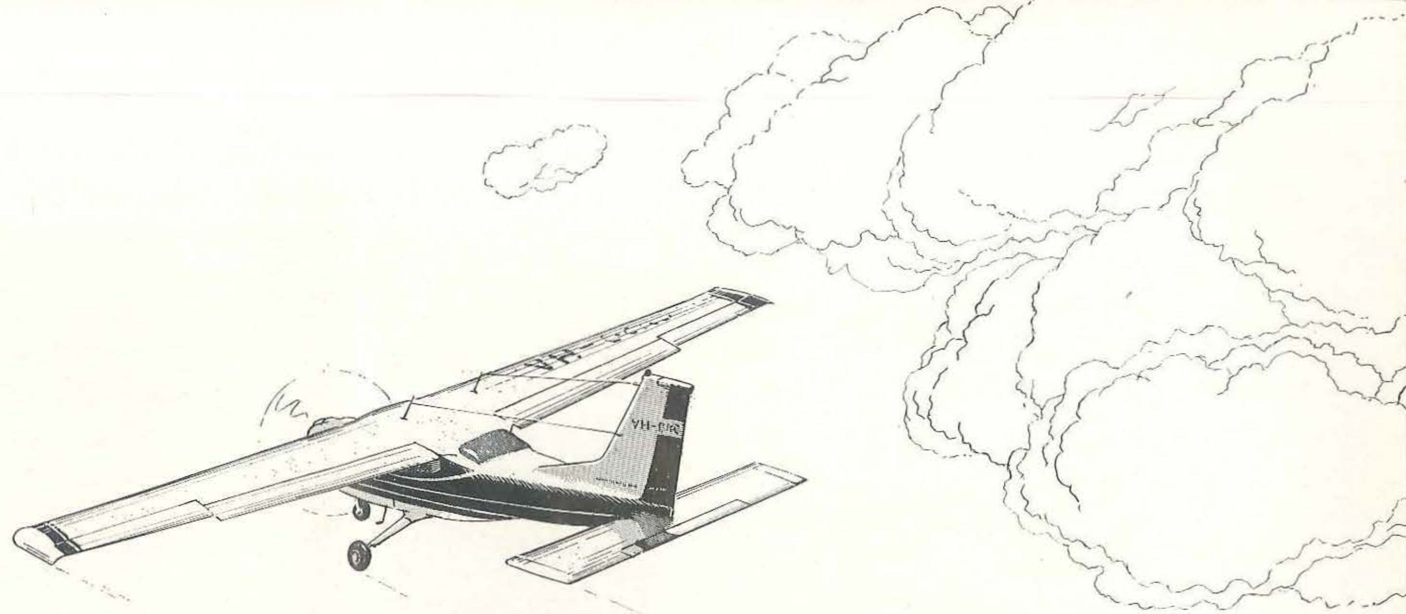
Likewise our own Department, in a comprehensive paper entitled "Visibility and Decision Heights for Low Weather Minima", has presented a case to the all-weather Operations Panel of the International Civil Aviation Organisation, detailing ways in which safety can be improved in low visibility approaches.

Table and diagram compiled during investigation to determine visual guidance segment available to crew during various stages of approach.

TIME FROM IMPACT (SECONDS)	PITCH ANGLE	CUTOFF ANGLE	HEIGHT ABOVE APPROACH LIGHTS	SEGMENT OF APPROACH LIGHTS VISIBLE
6·6	11°	7°	190 feet	220 feet
6·0	"	"	170 "	167 "
5·0	"	"	150 "	37 "
4·0	"	"	125 "	122 "
3·0	"	"	95 "	212 "
2·0	"	"	60 "	323 "
1·0	"	"	10 "	473 "
0·0	"	"	35 "	IMPACT

FIG. 3.





TOO LOW, TOO SLOW?

Shortly after taking off from Inverell, New South Wales in hot and gusty conditions, a Cessna 177 began a shallow turn to the left at a height of about 200 feet. As the turn continued, the angle of bank steepened suddenly, the nose dropped, and the aircraft, still turning, dived to the ground and caught fire. Though seriously injured, the passenger tried to rescue the pilot but was prevented from doing so by the intensity of the fire.

The pilot, who lived in Sydney, had business interests in northern New South Wales, and at the time of the accident was staying at Inverell. It was his normal practice, when visiting his interests in the country, to fly himself in his own company's Cherokee 235, but because the weather was poor when he was to leave for Inverell a few days previously, he had left his aircraft in Sydney and travelled by car on this occasion. Not having his own aircraft available during his stay in Inverell, he had hired the Cessna 177 locally because he also wished to make visits to Grafton and Coffs Harbour. It was his intention to fly to Grafton, and then continue to Coffs Harbour to stay overnight before returning to Inverell. The passenger accompanying the pilot was a business associate and friend.

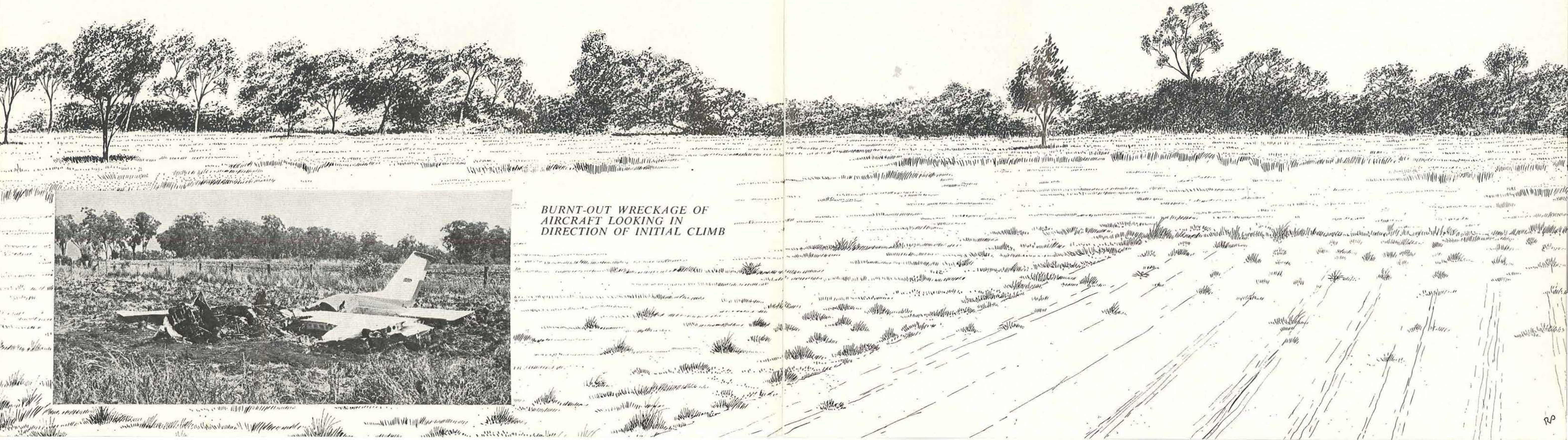
Although the pilot's licence was endorsed for Cessna aircraft, he had not flown the Cessna 177 before, and on the morning of his proposed flight, he went to the aerodrome to complete arrangements for hiring the aircraft and to be briefed on the handling characteristics of the type. The pilot then returned to the town.

After having lunch at the hotel where they were staying, the pilot and his passenger drove to the aerodrome and, together with the owner of the aircraft, prepared a flight plan for the proposed flight to Grafton and Coffs Harbour. The pilot then telephoned the plan to the Coffs Harbour flight service unit. The day was fine and hot and after loading their luggage into the aircraft and carrying out a pre-flight inspection in the hangar, they pushed the aircraft out and the pilot and passenger took their seats. The engine started satisfactorily and the pilot taxied out for take-off. The wind was light at the time, blowing in gusts from the north-west.

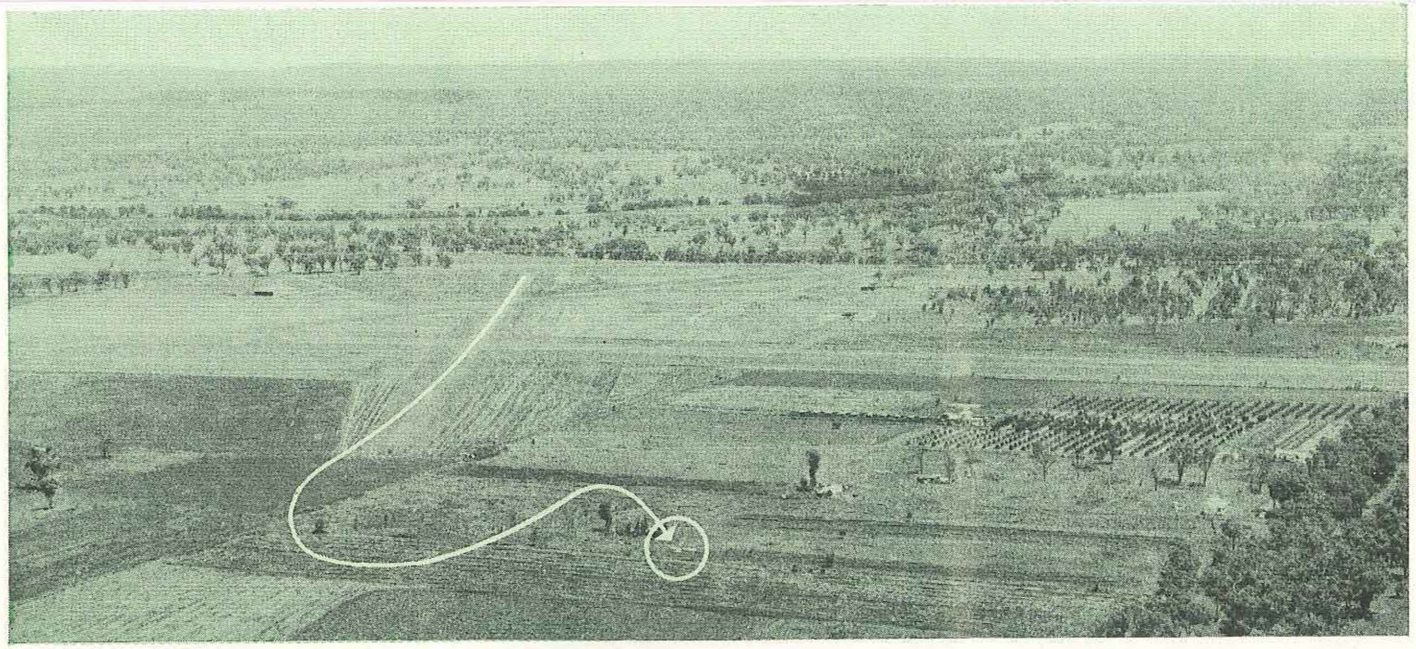
After reaching the threshold of the north-western strip, the pilot ran up the engine, but as he was not satisfied with the way the carburettor heat control appeared to be working, he taxied back to the tarmac. After having a look at the aircraft, the owner told the pilot that the carburettor heat control was in fact working satisfactorily and explained its operation in some detail. This satisfied the pilot and, after starting the engine again, he taxied back to the strip where he carried out another engine run-up and take-off check.

From his hangar office, the owner watched the aircraft line up on the strip and begin its take-off. It became airborne after a run of about 1500 feet and began to climb in an apparently normal manner. Some 2000 feet beyond the lift off point, when the aircraft had reached a height of about 200 feet, it began a gentle turn to the left. As the turn continued, the angle of bank steepened suddenly, the nose dropped and the aircraft spiralled steeply into the ground. A tremendous cloud of dust arose, and the owner immediately rushed to the telephone to call for assistance.

The crash was also seen by a mechanic who was working on a tractor in a paddock immediately to the north of the aerodrome. He saw the aircraft begin to burn after impact and ran at once towards the site of the crash. Meanwhile, the passenger who had been stunned by the impact, had recovered consciousness to find the aircraft burning and his luggage, which had been in the back seat, lying on top of him. He had succeeded in extricating himself and was attempting to drag the pilot free



BURNT-OUT WRECKAGE OF AIRCRAFT LOOKING IN DIRECTION OF INITIAL CLIMB



Aerial view of aerodrome showing direction of take-off and approximate flight path.

when there was an explosion and the fire increased greatly in intensity. The passenger was forced to abandon his attempt and by the time the mechanic arrived to assist him, he had managed to stagger from the burning aircraft.

* * *

The site of the crash was in the corner of a paddock some 1,500 feet north-west of the far end of the strip from which the aircraft had taken off. The surface of the ground was level and soft and covered in dense dry grass. The aircraft had struck the ground in a nose down attitude of about 60 degrees while banked 30 degrees to port and on a heading of about 210 degrees. After the initial impact, the aircraft had bounced backwards and come to rest in an upright attitude.

Although much of the wreckage was destroyed by fire there was no evidence of any airframe or control malfunction which could have contributed to the accident. All control surfaces and cables were intact and the flaps were also intact and extended slightly from the fully retracted position. The engine and fuel system appeared to have been capable of normal operation and the aircraft was loaded within its prescribed limits. Its all-up-weight at the time of the accident was about 94 per cent of the maximum permitted in the conditions prevailing at the time.

When interviewed later the passenger said that the pilot, during his pre-take-off drill, had checked the flying controls to the limit of their travel. He had also selected the flaps to the normal setting for take-off. Throughout the take-off and climb, the engine had run smoothly and without any roughness or hesitation. There was some turbulence after take-off and at a height of about 200 feet, the pilot had begun a gentle turn to the left. As the turn progressed, the angle of bank increased violently, the nose dropped steeply, and the pilot called out that they were "going in". The passenger added that the engine appeared to be functioning normally before and throughout the upset.

The pilot's log books showed that he had not flown this type of aircraft before, and that for the past two years, all his flying had been undertaken in Cessna 182, Piper Comanche 250, and Piper Cherokee 235 aircraft. As well as this, it was evident that throughout the ten months preceding the accident, the pilot had flown his own Cherokee 235 exclusively.

The evidence of the investigation left no doubt that the sudden dropping of the aircraft's nose and the subsequent steep dive to the ground, was the result of a loss of control, and was possibly the outcome of an aerodynamic stall. The reason for the loss of control however, was not clear.

Although weather conditions were satisfactory for the flight, the actual wind component that existed during the take-off and the initial climb could not be determined with any certainty. A post analysis of the synoptic situation on the day of the accident indicates that the gradient wind was from the west-south-west at five knots and the surface temperature was 31.5 degrees C. However, there was some cumulo nimbus cloud development in the area, and from witness evidence it was apparent that this was affecting the local wind velocity to some extent. The passenger in the aircraft said that the wind-sock was angled at 30 degrees from the vertical as they taxied out, which suggests a wind strength of at least seven to eight knots. The owner of the aircraft estimated the wind strength at about eight knots, gusting to twelve knots, while the witness who had been working on the tractor a short distance to the north of the aerodrome estimated the wind in that area as about five to seven knots. He also described the smoke from the burning wreckage as "drifting" back over the aerodrome. It seems possible therefore, that the head-wind component evident during the aircraft's take-off could have diminished as the aircraft left the ground and climbed away.

Although the passenger's evidence clearly indicates that the pilot set the flaps to the normal take-off setting during his cockpit check, the wreckage examination showed that the flaps were almost retracted when the aircraft was destroyed by the fire after impact. It is perhaps possible that the flap switch could have been moved to the "up" position at impact, energising the flap motor until the electrical circuit was destroyed by fire but it seems much more likely that the flaps would have been retracted deliberately by the pilot before he lost control of the aircraft. The aircraft at this stage had reached a height

View of wreckage looking in direction of impact. The flaps are almost fully retracted.

at which it would be normal for a pilot to retract the flaps after take-off.

It is evident from the pilot's flying history that before the flight on which the accident occurred, he was totally unfamiliar with the handling characteristics and performance of the Cessna 177, and that he had been conditioned over a period of two years, to flying more powerful, higher performance aircraft. The distance run by the Cessna during its take-off run does not suggest that the lift-off was made prematurely, but it seems possible that an unsafe speed might have developed during the climb as a result of the pilot's unfamiliarity with the aircraft. Because the flying attitude of the Cherokee 235, as seen from the cockpit, gives the impression of being much more "nose-up" than that of the Cessna 177, the pilot could have unwittingly raised the nose too much as the aircraft climbed. This, coupled with the considerably lower performance of the Cessna 177 in the existing conditions, could easily have led to an unnoticed, gradual decay in airspeed.

If as well, the pilot had retracted the flaps on reaching what he believed was a safe height, he might have subconsciously eased back the control column to counteract the tendency for the aircraft to sink as the flaps came up. The retraction of the flaps would in any case have raised the aircraft's stalling speed, thereby decreasing the margin of safety between the stalling speed and the airspeed at which the aircraft was actually flying. The evidence that the gusting head-wind component could have lessened after the aircraft took-off, might also have had a brief but nevertheless adverse effect on this speed margin.

At the weight at which the aircraft was operating and in the density altitude existing at the time, only 40 degrees of bank would have been sufficient to increase the aircraft's stalling speed from 49 knots to 56 knots with take-off flap lowered. With the flaps retracted, the stalling speed would have increased to 60 knots, which according to the aircraft's take-off chart, was the take-off safety speed in the conditions existing at the time. The passenger described flying conditions during the take-off as "a bit turbulent" and although there seems little doubt that the gentle turn to the left was a deliberate manoeuvre to position the aircraft on track to Grafton, the sudden violent further bank in this direction was obviously not intentional, and was in all probability the result of turbulence. There were thunderstorms in the area and in these conditions, patches of quite powerful thermal turbulence would be quite likely.

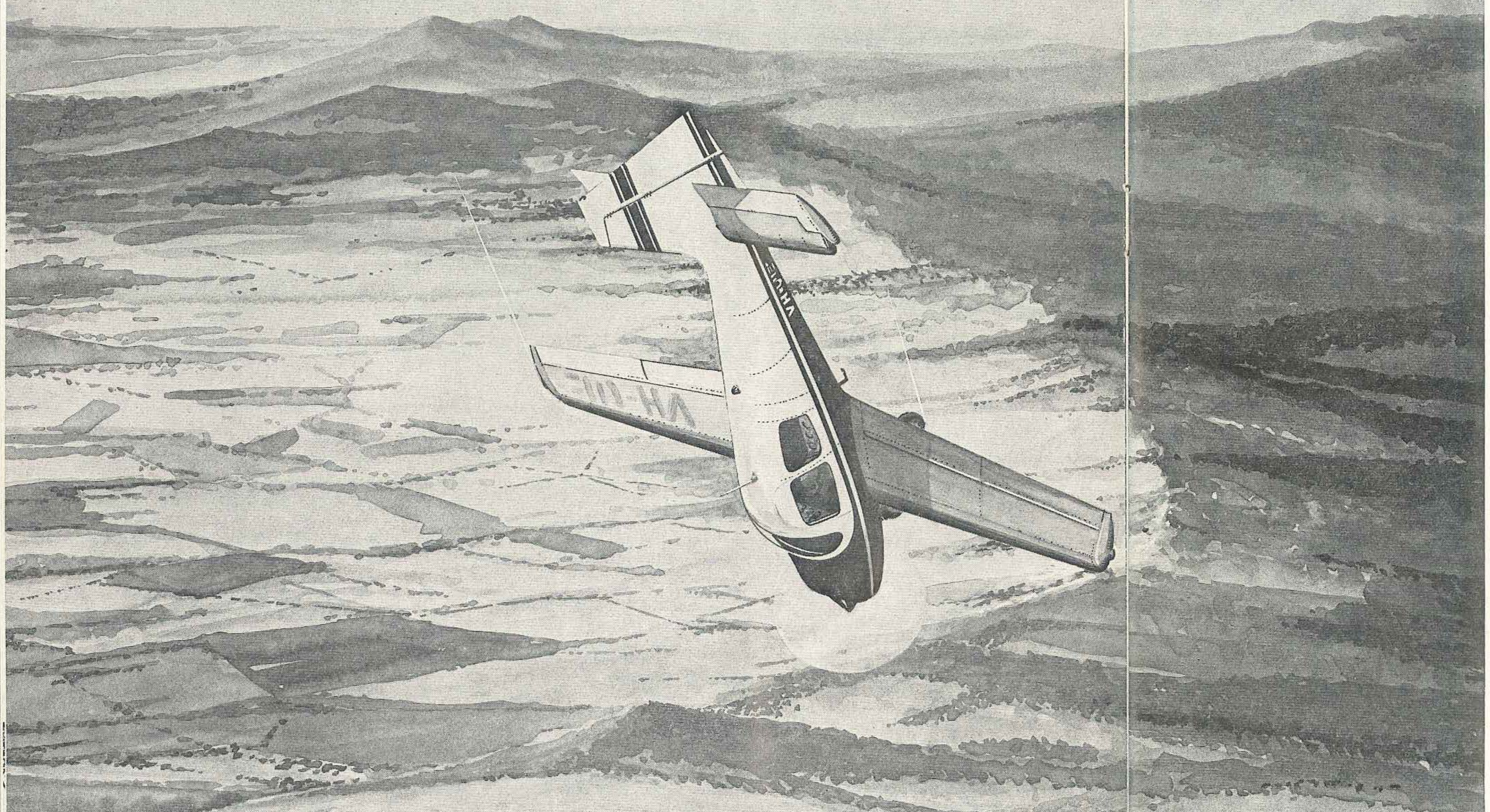
At a low airspeed when the aircraft was already banked a sudden encounter with such a patch of turbulence could easily produce the violent wing drop described by the passenger. If this unintentional manoeuvre were sufficiently steep, and the airspeed sufficiently low it would be almost impossible to prevent a sudden dropping of the nose, even if the aircraft did not actually stall. The aircraft would have simply "fallen out" of its excessively banked attitude and, at the comparatively low height at which it was flying there would have been little hope of recovering from the resulting spiral dive before the aircraft struck the ground.

Although from the available evidence, it is obviously not possible to reconstruct an exact sequence of events that led to the accident, it is clear that the loss of control was the result of some combination of a number of the factors discussed. Foremost amongst these is the fact that the pilot, though entirely competent to fly the aircraft types on which he was experienced, had no first-hand knowledge of the aircraft type involved in the accident. For this reason as well as emphasizing the hazards which a combination of low altitude, low airspeed, and hot gusty conditions can pose in a heavily laden light aircraft, the accident serves to drive home an important point which some flying organizations are at present too ready to overlook: that no matter what a pilot's experience in other types of aircraft, if he is not in current practice on the type he wishes to hire, it is no more than good airmanship, as well as only fair to the pilot himself, for him to undergo a flight check in that aircraft type.

Cause

The probable cause of the accident was that the pilot, who was inexperienced on the type, lost control of the aircraft at a height which was too low to permit recovery. It has not been possible to establish the reason for the loss of control.

The Stress of the Moment



RECENTLY, while an inspection was being carried out on a Beagle Pup, cracks were found in panels on the top surfaces of each wing near the outboard ends of the fuel tanks. Further investigation disclosed a number of loose rivets in both the upper and lower wing surfaces.

This particular aircraft was operated by a flying training school and had been used regularly for aerobatic training. Although the actual circumstances in which the damage had been incurred could not be positively established, the aircraft had clearly been subjected to flight loads considerably in excess of those for which the structure is designed. The damage was in fact, typical of that which would be expected from especially harsh aerobatic or flick manoeuvres.

It is vital that pilots who fly the Beagle Pup understand that, although the aircraft is cleared to perform a wide range of aerobatic manoeuvres, it is not certificated in the Aerobatic Category. The aircraft has been designed for structural load factors significantly lower than those required for fully aerobatic types and, in Australia, is approved for operations in the Utility Category.

As is the case with all aircraft certificated in the Utility Category, the aerobatic manoeuvres for which the Beagle Pup is approved, together with the entry speed for each manoeuvre, are specified in the aircraft's approved flight manual. These entry speeds are chosen with the dual purpose of ensuring that firstly, the manoeuvres can be completed safely, and secondly that, providing the aircraft is flown accurately, the maximum structural load factors will not be exceeded. Even then, to operate as a Utility Category aircraft, certain restrictions on gross weight and the loading of the rear passenger seats and baggage compartment must be observed. The approval for the Beagle Pup to perform various aerobatic manoeuvres is based on flight tests conducted in the United Kingdom during the aircraft's initial type certification. The manoeuvres were evaluated, and the design of the structure was found to provide an adequate margin of safety for the manoeuvres the aircraft is permitted to carry out.

Some years ago, an article dealing with the danger of performing aerobatics in normal category aircraft was published in the Digest. (See 'You CAN Loop them, but...", Aviation Safety Digest No. 40). This article emphasized the extreme hazards of subjecting an aircraft structure to loads greater than those for which it is approved, and included a summary of the positive and negative limit load factors to which aircraft in the various categories are designed. These details are reproduced in the table on this page to illustrate once again, the differences in the structural requirements for normal, utility and aerobatic categories.

Load Factor	Aircraft Category		
	Normal	Utility	Aerobatic
Maximum positive "g" (n_1)	Usually between +3.5 & +3.8	+4.4	+6.0
Maximum negative "g" (n_3)	$-0.4 \times n_1$	−1.8	−3.0

The design "limit loads" as determined from the table for the different aircraft categories, are those which the aircraft structure will withstand during a manoeuvre without incurring structural damage. It follows that, if these aerodynamic loads are exceeded in flight, some damage is almost certain to result. The degree of damage will of course be proportional to the load imposed, and the point beyond which the aircraft structure may actually fail is known as the design "ultimate load". Although aeroplane design requirements demand a safety factor of at least 1.5 between the limit and ultimate loads, any statement of the sort that claims an aeroplane is "150 per cent stronger than it need be", can be very dangerously misconstrued.

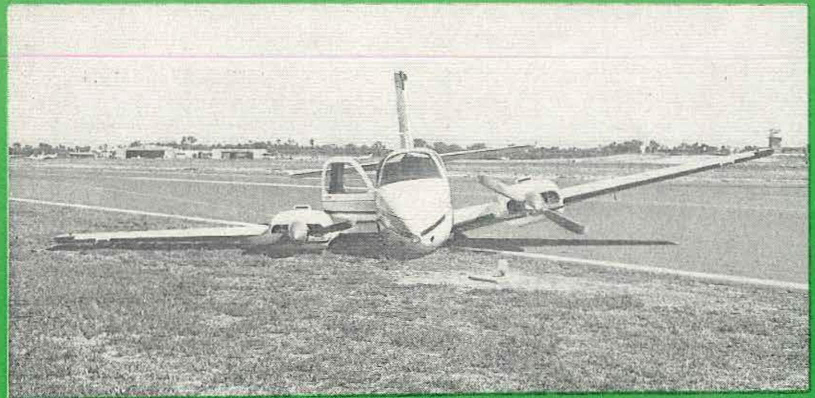
For example, it is not unknown for pilots, who should have known better, to have interpreted this 1.5 safety factor as meaning they could safely impose a 50 per cent greater aerodynamic load, or fly up to 50 per cent in excess of placarded speeds! It is vital for such pilots to remember that aerodynamic loads vary as the **square** of the speed, so that if the speed is increased 1.5 times, the load on the aircraft structure will increase by a factor of 2.25!

The earlier Digest article also included details of an investigation to determine the maximum positive and negative flight loads actually encountered when performing aerobatic manoeuvres. Using a fully aerobatic aircraft, flown by a very experienced aerobatic pilot, it was found that in a series of conventional manoeuvres, the aircraft structure was subjected to flight loads which dangerously exceeded the design limits for normal category aircraft, and very closely approached the maximum positive and negative limit load factors for those in the Utility Category.

It should be obvious that measurements taken in one particular aircraft cannot be related directly to an aircraft of a different type, and these results can only be regarded as an indication of the loads **likely** to be experienced in a typical light aircraft. Nevertheless, it is clear, even from this brief test, that it would take only a small amount of rough or inexpert handling to increase these loads to the point where the design limits for the Utility Category would be exceeded. Just how easily this can in fact, occur was demonstrated recently during an investigation carried out in the United Kingdom as part of a structural fatigue life-estimation programme. Recording accelerometers were installed in a number of training aircraft to determine the actual loadings achieved during aerobatics. These showed that excessive flight loads were being imposed sufficiently often to suggest there was a real risk of the ultimate design strength of the aircraft being exceeded inadvertently.

It is clear from this overseas experience, as well as from the damage sustained by the Beagle Pup in Australia, that pilots need to exercise great care in performing aerobatics in aircraft which, although approved for aerobatic flight, are designed only for utility category load factors. Before attempting aerobatics in any such aircraft, pilots should ascertain from the approved flight manual, the manoeuvres permitted and the appropriate entry speeds. Approved manoeuvres vary widely from type to type and the fact that an aircraft is certificated in the Utility Category does not automatically permit all the normal aerobatic manoeuvres to be carried out.

To avoid overstressing the aircraft, it is essential that pilots confine their manoeuvres only to those specified in the flight manual and at the same time strictly observe the prescribed entry speeds. Provided also that care is taken not to apply excessive flight loads during aerobatics, the structural design of the aircraft is such that an adequate margin of strength exists for the approved manoeuvres. Pilots who wish to perform more advanced manoeuvres should confine their aerobatic flying to aircraft designed to fully aerobatic load factors.

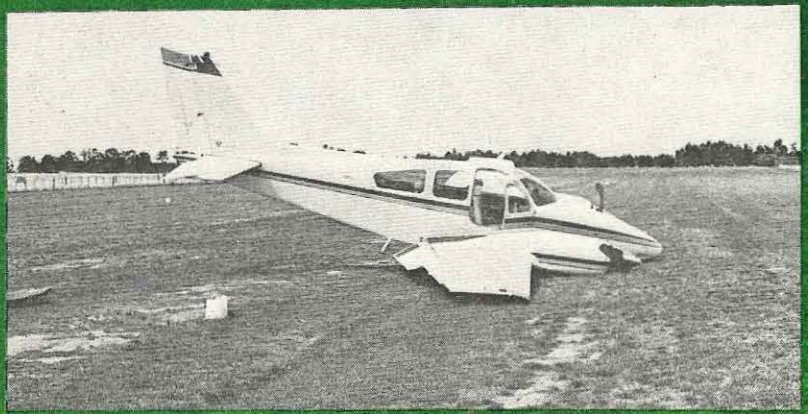


LANDING

For normal landings, make a power off, full flap approach at 8[illegible] kts IAS. Maintain this airspeed with an even rate of descent to a point 12 to 15 feet above the runway. At this point bring the nose slightly above the level attitude and hold the aircraft off by continuing the back pressure as the airspeed slows. After the aircraft is on the ground, raise the flaps to increase breaking efficiency.

!!! ***The unconscious humour of this spelling error is marred only by the expensive results that advice of this sort is likely to produce. The few such results depicted here speak for themselves — but there are many others we could show if we had the space!***

In all normal landings, it is sound practice to complete the landing roll, clear the runway, and bring the aircraft to a full stop **before** *retracting the flaps. This way you're much less likely to make a mistake!*
Retracting the flaps immediately after touch-down **may** *improve braking* **slightly** *on some aircraft types —*
But:
Calculations show the gain is minimal;
Statistics show the risk is considerable!
In any case be sure it's the flaps you retract — not the undercarriage!



'This airscrew is to be treated as alive at all times'

ONCE upon a time in the Services, this very sound little homily was thoroughly drilled into every new aircrew or engine fitter recruit before he was allowed anywhere near an aeroplane! And even if not in so many words, the same philosophy was instilled as a matter of course into all flying members of the aero club movement and was assented to by all as unquestioned good sense.

At that time of course, many types of aircraft, and certainly all ab-initio training aeroplanes, had to be started by hand. Thus, in the minds of the pilots of the day, flying and propeller handling were inseparable, and the seemingly dangerous task of swinging the propeller was taken for granted as a normal, every-day aspect of operating a light aeroplane. Far from engendering a high proportion of propeller handling accidents as might have been expected, the number of injuries were surprisingly few — no doubt because the operation was treated seriously. Learning the technique of propeller swinging was part of every pilot's training and, as a result, it was accorded the respect it deserved.

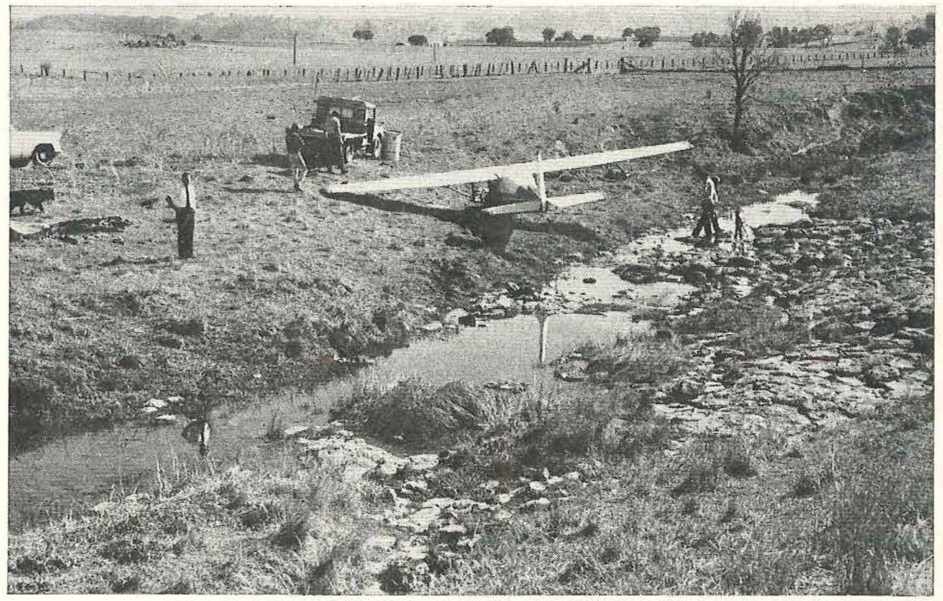
By contrast today, when engine starting by hand is only rarely attempted on most types of aircraft, and the great majority of pilots are accustomed to merely "pressing the button", propeller handling accidents are occurring with surprising frequency. Had we the space to do so, we could list quite a number of such instances all of which have a useful safety message. However, the following few examples should be sufficient to show what we mean:

• *While carrying out a daily inspection, the pilot of an agricultural Pawnee checked that the switches were off and took hold of the propeller to pull the engine through its compressions. As he swung the blade, the engine proved "tighter" than he expected. The pilot lost his balance, fell forward, and the still-moving blade gashed his head badly. A major inspection had just been completed on the engine, making it hard to "pull through," as well as causing it to "kick" vigorously over compression.*

• *After starting the engine and letting it warm, the pilot of an Auster noticed it running roughly. Suspecting a sticking exhaust valve, he shut down the engine and, ensuring that the magneto switches were off, he began winding the propeller to feel for a weak compression. As he pulled it through the third compression, the engine "kicked" suddenly, the propeller struck his arm, fracturing one of the bones.*

• *After refuelling his aircraft at a country airport, the pilot of a Cessna 182 attempted for several minutes to start the engine without success. Eventually, when the battery was exhausted, the pilot concluded the engine was flooded, so he turned off the switches, applied the hand brake, and chocked the port main wheel with the single chock he was carrying in the aircraft. He then opened the throttle fully and wound the propeller several times to blow out the rich mixture. Setting the throttle for starting, the pilot turned on the magneto switches, swung the propeller, and the engine started. As it increased in R.P.M., the aircraft rode over the single chock and moved forward. The pilot tried to climb aboard, but was prevented from opening the cabin door by the slipstream. The aircraft continued forward until it struck a steel trolley. Before the engine finally stopped, the pilot was injured by a piece of metal thrown from the badly damaged propeller. The pilot commented afterwards that he had forgotten to tighten the friction nut when he set the throttle for starting.*

• *The owner of the Cessna 150 pictured below was preparing for a flight from his country property. When he found there was hardly enough charge in the battery to start the engine, he set the throttle, pulled on the hand brake and chocked the wheels with three pieces of 4 x 2 inch timber. After turning on the switches, the pilot swung the propeller. As the engine came to life, the pilot realised the aircraft was going to jump the makeshift chocks, and ran around to switch off the engine. He grabbed the strut to restrain the aircraft while he climbed aboard but it swung, and he missed his footing on the cabin step and was thrown to the ground. While he watched helplessly, the aircraft gathered speed, ran beyond the confines of the landing area, crossed a road, tore its way successively through three fences and finally crossed a creek-bed, before coming to rest on the other side of the creek damaged beyond repair.*



It is not only the Digest that is concerned with the trend illustrated by these accidents. Fortunately, there are still some experienced and responsible pilots who are very mindful of the dangers of propellers, and are conscious that present attitudes to propeller handling generally are far from satisfactory. Two who have written to us recently, make no claim to be immune from error themselves, but they have taken the trouble to describe their own recent salutary experiences to try and inculcate a healthier respect for propellers generally. The two accounts speak for themselves and, we hope, will be taken to heart by all who read them!

The owner of a Chipmunk writes:—

"I had prepared my Chipmunk for starting and it failed to start. I reprimed the engine, pulled the propeller through and went to place the propeller in the impulse position. To my amazement the engine sprang into life, and there was almost a serious accident. Had it not been for the thorough training I had received in the past, the propeller would have struck my hand, arm, head or torso. I am sure that it was only the habit of handling a propeller correctly that saved my life. Of course, the magneto switches should have been turned off when I re-prepared the engine. This I had neglected to do. So perhaps the pilot in the account that follows could be more excused than I for my carelessness!

Strangely enough, when I was putting my aircraft away in its hangar only a week later, I could not help noticing a young fellow fooling around with the propeller of a Cessna nearby. At first I supposed he knew what he has doing and was slowly turning the propeller while he listened for a clicking of the impulse. After some time I realised he obviously knew nothing about handling a propeller safely because he was pulling on it and leaning on it, as though it were a branch of a tree.

After watching this performance for a short time, I felt it was my duty to go over and say, 'Look, I have no right to comment as to what you are doing, but you're giving me the horrors the way you're handling that propeller. Don't you realise that a faulty magneto switch could cause it to fly into action and kill you?' Fortunately he saw the wisdom of my comment, and said 'Fair enough' ".

The other owner-pilot relates a similar experience:

"After completing a local flight in my aircraft, I noticed before shutdown that the left magneto was "live" with the switch "OFF". As I had previously experienced this problem with the right magneto, I knew the reason for the trouble — the magneto earth terminal wire had broken. Having a spare terminal, I made up my mind to replace it on my next visit to the airport.

A week later, before replacing the broken terminal, I decided to complete a daily inspection of the aircraft and began by checking the cockpit. I noted the throttle was closed, mixture in idle cut-off and that the magneto switches were "OFF". As the aircraft is fitted with a fuel injected engine, I switched on the emergency fuel pump for about three seconds to check the fuel pressure. I then went to the engine and checked oil contents, plug leads, pipes and wiring, again noted and even handled, the broken earth wire to the left magneto. Without thinking, I then walked to the front of the aircraft and pulled the propeller through one compression. Immediately the engine fired and ran for several revolutions.

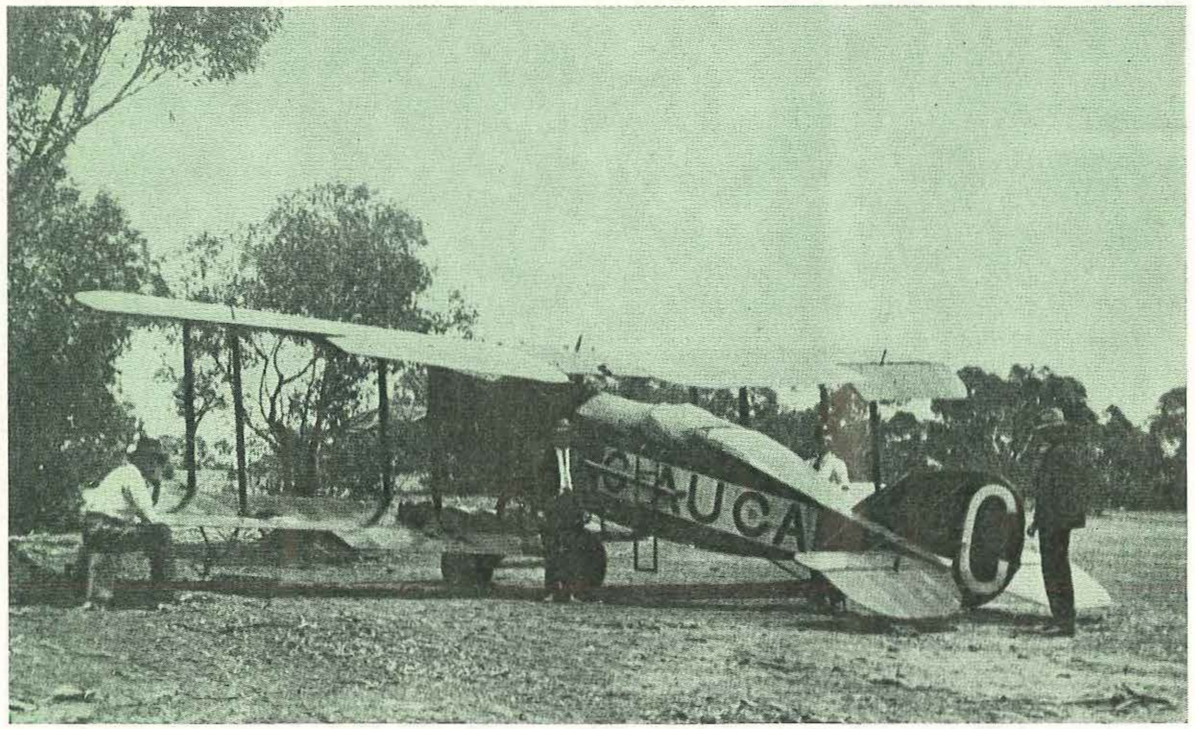
I was mentally stunned. In the past I had spent considerable time trying to develop a hand starting technique without success. Fortunately, thanks to R.A.A.F. training and over 20 years experience, I had developed a healthy respect for propellers and through force of habit I was well clear of the propeller when the engine fired.

On checking the mixture control in the cockpit, I found that it was not in the full idle cut-off position but still had about a quarter of an inch of movement before it reached the stop. This was obviously sufficient for all four cylinders to receive a charge of fuel when I checked the emergency fuel pump pressure. I had not been particularly concerned about accidental firing of fuel injected engines because of the exacting procedure required to start them under normal circumstances. As a result of this experience, I do not intend to take any chances in the future!

Apart from my own stupidity in not physically checking that the mixture was in the full idle cut-off position and my action in pulling through the propeller when I knew that the left magneto was "live", I believe that there is a valuable lesson to be learned from this experience which should serve as a reminder to those of us who have become a little nonchalant over the years.

Regardless of circumstances, it must always be assumed that a propeller is "live" and lethal at all times and should be treated accordingly. In particular, my thoughts are directed to those pilots I have occasionally seen turning propellers by standing directly in front and using a twisting action with a hand on each blade. Should the engine fire or kick back, there would be no way to avoid being struck a severe and possibly lethal blow."

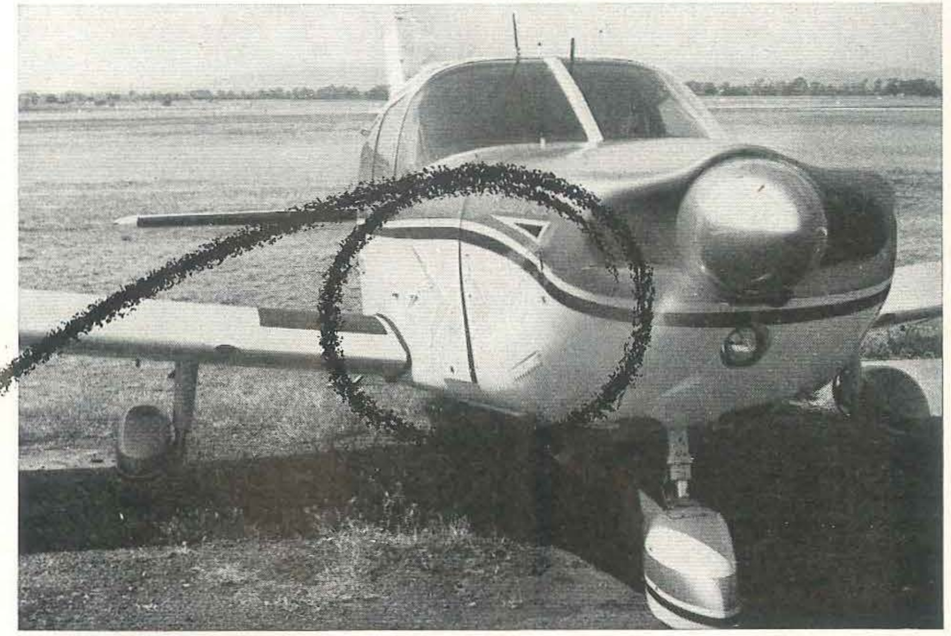
AIR SAFETY ADVICE-ILLUSTRATED



"Clearance not available — stand by!"

(Civil Aviation Branch's Bristol Tourer at Balranald, N.S.W. 1921)

THE TURN OF THE KEY



SOME time ago, the pilot of a Cherokee Six, about to touch down at a country airstrip, was startled to see the door of the nose luggage locker fly open. Almost immediately, there was a loud thump from somewhere outside the aircraft. After completing the landing and shutting down the engine, the pilot found that a 20 lb. gas cylinder had fallen from the nose locker when the door opened. The cylinder had punctured the skin of the starboard wing just ahead of the main spar, and then struck the tailplane, damaging the leading edge and both upper and lower skins. Extensive buckling of the rear fuselage skin had also occurred when the tailplane distorted under the impact.

The aircraft was an early model Cherokee Six and had a nose luggage door fitted with a key type barrel lock (see diagram). Inspecting the locker after the accident, the pilot found that although the door had opened, the tongue of the lock was still in the "locked" position. After he had "unlocked" the door, the pilot had no difficulty in closing it properly again, and he found that the door fitted quite firmly in the normal position.

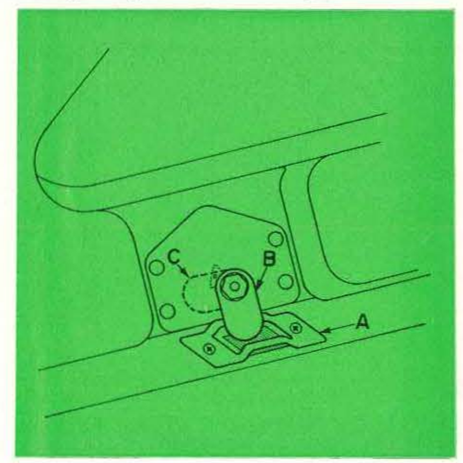
The nose door of the Cherokee Six is made of fibreglass, and is stiffened by a moulded frame section with a diagonal brace. On the aircraft involved in this accident, the fibreglass panel had been further reinforced by a strip of alloy skin riveted to the top of the door across its full width. When the door structure was examined later, the moulded frame stiffener was found cracked in a way that permitted the fibreglass panel to flex to a considerable degree. Furthermore, the lock itself was badly worn and the inner barrel, to which the locking tongue is attached, was loose enough to allow the tongue itself to rotate about 20 degrees on either side of the vertical, "locked" position. The stop, which normally limits the rotation of the key to ensure proper engagement of the tongue in the slotted striker plate on the door sill, was thus rendered largely ineffective. As well as this, because of wear, the maximum amount by which the tongue was engaging the plate was only a sixteenth of an inch.

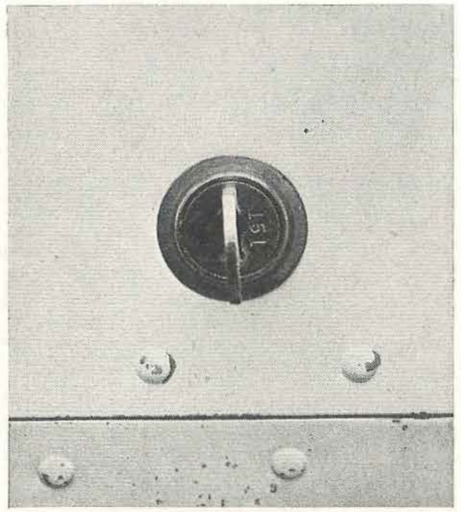
To check the effectiveness of the door lock in this condition, pressure was applied to the door from inside the compartment. It was found that with the locking tongue fully engaged, the door could be sprung open by applying moderate pressure to the panel. But with the key turned as far as possible in the locking direction, the position of the locking tongue was such that only light pressure was needed to spring the door.

At the time the accident occurred, the load in the forward locker, which comprised two large cartons in addition to the gas cylinder, was not tied down. It would have taken only a slight movement of the load to have applied sufficient pressure to the door to flex the structure and withdraw the latch tongue from the slot in the striker plate.

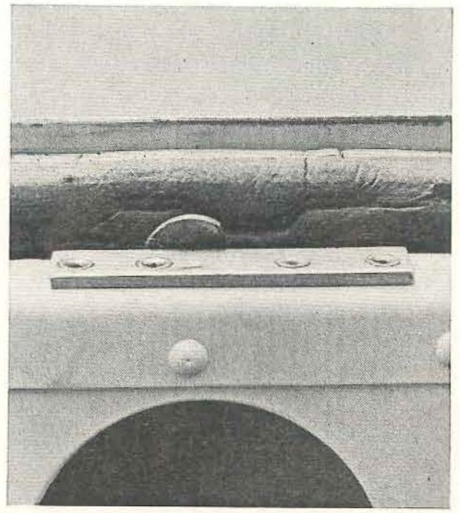
More recently, there have been several other instances in which Cherokee Six aircraft have sustained varying degrees of damage when their nose locker doors opened unexpectedly during a take-off or landing. In one such case the aircraft had just taken off from a large airport when, at a height of about 80 feet, the pilot saw the nose locker door swing open. Fearing that the door might be torn off its hinges, the pilot decided to abandon the flight and, with the aircraft still in the climbing attitude, he closed the throttle, intending to land straight ahead on the runway. The aircraft sank

Cherokee Six door lock assembly showing (a) slotted striker plate, (b) locking tongue in vertical, fully locked position and (c) locking tongue in unlocked position.





Left and right: In these pictures, the nose locker door is in an unsafe condition. Although the key is very close to the locked position the imprint of the striker plate on the rubber door seal shows that the locking tongue is barely engaging the plate.

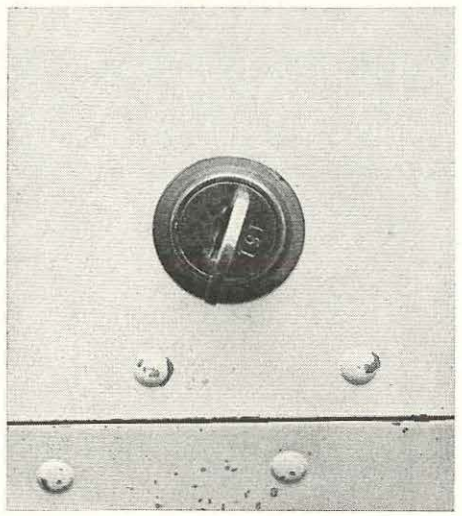


rapidly and although the pilot applied power at a late stage, he was unable to arrest the descent and the aircraft struck the ground heavily on all three wheels. The pilot completed the landing roll and taxied back to the tarmac area, intending to close the door and continue the flight. However, when he inspected the aircraft, the pilot discovered that the wings and undercarriage had been extensively damaged in the heavy landing.

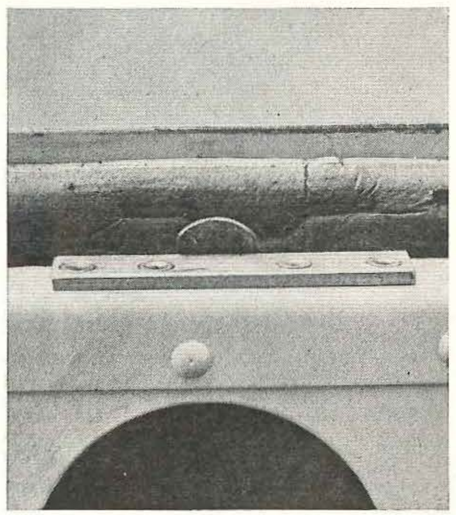
The pilot said after the accident that he was certain that the nose locker door had been closed and locked when he made his pre-flight inspection. The design of the lock is such that it should not be possible to remove the key unless the mechanism is in the fully locked position and, as the key was not in the lock and the door was flush with the fuselage at the time, it would be reasonable to expect that the door was secure. When the door locking mechanism itself was inspected however, it was found that the key could be removed when the door was not fully locked. Further investigation disclosed that the barrel retaining nut had worked loose in service, permitting the whole lock assembly, including the locking tongue, to rotate several degrees in the mounting hole in the door. Under certain conditions, it was possible to remove the key from the lock when in fact, the tongue was only barely engaging the striker plate and the door was actually in an unsafe condition. Had this been the situation when the door was closed, it is highly probable that flexing of the fuselage structure or the locker door itself, under normal taxi-ing and take-off conditions, would have been sufficient to disengage the locking tongue from the striker plate and allow the door to open.

The circumstances of these two accidents are typical of other instances on record in which the nose locker doors of Cherokee Six aircraft have opened as a result of defective locking mechanisms. Although the key-operated barrel-type lock has now been superseded by a trigger-action latch, there are many aircraft still operating with the earlier type locks. To avoid further occurrences of this nature, it is essential that the locks be kept properly adjusted. During regular inspections, particular attention should be paid to the general condition of the door, as well as the security of the lock and striker plate, to ensure proper engagement of the locking tongue.

When loading the nose compartment before flight, pilots should take care that no unrestrained articles are placed in a position where they could bear against the door panel. It is obviously also good practice not to rely on a visual inspection alone, to ensure that the door is securely locked!



Left and right: The nose door fully locked. Because of wear in the lock, the key must be turned past the vertical position to ensure the locking tongue is fully engaged in the striker plate.



HARD TO SWALLOW

SOME years ago, Aviation Safety Digest No. 22 described an accident in which an Auster lost engine power shortly after taking off. The aircraft stalled and crashed, killing all three occupants.

Before the pilot had taken over the Auster on the day of the accident to conduct a charter flight with several intermediate stops, his attention had been drawn to a defective Dzus fastener locking spring at the front of the engine cowling. However, the pilot accepted the aircraft and the flight apparently proceeded normally until just after the aircraft had taken off from one of the landing points along the planned route. At a height between 150 and 200 feet, the engine suddenly lost power and the pilot was faced with an immediate forced landing on unfavourable terrain. Probably in an attempt to return to the aerodrome, he commenced a turn to port but shortly after entering this turn, witnesses said that the aircraft appeared to stall and it struck the ground some distance from the threshold of the strip.

When the engine was examined later, it was found that the button of the defective Dzus fastener had broken away from the cowling and had entered the engine by way of the carburettor air intake. Marks on one of the cylinder heads clearly showed that the fastener had lodged between the inlet valve and its seat, causing the engine stoppage which led directly to the loss of three lives.

Although this fatal accident happened a long time ago now, engine malfunctions caused by the ingestion of foreign objects continue to occur. Recently, reports were received of two such cases involving objects originating from both engine and airframe structures.

In the first of these instances, a Beech Baron had just deparated from Perth Airport on a flight to a town some 150 miles to the south-east. As the aircraft was climbing through 1,000 feet, one engine began to run roughly. Quickly, the pilot carried out a trouble check but he could find nothing obviously amiss. By the time he had completed this check, the engine appeared to be operating normally once more and so the pilot continued the flight.

Passing through 3,000 feet however, the roughness returned and this time the pilot decided to divert to Jandakot to have the source of the trouble traced. Advising Perth A.T.C. of his intentions, he flew direct to Jandakot and, a short time later, landed there without further incident.

During the engine inspection that followed, it was found that portion of the Dzus fastener spring on the air filter cover, which had broken off on some earlier occasion, had worked past the air filter into the induction system. It had then been drawn into the No. 6 cylinder and from marks on the inlet valve seat, it was clear that the rough running had been caused by the valve being held off the seat by the piece of broken spring.

The other recent incident involved a Cessna 150 departing from Perth on a direct flight to Jandakot. During the take-off roll at Perth, the engine suddenly lost power and, abandoning the take-off, the pilot brought the aircraft to a stop on the runway. But when ground checks and an engine run-up revealed no apparent defect, the pilot decided to go ahead with the planned flight. On the next attempt, the aircraft took off normally but a short time later, while en route to Jandakot the pilot noticed a drop in engine R.P.M. However, he was able to continue the flight and in due course the aircraft landed at Jandakot.

A detailed inspection of the engine revealed that the piston and both spark plugs of the No. 4 cylinder had been damaged by a foreign body and upon further investigation, the nut from an engine cowl fastener was found in the exhaust stack of this cylinder. The loss of engine power on the pilot's first attempt to take-off was attributed to the nut jamming under the inlet valve, while the R.P.M. drop in flight was clearly the result of the spark plug damage caused when the nut passed into the cylinder at a later stage. The nut was found to have entered the induction system in the first instance through the carburettor hot air inlet, which is located in the baffle on the right hand side of the engine.

* * *

As a precaution against further occurrences of this type, the operator of the Baron involved in the incident described has adopted more stringent procedures for the inspection of the fasteners on the aircraft's induction air boxes. The operator of the Cessna 150 has fitted wire screens to the carburettor hot air intakes of his aircraft to prevent the ingestion of foreign objects.

The Department has on record many instances in which defective cowling fasteners and hinges, and other various air filter and air inlet attachments, have come loose or failed in service. The fact that, to date, there have been only few cases where these objects have actually entered engine air intakes in no way detracts from the lesson of the fatal Auster accident so many years ago.

Close adherence to prescribed maintenance procedures and proper attention to airframe and engine inspections are the very minimum requirements for preventing engine damage caused by foreign object ingestion. Since the main offenders in the recorded cases have been engine and cowling components, pilots also should pay special attention to the condition and security of these items during pre-flight inspections and ensure that any defects are rectified before further flight.

On the Credit Side

Difficult Forced Landing on Golf Course

BEFORE coming to rest in the manner shown, this Cessna 205 was making a private flight from Archerfield to Pialba, Queensland, with five persons on board. The weather was fine but overcast, and the aircraft was cruising below the cloud base at 3,300 feet.

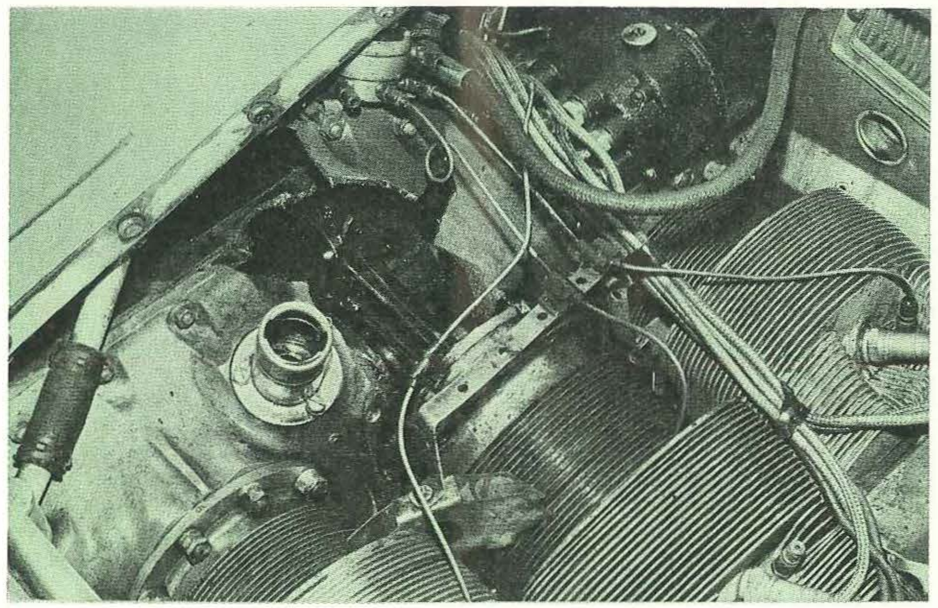
When about six miles south-east of Maryborough, the engine began to vibrate moderately. The pilot checked the engine instruments and controls, including the magneto switches, but there was no noticeable effect. As he finished his checks, there was a loud bang, oil splashed on to the windscreen and the engine lost power completely.

The pilot immediately turned off the fuel and magneto switches, closed the throttle and transmitted a 'MAYDAY' call to Bundaberg flight service unit. There were no suitable forced landing areas close to the aircraft's position, but on sighting the Maryborough golf course, which appeared to be just within gliding distance, the pilot began a flapless straight-in approach down-wind at 80 knots. The pilot waited until the aircraft had cleared a power line and a tall tree at the approach end of his proposed landing path, then quickly lowered full flap, turned off the master switch, and side-slipped off excessive height to put the aircraft down as early as possible. Because he was landing downwind and there were houses and other power lines at the far end of the landing run, the pilot forced the aircraft on to the ground to make the best use of the brakes.

As the aircraft landed, the wheels struck a grass bank which crossed the landing area. The nose wheel was wrenched off and the aircraft bounced back into the air, touched down again on its main wheels and fell forward on to its nose. Despite heavy braking, the pilot was unable to prevent the aircraft swinging hard to port, forcing its starboard wing on to the ground, before it came to rest against another grassy bank at right angles to the landing direction. The pilot and his passengers, who were all unhurt, left the aircraft quickly. After the pilot had ensured there was no fire risk, he returned to the aircraft, turned on the master switch and reported to Bundaberg that all was well.

The pilot, who held a private licence and had just over 200 hours flying experience, acquitted himself very well in the circumstances. With only 15 hours experience on the aircraft type, he was suddenly faced with total engine failure and a very limited choice of forced landing areas. In such an unenviable situation, he displayed commendable skill and good judgement.

Examination of the engine showed that the No. 4 cylinder had broken loose from the crankcase, ultimately causing the No. 4 connecting rod to fail. It was subsequently found that the studs and bolts securing the cylinder to the crankcase had failed from fatigue. As the official report put it, "the fatigue failure of the studs and through bolts was compatible with lack of pre-load applied by the respective nuts". In other words, it is likely that they had not been properly tightened when the engine was last assembled!



THE pilot of this Beagle 206 was an experienced helicopter pilot but, until about a month before the accident, he had not flown a fixed wing aircraft for some six years. He had then undergone several hours endorsement flying training on the Beagle 206 and carried out some three hours further flying on the type shortly afterwards.

The pilot had planned to make a flight from Port Moresby to Kerema with six passengers. After taxi-ing out and conducting the normal pre-take-off checks, the aircraft was cleared for take-off on runway 32. The aircraft accelerated normally to 75 knots, when it became airborne, and the pilot held the aircraft level until it achieved the take-off safety speed of 82 knots. He then climbed away at 90 knots.

After selecting the undercarriage up, by which time the aircraft had reached a height of about 150 feet, the pilot saw that the airspeed had decreased to 85 knots. He checked the instruments but saw no abnormality with the exception of the fact that the port fuel pressure was indicating between four and five pounds per square inch and fluctuating slightly. The pilot turned the booster pump switch up to the emergency position but this made no difference to the fuel pressure. The airspeed had now fallen to about 80 knots and the pilot found that he had to use some starboard rudder to keep straight. Only then did he realise that the port engine had failed.

As the speed was now down to 75 knots, the pilot decided to land in a clear area which lay slightly to the right of the aircraft's heading, while he was still able to maintain control. With the undercarriage retracted, the aircraft touched down under power and slid straight ahead for 300 feet. When the aircraft had slowed to about 25 knots, the port wing struck an embankment and the aircraft swung to the left and came to a stop. The aircraft was substantially damaged by impact forces but none of the occupants was injured. The subsequent investigation revealed that the No. 4 cylinder on the port engine had fractured.

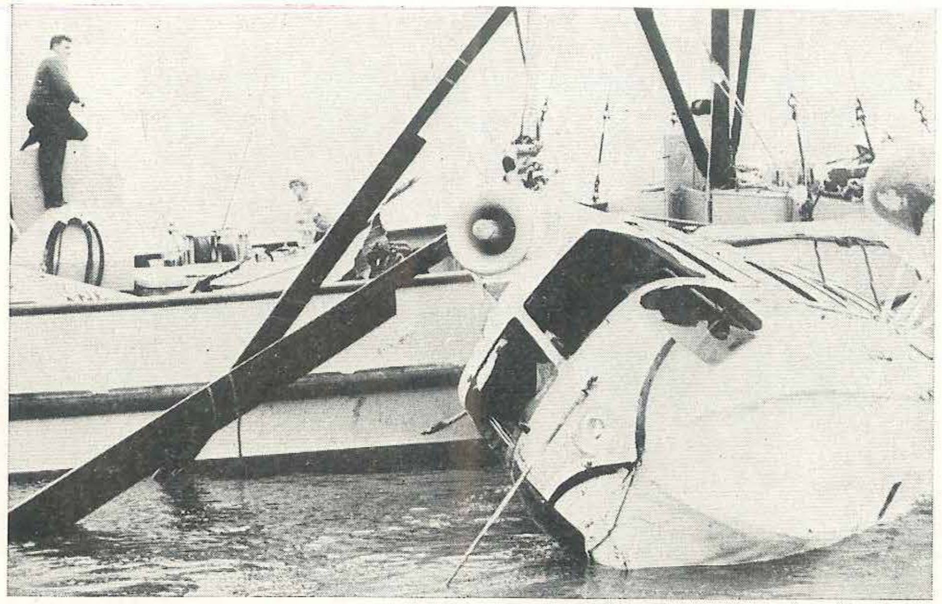
Even after the failure of the cylinder however the port engine should have been capable of producing at least 50% power and full power was available from the starboard engine. It was evident that although the partial engine failure had occurred just after lift off, the pilot did not detect it until he noticed the reduction in airspeed. The pilot's lack of experience on the aircraft type was undoubtedly a factor in the delay in recognising the loss of power, but it is also possible that, as a helicopter pilot, he had become so used to some assymetric "rudder" when he was flying, that he failed to attribute any significance to it while piloting a fixed wing twin-engined aircraft. Whatever the reason however, the fact remains that the pilot did not monitor the operation of the aircraft with the vigilance necessary to detect and identify the engine malfunction.

BEFORE landing at Dunk Island after a private flight from Cairns, the pilot of a Cherokee Six circled the strip several times to check the wind direction and the layout of the aerodrome. There was no wind and while he was circling and making up his mind in which direction he should land, he saw another Cherokee land into the south-east. He therefore decided to land in the same direction and carried out a left hand circuit with this intention. His final approach was steeper than normal and faster than recommended in the existing conditions, and after the pilot had rounded out, the aircraft floated for some distance. It touched down initially about a quarter of the way along the strip, but after striking a depression in the surface, became airborne again and touched down finally half way down the strip. The pilot applied the brakes but on the grass surface, the aircraft did not decelerate as quickly as he expected. When he saw that the aircraft was not going to stop within the confines of the strip, he turned to starboard slightly towards what appeared to be an extension of the strip. When the pilot saw that this area was not usable, he turned the aircraft back to port. By this time, however, the aircraft had passed beyond the markers of the strip and at low speed, the starboard wheel entered a depression and was wrenched off. The aircraft came to rest on its starboard wing and, after turning off the fuel and switches, the pilot and his passengers quickly left the aircraft.

The pilot had a total of 85 hours aeronautical experience, and although he was endorsed in the PA28 which also covers the PA32, he had only recently converted to the latter type. The pilot said that when he arrived over the aerodrome it looked "a bit small" to him and he flew around the area for some time trying to decide whether he should land or not. It seems likely that if he had not seen the other Piper Cherokee land during this time, he might not have attempted to land at all. As well as being inexperienced, the pilot was accustomed to operating from sealed runways at a southern flying school, and was used to flying in cooler conditions. When confronted with over-century heat and its consequent "floating effect" on a landing aircraft, he apparently did not recognise the necessity to "go around" until it was too late.

APPROACHING Bundi in the New Guinea highlands, after a flight from Usino, the pilot of a Cessna 206 thought at first that the strip was obscured by cloud. As he overflew the settlement however, he saw the strip itself was clear though cloud was hanging on the ridge which rises steeply on its eastern side. The pilot entered a normal left hand circuit for a landing into the south but when he turned on to final approach, he lowered only 20 degrees of flap in case the cloud moved across the strip and forced him to go around. The cloud remained clear of the strip during the greater part of the aircraft's final approach but just as he was going to select full flap, a patch of cloud rolled suddenly across the threshold from the left hand side, obscuring his view. By this stage, the pilot believed he was committed to land so he endeavoured to avoid the cloud by diverting about 50 feet to the right of the strip. Once clear of the cloud, he turned back and aligned the aircraft with the strip again. The aircraft did not touch-down until about 900 feet beyond the threshold and with its speed still in excess of 70 knots, it bounced. As soon as the aircraft had settled firmly, the pilot applied the brakes but after travelling some distance he could see that he had little chance of stopping the aircraft in the length remaining. About 200 feet from the end of the strip, he began a ground loop to the left, but the nose-wheel failed, the nose dropped and the aircraft's momentum rolled it on to its starboard wing tip. Falling back on to its main wheels and nose, the aircraft came to rest at right angles to the strip. The aircraft was substantially damaged but neither the pilot nor his passenger was injured.

View looking in landing direction showing marks of heavy braking. The damaged aircraft can be seen at the end of the strip. Note the cloud rolling in from the left side of the strip.



AT Lake Wellington, Gippsland, Victoria an amphibious S62A helicopter was engaged in a flying training exercise. Two highly experienced helicopter pilots were at the controls of the aircraft. The pilot flying the helicopter was doing so under the supervision of the other pilot, as part of his training for appointment as the company's check and training officer for this type.

After practising various emergency procedures, the pilot under training made an auto-rotational landing on to the surface of the lake in a light westerly wind. The touch-down was taildown and slightly fast at about 10 knots. The pilots then discussed the landing and the supervising pilot pointed out the need for a more positive flare in the existing conditions, and the necessity to touchdown in a more level attitude.

The aircraft then took-off to carry out a second auto-rotational landing in the same direction. Pre-landing checks were completed on the down-wind leg and the auto-rotational approach was begun at about 1000 feet at 55 knots. At about 150 feet above the water, the pilot flying the aircraft flared the helicopter, but at about 75 feet, both pilots realised that the ground speed was too high. The supervising pilot joined the other at the controls and together both pilots increased the flare with little apparent effect. The aircraft was levelled as it approached the water and full collective pitch was applied to cushion the touchdown.

The aircraft struck the water at a forward speed of about 20 knots, the nose pitched down into the water and "dug in" and, with full collective pitch still applied, the aircraft overturned. As it sank the pilots were able to escape through a hole broken in the port "chin" bubble, and after inflating their life jackets they swam ashore. They were later picked up by a fisherman.

After reaching the shore the pilots noticed that the wind had changed and was now blowing from the east at about 5 knots. The accident was attributed to the auto-rotational landing practice having been conducted in wind conditions which did not provide an adequate margin of safety.

THE pilot of this Pawnee was the district manager for the Queensland agricultural aviation company that owned the aircraft. Although he held a commercial licence endorsed for the PA-25, and regularly carried out ferry and spray calibration flights, as well as aerial inspections in the aircraft, he did not hold an agricultural rating.

At a time when the firm's agricultural pilot for the district was away on annual leave, the manager accepted a request by telephone from a farmer to inspect a small area of sugar cane. The farmer, who himself was a qualified pilot, had some doubt as to whether the area could be sprayed from the air because it was undulating and situated amongst trees, but he asked the manager to have a look at it and decide whether or not it was suitable.

The manager made up his mind that if he found the area satisfactory he would straight away proceed with the spraying. Early the next morning he loaded the aircraft with chemical and flew to the canefield where the farmer was working. After making a superficial inspection of the area, the pilot manoeuvred the aircraft into position, then descended steeply over trees towards the undulating crop to begin his first spraying run. As he did so, the pilot looked momentarily away from his line of flight to see what the farmer was doing, and the aircraft flew into the crop. The pilot was unable to regain control, and the aircraft crashed in an adjoining paddock and caught fire. The aircraft was destroyed and the pilot suffered severe burns.

IN a country area in Queensland, the owner-pilot of a Ryan STM had agreed to give conversion training on his aircraft to a restricted private pilot who wished to obtain an endorsement for the Ryan. The owner-pilot held an unrestricted private licence and although he had been given approval on past occasions to carry out conversion training on this type of aircraft, he had not sought approval in this case. The aircraft was fitted with dual controls in tandem cockpits and, as in DH-82 and similar aircraft, the pilots communicated with each other by means of speaking tubes. The owner-pilot occupied the front cockpit and the pilot undergoing the conversion training, the rear cockpit.

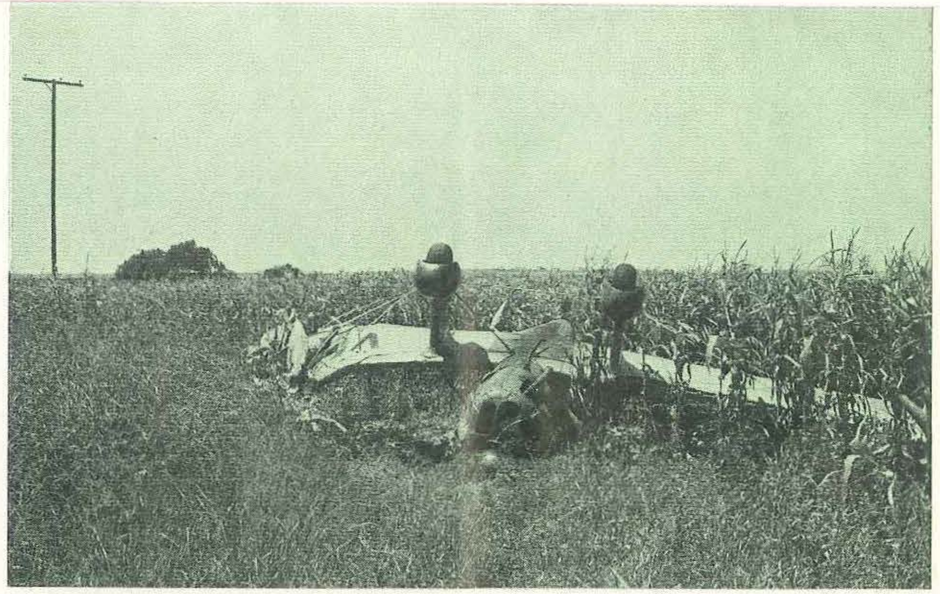
Two circuits and landings were carried out to a full stop, and during the downwind leg of the third circuit, which was flown a little wider than the others, the owner-pilot closed the throttle and nominated a small field for a practice forced landing. The pilot under training misjudged the approach and, on turning on to base leg, was obviously too high for the field. The owner-pilot took over the controls, applied the power and, after levelling the aircraft, made a comment about the other pilot's judgement and told him to make another attempt.

At this stage he thought he had handed control back to the pilot under instruction. Although he did not receive the usual "taking-over" response, he expected the trainee pilot to return to the aerodrome and make another landing. The aircraft continued to fly in a wide shallow turn at about 150 feet above the ground, climbing and descending slightly at various times. When the aircraft did not appear to be returning towards the airstrip for a landing, the owner reasoned that the trainee pilot was positioning the aircraft for another forced landing attempt.

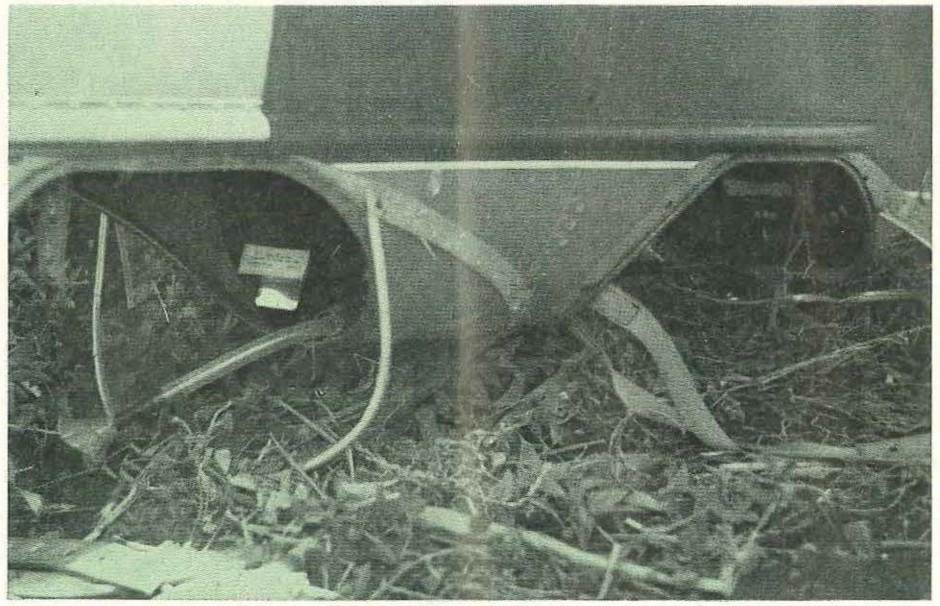
As the aircraft continued to fly in a wide orbit, the owner occasionally corrected the aircraft as it became overbanked or it entered a more pronounced climb or descent but then released the controls each time as he thought, to the trainee pilot, at the same time making a mental note of the poor flying techniques that he would draw to the trainee's attention after landing.

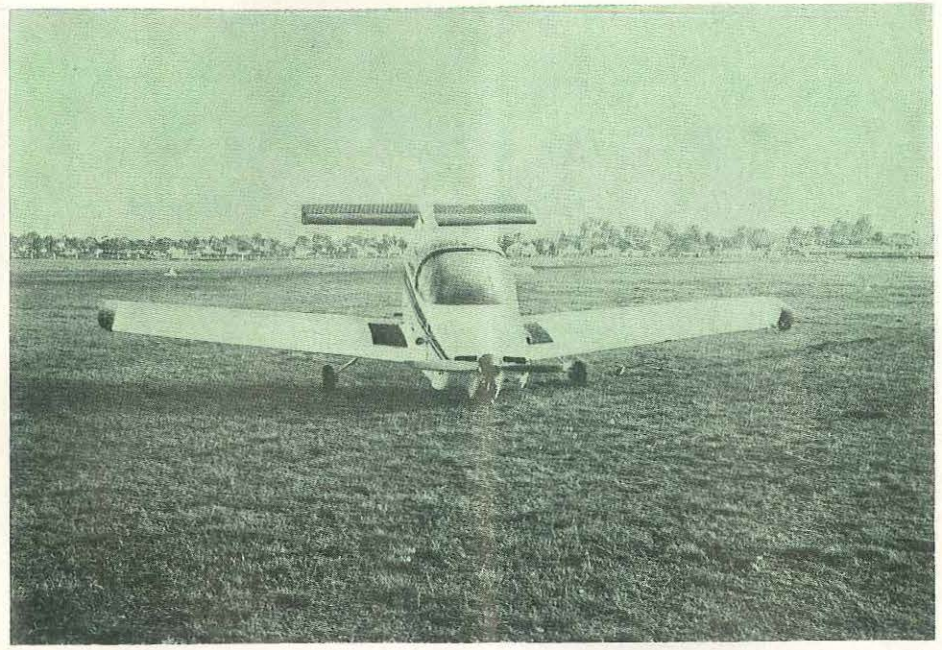
Meanwhile, the trainee, knowing that the owner-pilot had taken over to level the aircraft and adjust the power, believed that the owner was retaining control for the time being, to do some flying of his own. On several occasions when the trainee thought the aircraft was getting dangerously low, he involuntarily grabbed the controls but then, in deference to the other pilot's seniority, released them again, merely concluding that the owner was having a rather poor day.

Oblivious to the fact that the aircraft was "flying itself", neither pilot had noticed that they were gradually converging with a set of three power lines which ran between two farms. At the last moment, both pilots saw the power lines but it was too late. The aircraft collided with the wires, slid along them for a short distance and was then flung sideways towards the ground. It struck the ground with its port wing tip, cartwheeled and came to rest upside down in a crop of maize. The aircraft was destroyed by the impact forces but both pilots escaped with minor injuries.



The Ryan as it came to rest inverted. The initial impact damage to the port wing is clearly evident. The lower photograph shows the tandem cockpits and speaking tubes.





LATE in the afternoon, towards the end of a private flight from Bankstown to Taree and return, the pilot of a Victa Airtourer called Bankstown Tower from over Parramatta and reported inbound. The aircraft was cleared for a straight-in approach to the 18 strip in hazy conditions with a visibility of about five miles.

At that time, the 18 strip at Bankstown was 630 feet wide, but as aerodrome works were in progress, 300 feet of the eastern side of the strip was unserviceable. A Notam had been issued to this effect, and the unserviceable area was marked by white crosses. The pilot had been issued with the Notam before departing for Taree that morning.

Five minutes after its inbound call, the aircraft was sighted on short final approach for the unserviceable side of the strip. At a height of about 10 feet, the aircraft suddenly banked steeply to the right, then made a flat skidding turn to the left, as the pilot made a very late attempt to line up on the correct side of the strip. Another aircraft, also on final approach, was forced to turn away steeply.

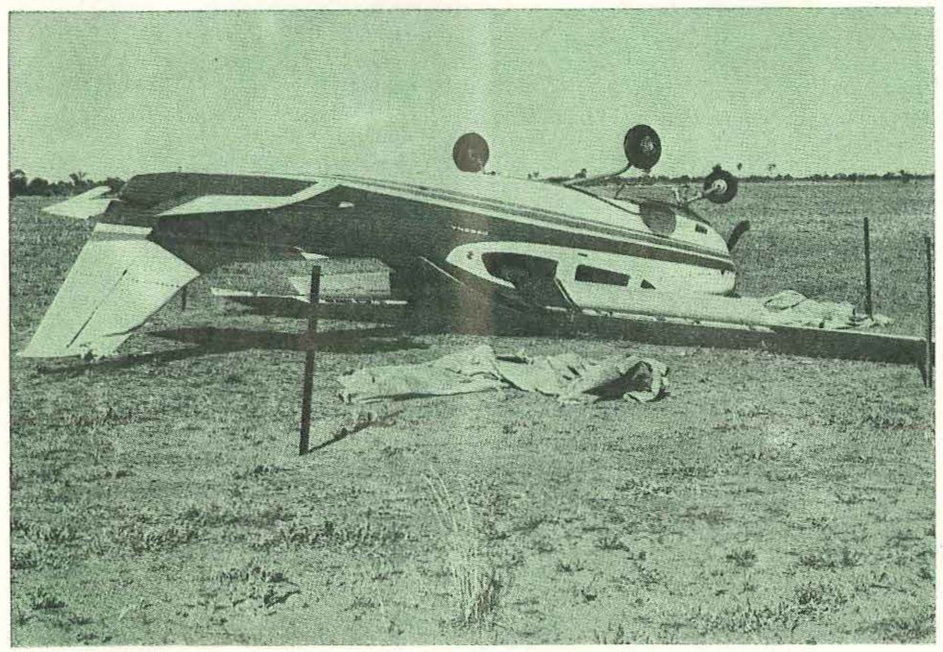
When the Victa had almost completed its skidding turn, it stalled and dropped heavily to the ground in a nose-down attitude. The nose wheel broke off, the aircraft bounced, then struck the ground heavily for the second time. The broken nose strut gouged a furrow in the ground and dug in. Decelerating rapidly, the aircraft nosed-over into an almost vertical attitude, then fell back on its main undercarriage and came to rest, 80 feet from the first point of impact. The passenger in the aircraft sustained minor injuries but the pilot was unhurt.

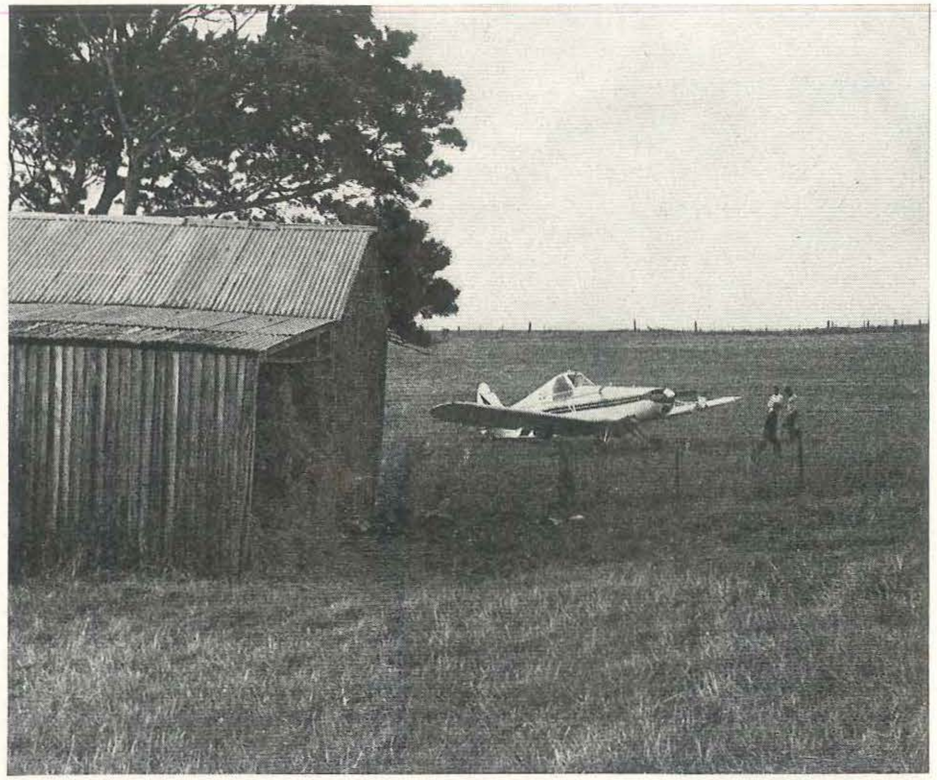
AT the end of a flight from a neighbouring station in Western N.S.W., the pilot of this Cessna 210 arrived over the airstrip of a grazing property after sunset, but before last light. The weather was fine and clear and there was no appreciable wind.

The landing strip on the property is situated in a large paddock and its boundaries are not marked. As the pilot overflew the strip to inspect it before landing, he thought he saw sheep grazing close to his intended landing path. To make sure the area was clear, he flew a second circuit, then, satisfied that it was safe, he began an approach to land into the north.

After turning on to final approach, the pilot found that the light had faded badly, though the sky remained bright. The pilot had difficulty in distinguishing the strip from the neighbouring area and although he did not realise it, the aircraft's final approach path was displaced about 100 feet to the left of the strip. As the aircraft touched down, the undercarriage struck a rabbit warren forming a mound of earth about two feet high which the pilot had not seen. The aircraft ballooned high into the air, floated for over 300 feet, then sank heavily on to the ground again. The nose-wheel collapsed, the aircraft skidded on its nose for a short distance and then somersaulted on to its back.

The aircraft was substantially damaged but the pilot escaped injury.





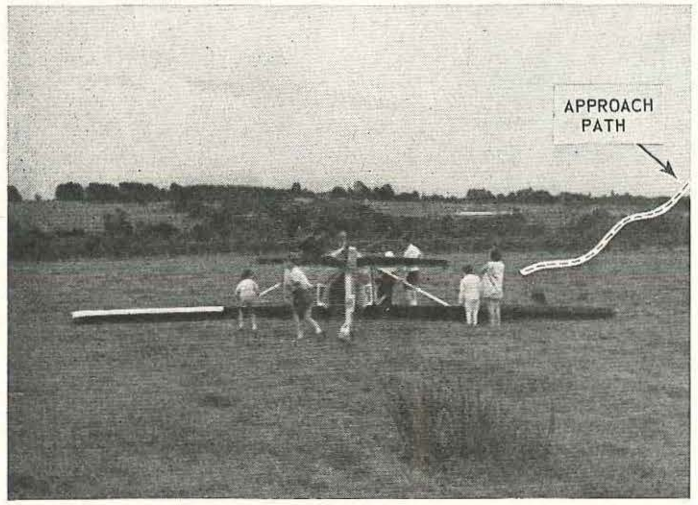
IN Tasmania, a Piper Pawnee was engaged in spreading superphosphate over hilly and moderately timbered terrain in which the cleared areas were fenced into small paddocks only about 100 yards square. While making a procedure turn at the end of one spreading run at a height of about 100 feet, the aircraft's engine failed completely. The pilot carried out a quick trouble check, then tried to position the aircraft for a forced landing uphill in a field less than 400 feet in length, which lay ahead and to the right of the aircraft's position. The aircraft struck a barbed wire fence at the approach end of the field and, as it touched down, the pilot applied the brakes fully and used the slope of the ground to assist in ground looping the aircraft to the right.

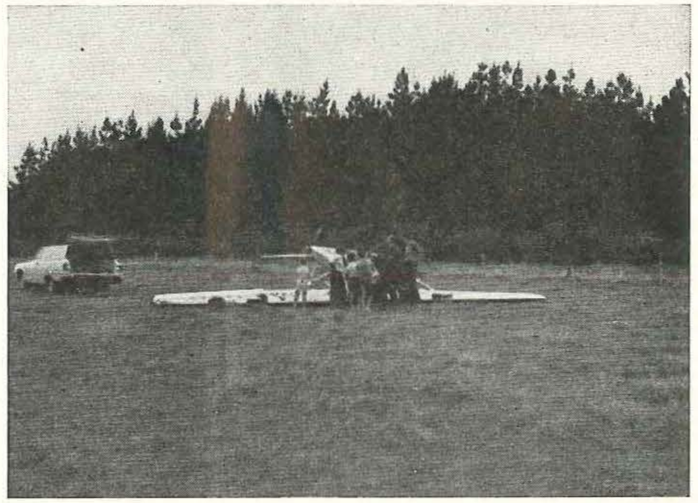
The wings and tail plane had been damaged when the aircraft struck the fence but, apart from the failure of the tailwheel fork during the ground loop, the aircraft sustained no further damage. Despite the fact that the fuel tank contents gauge showed that eight gallons remained, the aircraft's fuel tank was found to contain only one pint of fuel.

AFTER a dual check at a Victorian flying school, a woman student pilot was sent off for one solo circuit. The take-off was normal and after the aircraft had climbed to about 500 feet, the pilot turned across wind. At this point, as the pilot throttled back to climbing power, the engine failed. She closed the throttle and opened it again and the engine responded momentarily, but then lost power completely. The pilot checked that the fuel was on and the mixture rich, and began an approach towards a small field which lay almost straight ahead. The wind was from 020 degrees at 10 knots, but as the longest dimension of the field available to the aircraft lay towards the south-east, she continued her approach in that direction.

The field was bounded on its western and southern sides by trees and in the final stages in the approach, the pilot was forced to raise the nose steeply to avoid a tree. The aircraft sank heavily into the field, and bounced twice as it struck drainage furrows which crossed the landing direction. On the third touch-down, the nose undercarriage collapsed, the nose dug into the ground and the aircraft somersaulted on to its back. After turning off the ignition and master switches, the pilot scrambled from the aircraft through the cabin window.

The field, which was the only landing area available to the pilot from the point where the loss of power occurred, measured only 480 feet by 270 feet and an accident in such circumstances was inevitable. The reason for the loss of engine power could not be established.





Caught Out?

Engines are extremely reliable these days – but they still fail occasionally! The ability to make a successful forced landing remains one of the hallmarks of good airmanship.