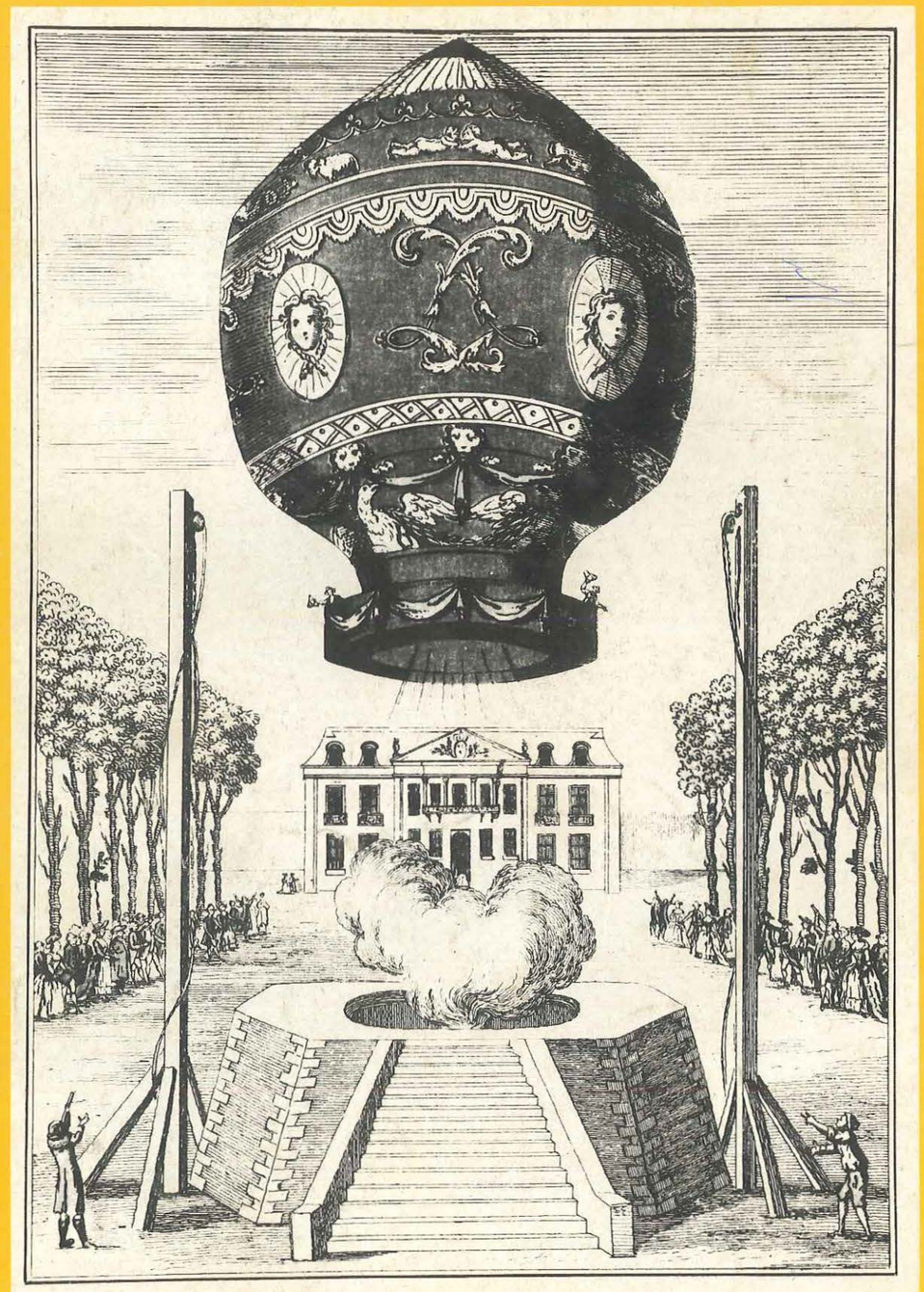

Number 79 May 1972 DEPARTMENT OF CIVIL AVIATION AUSTRALIA

AVIATION SAFETY DIGEST

Number 79 May 1972

DEPARTMENT OF CIVIL AVIATION AUSTRALIA

Front cover and above:

The wheel has turned full circle: In this age of supersonic and space flight, one of the "newest" forms of sport aviation to be introduced to Australia tackles the problem of lift in precisely the same way as the brothers Montgolfier, nearly 200 years ago—the hot air balloon!

Taking part in Australia's first "modern" balloon festival at Cranbourne, Victoria, a few weeks ago, a crew of three aeronauts prepare to lift off as a second craft is inflated. The balloon's lift is achieved and controlled by a burner, virtually a giant blow-lamp, operating on liquid petroleum gas, which projects a tongue of flame into the neck of the balloon envelope. The gas cylinders are carried with the crew in the balloon's basket.

Cover: "The Age" Photograph. Above: DCA Photograph.

Back cover:

This old engraving of the first manned flight in 1783 provides a fascinating contrast in design, handling and heat source!

AVIATION SAFETY DIGEST

Contents

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AUSTRALIA

Aztec disappears in storm

After departing from Carnarvon on a private flight to Jandakot, W.A., with six persons on board, a Piper Aztec failed to reach its destination. A large scale search subsequently found no trace of the missing aircraft but small items of wreckage were later washed up on the shores of Shark Bay. At the time of the flight, a line of severe storms and heavy cloud lay across the aircraft's track in this area.

THE aircraft was being flown by a private pilot who had hired it at Jandakot Airport for a flight to Carnarvon and return. The pilot was a haulage contractor who operated heavy transport vehicles between Perth and the mining centres in the north of Western Australia. He was making the trip because heavy rain and flooded creeks had stranded several of his lorries north of Carnarvon and he wished to assess the situation for himself and fly three of his drivers back to Perth.

Accompanied by a relative as a passenger, the pilot took off from Jandakot just before 0600 hours on the day of the accident. Before departing he had prepared and submitted a "full reporting" flight plan. The flight proceeded uneventfully in accordance with this plan and the aircraft landed at Carnarvon at 0855 hours.

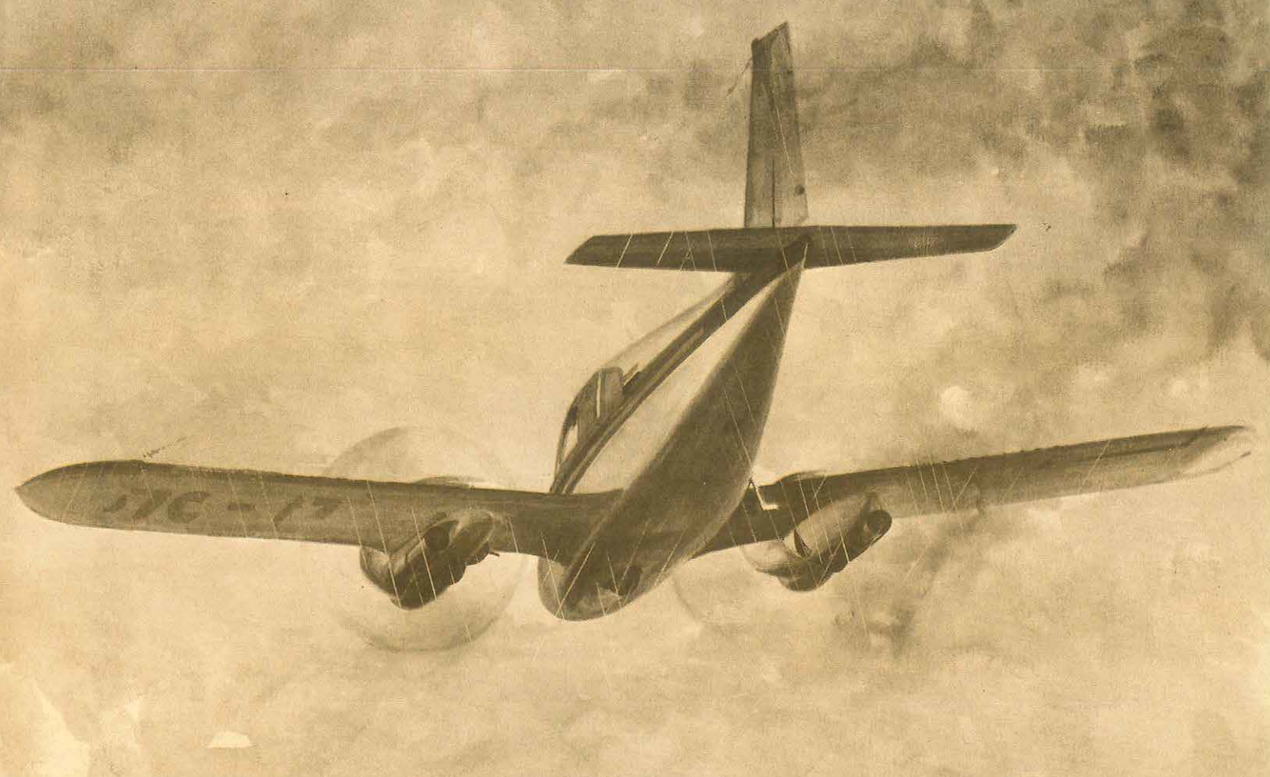
Here the pilot had the Aztec refuelled and, after picking up his three additional passengers, he took off again in the aircraft to make a "NOSAR, NO DETAILS" flight to the Cane River area, 200 miles north-east of Carnarvon to try and find one of his lorries which had been stranded there by the flood waters. After successfully locating the vehicle from the air and satisfying himself that it was in a safe position, the pilot flew back to Carnarvon and landed there again at 1259 hours.

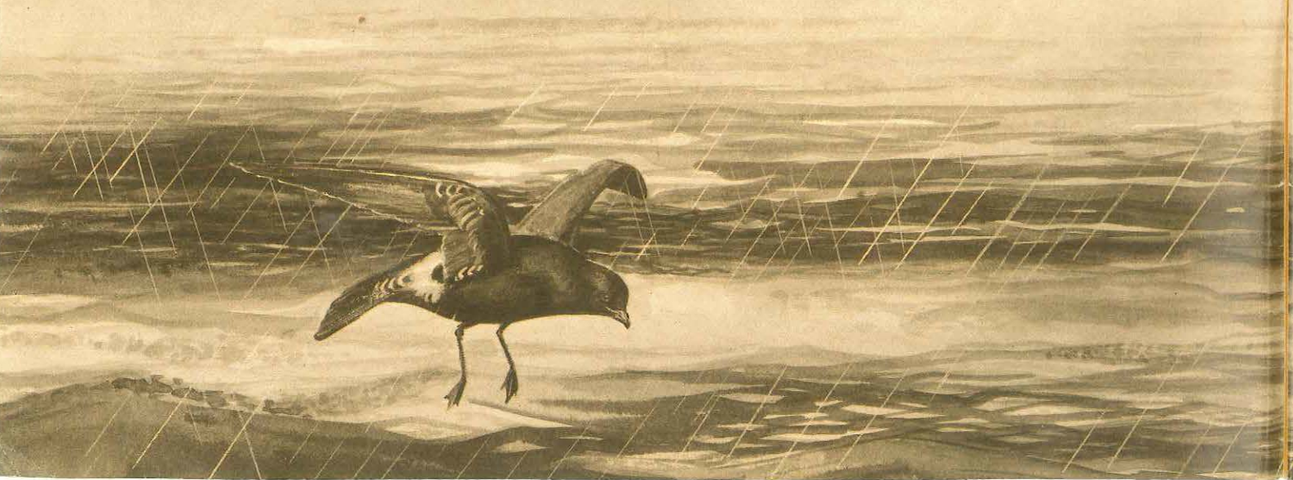
The aircraft was refuelled once more and the pilot, after examining the area weather forecasts, lodged a flight plan for the return trip to Jandakot. This time, the pilot elected not to proceed on a "full reporting" basis, but nominated a Sartime of 1730 hours to Jandakot.

While on the ground at Carnarvon, because there was still a spare seat in the aircraft, the party arranged to take a fifth passenger back to Jandakot with them. This passenger, also a transport driver who had been prevented from continuing his run north from Carnarvon, arrived at the airport at 1315 hours where the rest of the party were waiting for him. The six men boarded the aircraft and it was seen to taxi out and take-off into the east at 1340 hours. The weather at Carnarvon at the time was fine but overcast by large cumulus clouds at 3,500 feet and there was scattered rain showers in the area. The visibility was 15 miles, reducing to two miles in rain.

At 1342 hours the aircraft called Carnarvon Flight Service to pass its departure time and gave an estimate for Hamelin Pool, 125 miles south of Carnarvon, at 1419 hours. No further transmissions were received from the aircraft.

At Jandakot late that afternoon, when the aircraft's arrival had not been reported by the expiry of its Sartime and communications checks during the ensuing 30 minutes failed to produce any further news of its whereabouts, search and rescue action was begun. This quickly developed into a full scale operation and, for the next eight days, an intensive air, ground and sea search was conducted throughout the area in which the aircraft could conceivably have crashed or force landed. Particular attention was given to the Shark Bay area of the aircraft's intended track, where severe thunderstorm activity was known to exist at about the time the aircraft would have been in the vicinity. When no trace of the aircraft was found and there seemed no further possibility that any of its occupants could have survived, the air search was discontinued, but police ground parties continued to patrol the beaches in the vicinity of Shark Bay and Hamelin Pool.





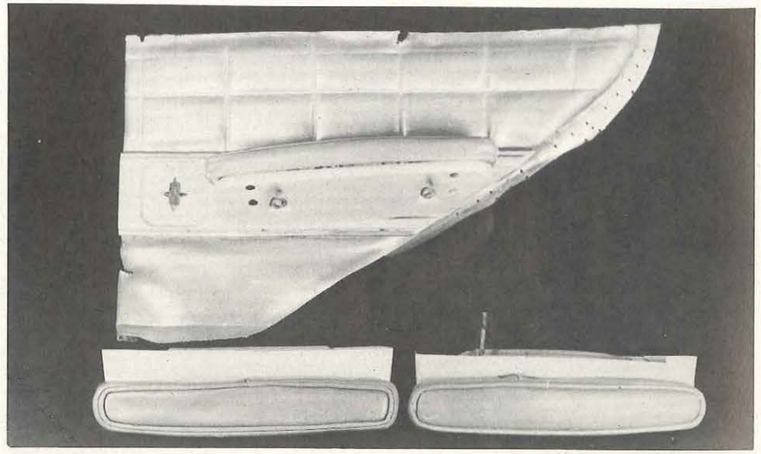
Ten days after the aircraft had disappeared, three arm rests from the aircraft's cabin, together with a torn piece of the fuselage skin and cabin upholstery, and personal effects of one of the passengers, were found washed up on a beach in the western arm of Shark Bay. The damage sustained by this wreckage suggested that the aircraft had made violent impact with the water. A week later, a cabin seat back from the aircraft, together with personal effects of another passenger, were found on the same shore line, but 20 miles further to the north-east. The locations in which these items of wreckage were found were both about 25 miles west of the aircraft's flight planned track.

* * *

The pilot had 123 hours experience and had held a private pilot licence for two years. He had accumulated a little over 50 hours on the PA23, all of it in the three months preceding the accident, but he held no instrument rating and had undergone no formal instrument flying training.

The weather pattern in the area south of Carnarvon on the day of the accident was under the influence of an intense tropical cyclone to the north and an anticyclone to the south-east. The area forecasts available at Carnarvon indicated that the wind at 5,000 feet was blowing from 060 degrees at 15 knots. Isolated thunderstorms and rain showers were expected, as well as intermittent turbulence below 7,000 feet, increasing to severe in the vicinity of thunderstorms. One eighth of cumulo-nimbus cloud was forecast at 7,000 feet, with tops reaching to 30,000 feet. There was also expected to be two eighths of cumulus cloud at 7,000 feet with tops at 16,000 feet, six eighths of alto-stratus at 12,000 feet and, in the shower areas, five eighths of strato-cumulus at 3,500 feet.

A post-flight analysis of weather reports and observations made on the day of the accident indicated that there was a line of thunderstorms, producing



Cabin fittings from the missing Aztec found washed up on the shores of the western arm of Shark Bay.

severe turbulence and high rainfall, lying in a north-east, south-west direction, which crossed the aircraft's proposed track about 100 miles south of Carnarvon and just to the south of Hamelin Pool. The township of Hamelin Pool itself recorded rain and overcast conditions on the day of the accident, but only 64 points up to 1500 hours. By contrast, Hamelin Station, only three miles further south, recorded 298 points of rain in the same period, while at Coburn, 20 miles south of Hamelin Pool, 600 points fell up to 1800 hours. The area in which the wreckage was recovered, 25 miles further to the west, would have been close to the northern edge of the severe weather at about the time the aircraft reached this position.

A Baron aircraft, flown by an experienced instrument-rated pilot, which had departed Carnarvon for Jandakot on the day of the accident 45 minutes after the Aztec, encountered very heavy rain showers on track 110 miles south of Carnarvon. The pilot of this aircraft said that after departing from Carnarvon, he observed large build-ups ahead on track which he estimated lay between Hamelin Pool and Murchison River. Approaching this weather, he noticed from the amount of water lying on the ground, that the rain had been very heavy in the area and he decided to divert 20 miles east of track where the build-ups appeared to be less dense. Even so, after penetrating the line of weather, he was in cloud and extremely heavy rain for ten minutes. The pilot believed that VFR flight would have been impossible in the heavy rain in the vicinity of Hamelin Pool, but further to the south of the line of storms, conditions became suitable for VFR procedures again. The pilot added that a Friendship, flying at 29,000 feet, had reported the line of weather extended more than 100 miles to the west.

There was considerable evidence from persons who knew the pilot, and from those who had been associated with his flying activities during the comparatively brief period that he had held an unrestricted licence, that he exhibited all the characteristics of a sound pilot. The flying instructor who had given the pilot his endorsement on the PA23, said that his ability was well above average and that the conversion flying he had carried out was of a high standard. The pilot had also demonstrated a sound level of navigational ability and airmanship during this time and had been thoroughly briefed on the use of the ADF and DME as aids to visual navigation.

Passengers who had accompanied the pilot on a flight to Hobart and return in a PA23 a few weeks before the accident, described him as calm and sensible with a cautious approach to flying in marginal weather. He normally reported positions during flight, and made use of the radio navigational aids in the aircraft. The operations manager who had arranged to hire the Aztec to the pilot for the return trip to Carnarvon, said that although at first he had some doubts about the weather in the Carnarvon area, he was confident that the pilot would not attempt anything beyond his ability. On previous occasions he had shown he was prepared to "sit on the ground" if the weather was doubtful. Another member of the staff described the pilot as a young man of quiet assurance who would be "conscientious and aware of where his responsibilities lay".

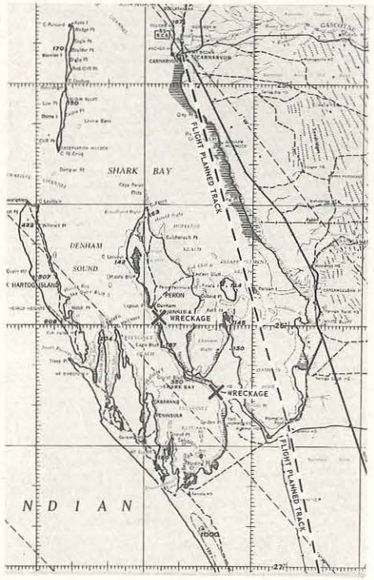
The flight service officer on duty at Carnarvon at the time of the aircraft's departure said the pilot seemed a stable type of person who did not appear to be in any hurry and he had completed his flight plan in a methodical manner.

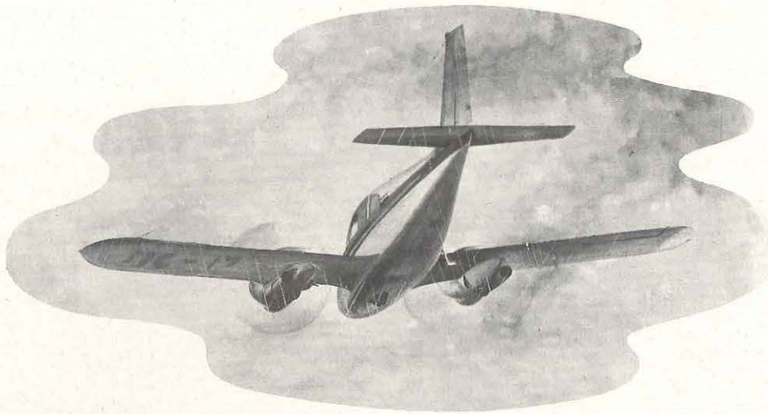
* * *

Notwithstanding this remarkable weight of evidence as to the pilot's ability and judgement, the circumstances of the aircraft's disappearance and the facts subsequently established by the investigation, point overwhelmingly to the conclusion that the accident was in some way associated with the line of severe weather in the vicinity of Shark Bay.

Although it seemed clear that the aircraft had crashed in the water somewhere in the western arm of Shark Bay, the fact that no substantial portion of the aircraft was recovered precluded any possibility of determining the mode of impact or the condition of the aircraft at the time. For this reason, the precise circumstances in which the accident occurred must inevitably remain a matter of speculation, but it seems most likely that the pilot, in an attempt to penetrate the line of severe weather, initially diverted seawards to the west. Here he may have descended from his cruising height to ensure that the aircraft remained below the cloud base, and to

Map showing flight-planned track and locations in which wreckage was found.





try and maintain visual contact with the ground or water. On entering rain as heavy as that reported in the area however, even if the aircraft did not actually fly into cloud, the pilot could quite easily have lost visual reference.

Had this occurred, with no instrument flying training to assist him, the pilot would almost certainly have become disorientated and lost control of the aircraft, either while trying to continue in the undoubtedly turbulent conditions, or while attempting to turn back towards the better weather he had just left. As explained in some detail in Digest No. 75, the almost inevitable result of such a combination of factors would have been a tightening spiral dive, terminating only when the aircraft made violent contact with the surface of the water.

Alternatively, it seems possible that the pilot, after diverting to the west and attempting to continue south into the very heavy rain, might have deliberately descended to a very low level over the waters of Shark Bay to try and maintain some visual reference in what must have been at the very best, extremely poor visibility. In this situation, even if the pilot did not actually lose visual reference in the strict sense, the very limited reference provided by the surface of the comparatively sheltered waters of the bay would hardly have been sufficient for safe flight at low level. The January issue of the Digest discussed an accident in which a Comanche flew into a lake while attempting a turn at low level in poor visibilty. The pilot of the Aztec in this case would have found himself in a similar but even worse situation, particularly if he too had attempted to turn back while intent on remaining low enough to keep the surface of the water in view in the extremely heavy rain.

A third, though perhaps less likely possibility, is that the aircraft was damaged in the vicinity of the line of weather by severe turbulence, to the extent that the pilot was deprived of control and the aircraft crashed into the water.

Whatever the actual circumstances of the accident, and the evidence is insufficient to determine an official cause, it may seem hard to reconcile the apparent "press on" attitude of the pilot on this occasion, with the abundant indications of his airmanship and ability. The fact remains however, that the pilot was inexperienced and the stage he had actually reached in his flying career might not be without significance.

It has long since been pointed out that "the first hundred hours" is a danger peak in a pilot's life. At this stage, it has been said, he has accumulated enough skill and experience to lead himself to believe he "knows all about it", but not enough to appreciate that he can never hope to know all there is to be learnt about flying! In other words, it is a stage in a pilot's career when he is sufficiently skilled and knowledgeable to be confident in what he is doing, but this confidence is not yet tempered by the prudence born of wisdom that comes from long experience. As a result, a pilot in this category, though not rash or impetuous in the usual sense, tends quite genuinely to over-estimate his ability to cope with an impending situation.

No one can know what was in the mind of the unfortunate pilot of the Aztec when he chose to continue his flight southwards into an obviously severe line of weather, but the fact that he was known to be careful and stable and, for his experience, a most competent pilot, renders the lesson of this accident all the more salutary. ——►

While making a low pass over the homestead buildings of a station property, a Cherokee 140 struck a power line and crashed into an adjacent paddock. The aircraft was destroyed by the impact and the fire that followed, and both occupants were killed.

THE aircraft belonged to a local flying school and had been hired by the private pilot who was flying it at the time of the accident. The pilot was the manager of the station property on which the aircraft subsequently crashed and was making an aerial inspection to check the amount of surface water that was lying on the irrigated land of the property as a result of rain that had been falling intermittently during the past three days. Another member of the property staff accompanied the pilot in the aircraft.

The pilot arrived at the aerodrome where the aircraft was based at about 1415 hours on the day of the accident, and was joined by his passenger shortly afterwards. At 1440 hours the aircraft was seen taxi-ing for take-off. No radio transmissions were received from the aircraft, but it took off from the aerodrome about 10 minutes later and was seen flying towards the property, which was some 15 miles away, at a height of about 1,500 feet. The weather at the time was showery and overcast, but the cloud base was well defined and the visibility beneath it was about 20 miles.

After arriving over the property at about 1500 hours, the aircraft was seen circling and manoeuvring over the various paddocks at about 500 feet, and it was obvious to persons working on the property that the occupants of the aircraft were carrying out their intended aerial inspection.

About 15 minutes later, the aircraft was seen heading north-east away from the homestead buildings, still at about the same height as before. Beyond the river which forms the eastern boundary of the property, it carried out a wide circuit to the left, then crossed the river again and, on a south-easterly heading, flew back in the direction of the homestead buildings. Still flying at cruising power and speed, it then began a shallow descent, which continued until it was only about 30 feet above the ground.

Two station employees, who were working on a motor cycle in front of the property's workshop, heard the sound of the approaching aircraft and, on looking up, were surprised to see it coming directly towards them about 250 yards away, flying very low in a straight and level attitude. Alarmed, the men could see the aircraft was going to hit a high tension power line which crossed its path, 100 yards from where they were standing. Moments later, there was a metallic noise of impact as it struck the wires in mid-span.

Apprehensive as to what was going to happen next, the two men ran into the workshop as the aircraft continued on over their position about 30 feet up, dragging with it one of the high tension cables, which was whipping through the tops of nearby trees. Shortly after it had passed the workshop, with the engine still running at high power, the aircraft nosed up sharply and climbed steeply. With its forward speed obviously being retarded by the wire, the aircraft's nose-up attitude continued to increase until, by the time it had climbed to about 100 feet, it was standing almost vertically on its tail. At this point, the engine noise ceased suddenly, the nose dropped and the aircraft fell away to the left and spiralled steeply into the ground about 200 yards away. A number of station employees, who had stopped what they were doing to watch the aircraft, ran at once towards the crash site. Seconds later, before any of them could reach the scene, a fierce fire engulfed the wreckage.

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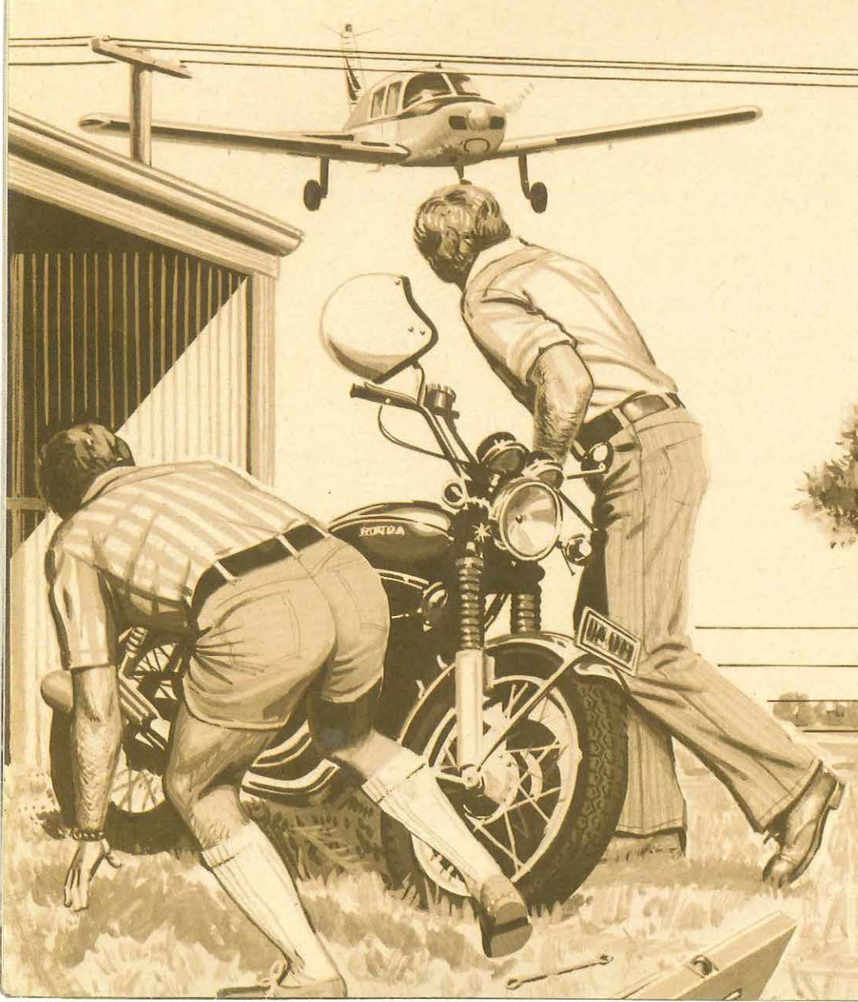
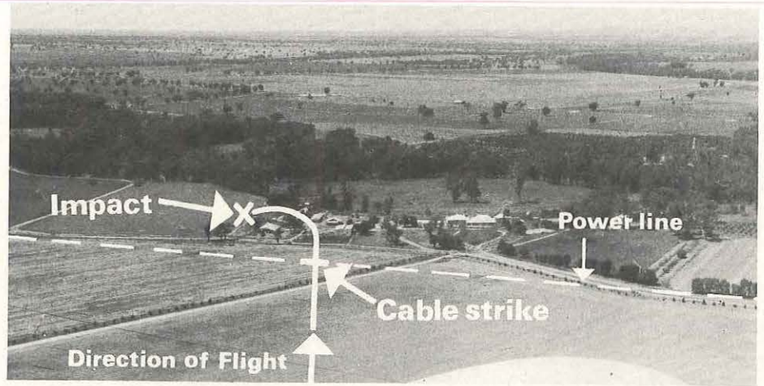


IT'S NOT WORTH THE RISK



Aerial view of homestead buildings showing position of power line, final flight path and crash site.

Examination of the almost completely burnt-out wreckage and the overall area in which the accident occurred, showed that the power line struck by the aircraft ran east-west and comprised three heavy gauge cables, carried on poles 28 feet high and 475 feet apart. Each cable consisted of three strands of 14 gauge steel wire. All three cables had been broken at the pole next but one to the collision point on the eastern side of the flight path, approximately 700 feet away. To the west of the point struck by the aircraft, two of the cables had been torn from their insulators on seven supporting poles, over a total distance of 4,800 feet. One of these cables had become inextricably entangled on the aircraft structure. It had looped around the port wing, under the engine against the carburettor, back over the starboard wing, and finally around the rudder and port side of the stabilator. The tension of the cable had pulled the carburettor rearwards, breaking it from its mounting flange. The landing lamp, mounted near the carburettor air intake, had also been broken by the cable, and pieces of glass had been ingested into the engine. At the tail of the aircraft, the cable had cut deeply into the stabilator from its trailing edge, and jammed the rudder hard to port.

Apart from the damage sustained by striking the wires and the obvious results of the impact with the ground and the ensuing fire, no evidence of any defect was found in the aircraft and there was no reason to believe that it was other than fully serviceable at the time it hit the power line.

Reconstructing the sequence of events that led to the ground impact, it was evident that although the propeller had struck the power line in the initial impact, it had not severed the wires, and they had caught on the aircraft and subsequently failed in tension as they were stretched by the aircraft's momentum. The cable which became entangled around the aircraft, had slid from the propeller and become caught on the nose cowling below the spinner. As the aircraft continued forward, the cable broke the landing lamp, cut into the cowling and carburettor air intake, and became lodged around the carburettor itself.

Initially, the restraining force of the cable would have applied a nose-down tendency to the aircraft but, as it began to climb at this stage, it can only be presumed that this was the result of the pilot pulling back, probably instinctively, on the elevator controls. As the aircraft nosed-up, the dragging and stretching cable appears to have passed over the top of the starboard wing, changing the relative direction of its restraining force to one producing a nose-up tendency. This nose-up movement would have increased as the angle of climb steepened and the cable tensioned.

Towards the top of the climb, as the aircraft was increasingly restrained by the cable, its tension evidently became great enough to break the carburettor bodily from its mounting flange as shown in the accompanying photograph. This was no doubt responsible for the sudden cessation of engine power heard by witnesses on the ground. At this point, in its extreme nose-up attitude, the aircraft appears to have stalled and rolled to the left, entangling the port wing and tail structure in the cable as it did so, before it dived to the ground out of control.

* * *

The pilot, who had nearly 200 hours flying experience and had previously been an aircraft owner, was a middle-aged man and was regarded as a competent pilot by the flying school that owned the aircraft. There was no evidence to indicate that he made a practice of indulging in low flying over the property or anywhere else, and previous inspection flights he had made, like the earlier part of the flight on which the accident occurred, had apparently been flown at a height of about 500 feet. Nevertheless, when the circumstances of the collision with the power line were examined in detail, and all reasonable alternatives were considered, it was impossible to avoid the conclusion that the manoeuvre which culminated in the accident was a deliberate low pass over the station buildings.

The collision with the power line occurred after the aircraft had made a long, straight, shallow approach, apparently flying at normal cruising power and speed, at what appeared to be the conclusion of the inspection flight over the various parts of the property. It is probably also significant that the heading on which the low pass took place was back in the general direction of the aerodrome where the aircraft was based. It thus seems likely that the pilot, having completed his inspection of the station property, was about to begin the return flight to the aerodrome, but before doing so decided to make a low, farewell run over the station buildings, where a number of employees were working.

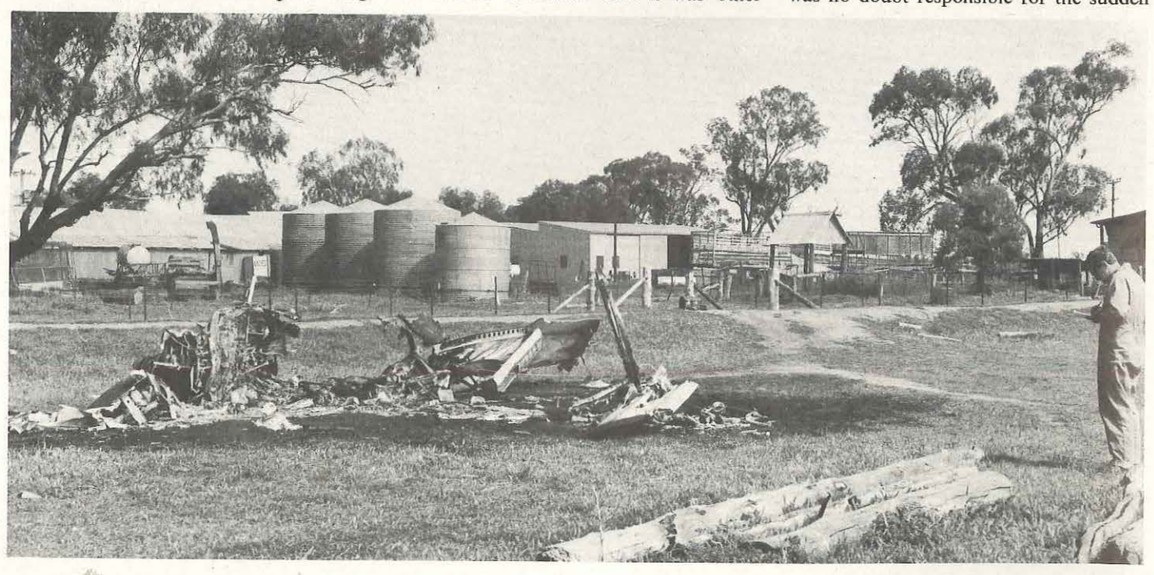
The pilot was apparently so intent on positioning the aircraft for this low pass, that he momentarily overlooked the presence of the power line in his path. Although the wires would have been hard to see from the air because of the wide spacing of the supporting poles and the general background, there could be no question of the pilot not knowing they were there. Only about 300 yards to the west of the collision point, the power line converged with the access road to the property, and ran parallel with it for some distance. The property manager used this road every day and the location of the power line should have been as familiar to him as any of the property's characteristics.

* * *

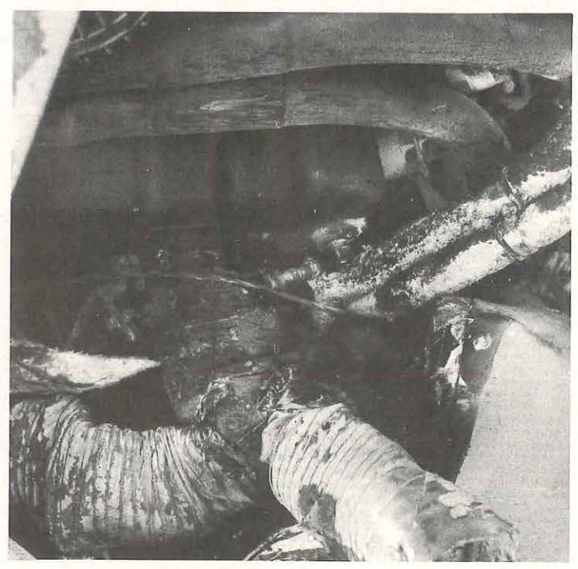
The circumstances in which this tragedy occurred are somewhat different from those of the other low flying accidents that have been reviewed in this and the last two issues of the Digest. In this case, the pilot was not attempting an obviously dangerous and ostentatiously spectacular manoeuvre close to the ground, but was merely making what many general aviation pilots in country areas might regard as a "safe" low run over a private property in a situation that would seemingly endanger no one. In spite of this, its outcome was little different from the others and every bit as disastrous. In common with at least one other similar accident that has occurred since, it shows yet again and all too well, that there can be no such thing as a "safe" low level beat-up in any circumstances.

It may seem pompous, and perhaps bureaucratic, to keep pointing out that if aircraft were not flown below the minimum statutory height requirements, accidents of this sort would not happen. But the fact remains that the only way in which pilots can be certain of avoiding unseen obstructions (and this accident demonstrates clearly enough that familiarity with known obstructions is no guarantee of safety), is to maintain sufficient clearance from them to provide an adequate margin of safety. As has been explained before, the whole intention of ANR 133 in specifying 500 feet as the minimum altitude at which an aircraft may fly in normal circumstances, like other ANR's of the same type, is to provide such a buffer against the unexpected and unforeseen event that can so easily occur in aviation.

No matter how innocuous a particular situation may seem when one is tempted to "bend" the regulations to make a "harmless" low pass, it is surely not worth the risk involved. The only positive way to avoid danger is to continue to conduct one's operations in accordance with the philosophy reflected in these regulations. They have been framed for the express purpose of avoiding tragedies like this one. ——➥

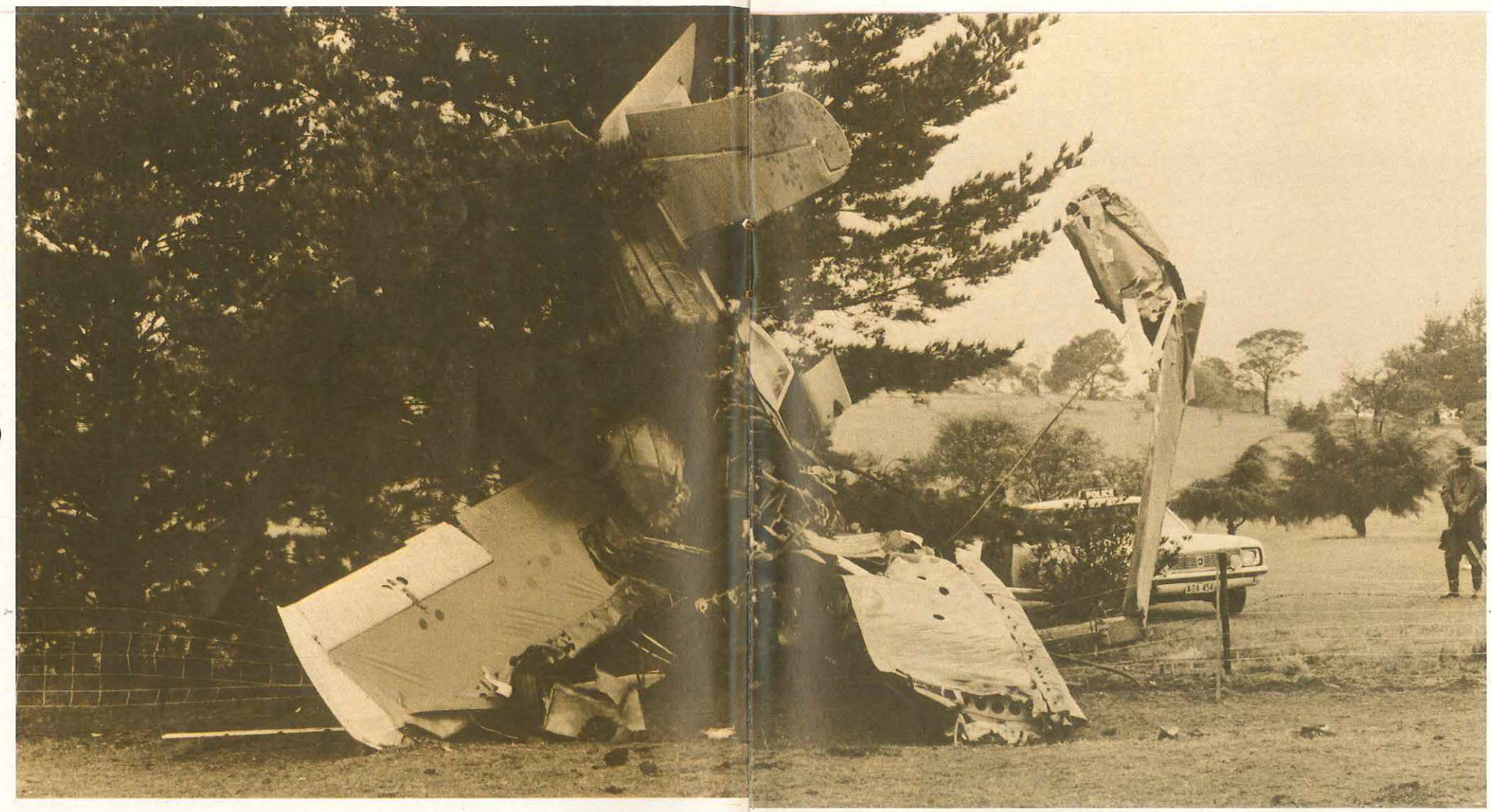


Left: View from crash site looking back in direction of aircraft's approach. The workshop beside which the men were working is in the centre of the picture.



Right: View of underside of engine showing carburettor broken away from mounting flange by tension of power cable.

There are no second chances



Wreckage of the Grumman Agcat as it came to rest on the golf course boundary after diving into the ground out of control.

The last issue of the Digest reviewed two fatal accidents, each of which resulted from attempts to perform spectacular "wing-over" or stall-turn type aerobatic manoeuvres at low level.
It is to be hoped that the clear operational lessons of these two tragedies have already been absorbed and taken to heart by pilots who might have felt disposed to try similarly ostentatious performances for themselves. But lest there still be any who feel inclined to shrug off those two results as "isolated cases", having little bearing on "what happens to me", the Digest offers readers a further opportunity to consolidate their thinking on the subject, with two more examples of this particular form of aeronautical irresponsibility.

THE first of these involved a young, comparatively inexperienced, agricultural pilot who was working as a loader driver for his company while awaiting a position as a full time agricultural pilot. Based in a country town, the loader driver and the regular pilot of a Grumman Agcat had been working as a team in the district, operating from a number of different agricultural airstrips.

The Agcat was due for a major inspection in the company's workshops and, as the regular pilot had planned to take his holidays at the same time, the company's agreement was obtained for the loader driver to ferry the aircraft to the workshops. The loader driver held a commercial licence with a Class 2 agricultural rating, and had been endorsed on the Agcat some time previously.

Before the regular pilot of the Agcat left, he supervised the loader driver while he carried out a circuit at the town aerodrome to re-familiarise himself with the handling characteristics of the Agcat. The circuit was satisfactory and the regular pilot later briefed the loader driver generally on the proposed ferry flight. The aircraft was then refuelled to capacity in readiness for the flight, and it was agreed that the loader driver would depart the following morning. The regular pilot then left in his car for his holidays.

Less than an hour later, although he had not been authorised to do so, the loader driver decided he would make a brief local flight in the Agcat. After carrying out a pre-flight inspection and a satisfactory engine run up, the pilot took off, and at a height of 500 feet set course towards the town, seven miles away.

A short time later, a number of witnesses on the ground saw the aircraft flying normally but at low level, approaching the golf course, which is situated between the aerodrome and the town. Still at low level, it crossed the boundary fence at the golf course, passing almost directly over a group of players, then nosed up sharply into what a number of witnesses later described as "the start of a loop" or "half a loop". The aircraft then seemed to bank to the left, a "little past the vertical", then entered a dive and struck the ground in a steeply nose-down attitude beside a line of pine trees lining the boundary fence of the golf course.

A number of witnesses ran at once to the scene of the crash and rendered what assistance they could to the badly injured pilot until an ambulance arrived a few minutes later.

* * *

Examination of the wreckage and a subsequent detailed inspection of the impact-damaged engine and its accessories showed that although the engine was developing little more than idling power when it struck the ground, the aircraft should have been capable of normal operation before impact. The weather at the time was fine and almost calm and obviously would have had no bearing on the circumstances that led to the crash.

The pilot had a total of about 340 hours flying experience, of which nearly 20 hours had been accumulated on Grumman Agcat aircraft. He had no formal training or experience in aerobatics.

The pilot, when interviewed later, claimed that he had undertaken the flight to check the aircraft's cruising speed and fuel consumption in preparation for the ferry flight. After taking off, the pilot said, he had flown in the direction of the town at a height of about 500 feet. Because the terrain rises in this direction however, the aircraft's height above the ground was less as it approached the golf course. At

this stage of the flight, the pilot said he looked out of the cockpit and, realising he was lower than he intended to be, he had attempted to increase power to climb and turn on to a reciprocal heading. But as he had opened the throttle and pulled back the control column, the engine had died and the aircraft seemed to flick or spin. The final thing he remembered was pulling back hard on the control column "to get the ground out of the windscreen".

Despite the recollections of the injured pilot however, the consensus of eye witness accounts was such that it was impossible not to accept that the aircraft's manoeuvres immediately before the accident had resulted from a deliberately induced aerobatic manoeuvre of some sort, undertaken at a dangerously low level. Indeed, the evidence all points to the conclusion that the pilot was attempting a stall-turn type manoeuvre over the golf course where there were a number of players to witness the performance.

It seems that the young pilot, left perhaps for the first time in charge of his aircraft, decided to make the most of the opportunity this presented to do some further flying, no doubt justifying his decision on the grounds of familiarisation.

But once airborne and completely free of the constraints of supervision, he was apparently unable to resist giving vent to his pent-up exuberance. Unfortunately, his desire to perform an impressive and spectacular manoeuvre was not matched by his skill or judgement. The result cost his company a valuable aircraft, and almost cost the pilot his life.

The three victims of the other accident of this type were not nearly so fortunate and were all killed when a Piper Comanche, operated by an inland flying school, crashed during what was primarily intended as a conversion training flight. A qualified flying instructor occupied the aircraft's right hand seat, and a private pilot undergoing endorsement training was in the left hand seat. The third occupant, travelling in the aircraft as a passenger, was a student pilot who had not yet begun his flying training. It had previously been arranged that, in the course of the training flight, the aircraft would make a brief call at a country property some 50 miles away, which belonged to relatives of the private pilot. The student pilot had come to the hangar while the other two pilots were preparing for the flight, and the instructor had invited him to accompany them on the trip to the country property for the experience.

Approaching the property from the south-east half an hour after departing from its base, the aircraft was seen to fly low over the homestead and continue north-west towards the airstrip where relatives of the private pilot were already waiting for the aircraft to land. After circling the strip to the left, the aircraft headed back towards the homestead and, with its engine apparently throttled well back, passed directly over the house again at low level. As the aircraft approached a low timbered ridge which lay at right angles to its path half a mile beyond the buildings, it nosed up into a steep climb. Its forward speed decayed rapidly, and at a height of about 250 feet, a little more than twice that of the ridge above the surrounding terrain, it entered a steeply banked turn to the left. Losing height quickly, the aircraft emerged in the reciprocal direction but in a steep nose-down attitude, and dived with great force into the trees close to

the foot of the ridge. A fierce fire engulfed the wreckage almost immediately.

* * *

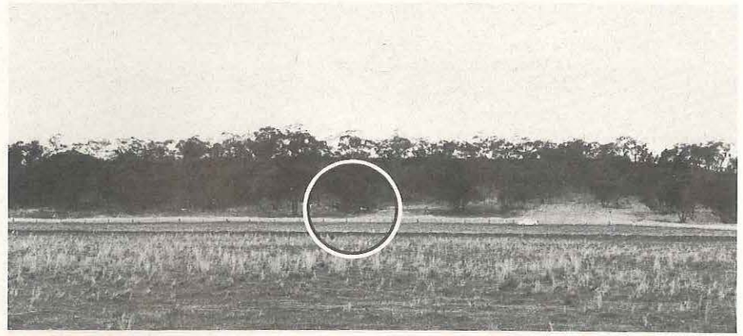
Examination of the wreckage showed that the aircraft had first struck the trees at a descent angle of about 50 degrees. There was no evidence of any malfunction having occurred before impact, and although the engine was not delivering any substantial power when the propeller struck the ground, it was clearly capable of normal operation.

The flying instructor on board the aircraft held a commercial pilot licence with a "C" class instructor rating and a Class 4 instrument rating. He had nearly 2,500 hours experience, of which almost 800 hours had been gained in instructional flying. The pilot undergoing endorsement training held a valid private licence and had about 200 hours experience.

There is no way of knowing who was actually manipulating the controls immediately before the accident, but as the flight was ostensibly a training one, and the pilot in the left hand seat was not endorsed for the aircraft type, the instructor pilot in the right hand seat was clearly the pilot in command and was responsible for the safety of the aircraft.

Although the evidence of persons on the ground who witnessed the aircraft's manoeuvres just before the crash could be taken to indicate that the aircraft simply stalled during a climbing turn and there was insufficient height in which to recover control, it is hard to accept that this could occur unintentionally with two experienced pilots occupying the control

Left: All that remained of the Comanche after the crash and ensuing fire. A few seconds disregard for the fundamentals of flying safety was all that was necessary to reduce a fully serviceable aeroplane to this almost unrecognisable aggregation of charred and twisted wreckage.



Top: General view of accident site looking in direction of flight. The wreckage can be seen in the centre of the picture at the base of the low, timbered ridge.

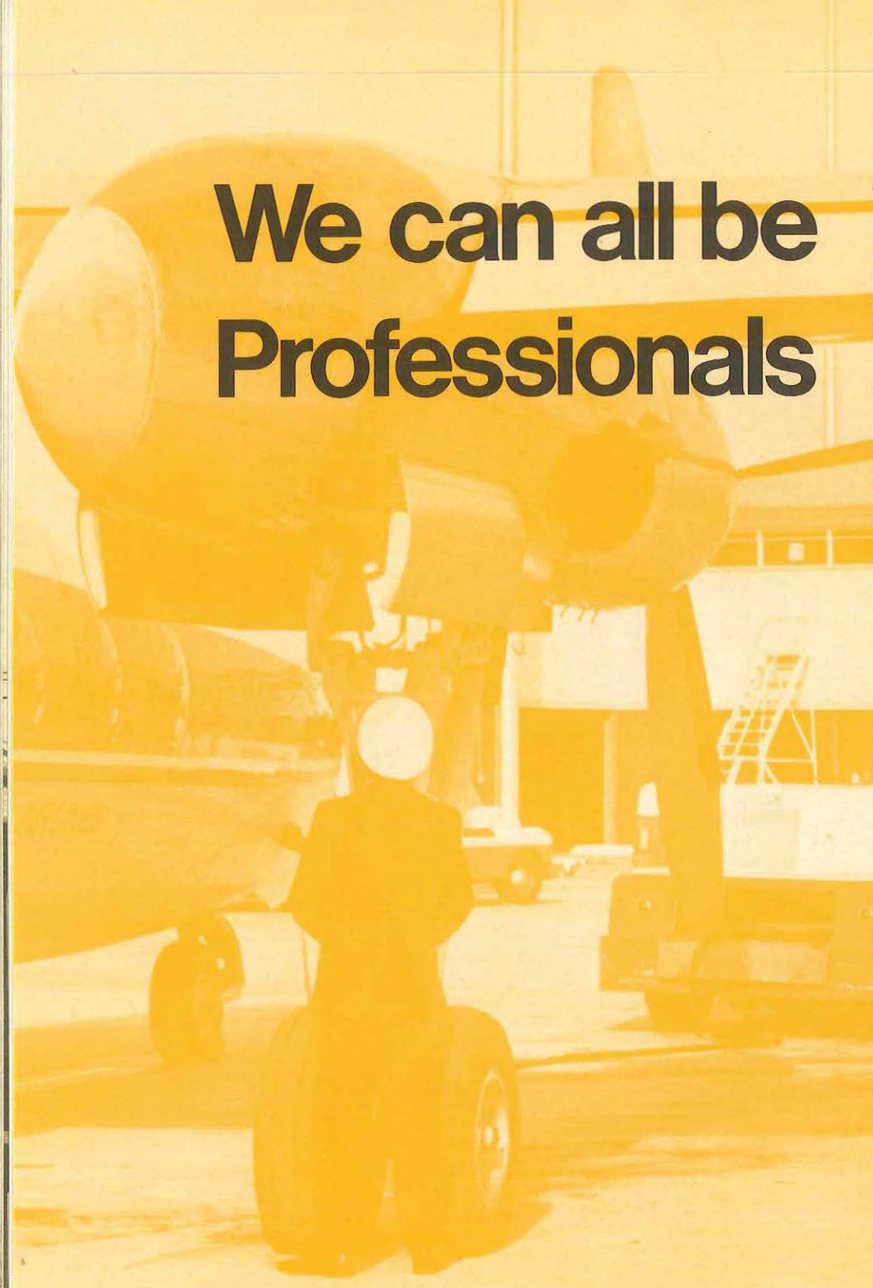
Bottom: Close-up of the accident site showing the burnt-out wreckage amongst the trees at the base of the ridge.

seats of the aircraft. Indeed, as with the accident to the Agcat, it is difficult not to conclude that the steep nose-down attitude of the aircraft was the result of a deliberately induced wing-over or stall turn type manoeuvre, initiated at low level, in this case, shortly after the aircraft passed over the homestead.

Be this as it may, the evidence of the eye witnesses leaves no doubt that, during the few minutes between the time the aircraft first approached the property and when it crashed, it was being flown at an unnecessarily low height. Certainly the flight path flown by the aircraft up to the time it commenced the final fatal manoeuvre could possibly have been regarded by its crew as part of their approach to land, but if this were so, their passage over the homestead for the second time could only have been the latter portion of a very extended downwind leg. At this point in the circuit, there could be no possible "approaching to land" justification for flying so low and it is apparent that the safety requirements embodied in ANR 133(2)(b), were being disregarded.

Apart from this lapse and the manoeuvre itself that precipitated the accident, there was one further aspect of the flight that was irregular. ANR 242(1)(b) prohibits the carrying of passengers in aircraft engaged in practice flying "for the purpose of obtaining an endorsement . . .". Although the contravention of this regulation might not have contributed to the accident in any way, its non-observance was perhaps symptomatic of a general lack of flying discipline on the part of the pilot-in-command. Such an attitude could have provided the environment necessary in the circumstances for an accident of this type to develop.

We can all be Professionals



THE reception accorded the recently introduced "In Brief" section of the Digest has been most favourable and is evidently a measure of the need felt by some readers for guidance on the narrow margin of circumstances that can spell the difference between a safe, efficiently conducted flight, and one that falls short of this ideal without actually becoming a catastrophe.

Although they are seldom spectacular enough to attract much publicity, accidents in this category are surprisingly numerous by comparison with those of more serious consequences. In fact, for every fatal general aviation accident in which an Australian registered aircraft is involved, there are, according to the latest figures available, no less than 14 other accidents of varying severity.

What then, are the reasons for so many well-intentioned flights ending this way? It is here that the Department's computer-controlled statistical data is now able to help in pin-pointing just where some of the problems lie. For example, most pilots probably know that the landing phase of any flight is the most accident prone, and the statistics in fact show that this phase accounts for some 47.5 per cent of all general aviation accidents. Significantly however, when this figure is further broken down to show the percentage applicable to the different categories of operation, the landing phase accident percentage for flights conducted on a commercial basis (excluding flying training) falls to 28 per cent, while that for private and business flights rises to 57.5 per cent!

Unfortunately, it has to be said that the same sort of trend is evident throughout the range of accident categories for which statistical data is available. The unpalatable truth is that, flying training aside, the standard of ability amongst non-professional pilots leaves much to be desired and far too many appear to exhibit a dismaying lack of airmanship. Paradoxically, the accident record for flying training, when compared on an hours-flown basis, is very much better than that for private and business flying. A newcomer to the industry might be pardoned for imagining the opposite would be true!

This surprising finding perhaps provides the key to the situation. One of the difficulties with private and business flying is that, while airmanship is a quality that is more often caught rather than taught, many private pilots, once they have satisfactorily completed their flying training and have been issued with their licence, go their own way and their flying is only rarely subjected to any form of check or revision training. As a result, bad flying habits can form and develop undetected until they culminate, if not in something more serious, then at least in an expensive mistake of the type portrayed in some of the "In Brief" reports.

All pilots of course, regardless of their class of operation or category of licence, carry a heavy responsibility for the safety of their operations, but nowhere does this devolve more personally than upon a private pilot operating quite independently of any form of supervision. The manipulative skills and operational practices of pilots who fly commercially are normally subject to the surveillance of a chief pilot or to some other form of training and checking organisation. But the private pilot, particularly one who operates and flies his own aeroplane, has no such yardstick by which he can regularly measure his performance.

How then can such a pilot ensure that his airmanship and flying ability is maintained at a proper standard? Before anything else can be considered, it is essential that he develop the faculty for objective self-appraisal and self-discipline which will enable him to adopt for himself, standards and requirements of the type imposed upon professional pilots.

Next, he must keep himself thoroughly conversant with all aspects of his operations and responsibilities. This is straightforward enough, provided that he will take the trouble to do it, as all such information is issued to licence holders in the form of AIP's and the VFG, maps and charts, AIC's and NOTAMS. This published data is further supplemented by operational and weather briefings, available on request at Air Traffic Control and Flight Service Units.

Thirdly, the pilot must ensure that he knows the aircraft type he is flying and knows what its limitations are. This is admittedly not so much of a problem with owner-pilots today, but amongst those who hire the aeroplanes they fly, it is perhaps here as much as anywhere else, that well-intentioned but ill-informed pilots unwittingly get themselves into difficulties. Typical examples are mismanagement of the aircraft's systems, particularly the fuel supply, or attempting a take-off or landing in a field that is too small for the performance of the aircraft. All this information however is contained in the owner's manual and flight manual for the particular aircraft, and if pilots made themselves thoroughly familiar with the contents of these publications, the possibility of accidents resulting from lack of knowledge of their aircraft would be greatly lessened. It is possible that aircraft hiring organisations are not always above criticism in this regard. In some cases, there appears to be little provision for pilots to study beforehand the flight manual of the aircraft they intend to fly, and the availability of adequate aircraft handling notes is sometimes less than it should be.

The fourth requirement of the good private pilot is to know and to be able to recognise his own limitations, in the fields of both manipulative ability and operational judgement. Confidence of course is a very desirable attribute in a pilot, but over-confidence can lead to all manner of difficulties and dangers, as should be evident from some of the accidents reviewed in recent issues of the Digest. A proper estimate of one's own limitations is not in any sense an admission of inadequacy, but is only a sensible and realistic attitude that can enable one to say "no" when faced with pressures of one sort or another, to continue into a situation that could obviously endanger the aircraft and its occupants.

The fifth point concerns flight preparation and planning. If some of the Department's investigation files are any guide, some private pilots seem to have developed a fine contempt for flight planning, apparently regarding it as so much wasted time. The fact of the matter is that accident case-histories have shown time and again that lack of proper planning can lead to disaster. Indeed, it is not only the actual weather briefing and flight planning in the briefing room that pays dividends in safety; the same principle applies to all aspects of flight preparation, from acquiring details of fuel supply arrangements at the distant aerodrome at which it is intended to land, to ensuring that there is suitable accommodation for the passengers. Unrelated though some such matters might seem to be to actually flying an aeroplane safely, they have sometimes been the reason for continuing a flight beyond what was prudent in terms of daylight or remaining fuel. In summary, it would be difficult to express the case for preparation more succinctly than does ANR 231(1) when it says that "Before beginning a flight, the pilot in command shall study all available information appropriate to the intended operation...".

Lastly, the private pilot must be particularly on his guard against the temptation to give way to any form of cavalier conduct at the controls of his aircraft, either for the benefit of his passengers, or for those watching from the ground. This trait, if yielded to, can completely undermine and negate the whole umbrella of safety that the pilot might otherwise have succeeded in developing in respect of the flight through his other qualities of airmanship and ability. Even in the most favourable situation, conduct of this sort can only lead to ill-considered judgements and actions. And while such aeronautical behaviour may impress some of his audience if he gets away with it, the type of impression it makes on most mature people is not the sort any responsible pilot would relish.

There is little doubt that if these measures could be taken to heart by private pilots generally, there would be an immediate and lasting improvement in the safety standards of this class of general aviation operations. Does it all sound too stiff and dull to be regarded seriously? It is asking no more of the private flying fraternity than is expected of professional pilots every day of their working lives! There is no valid reason whatever why private pilots should not set their sights on a professional standard of airmanship and ability. And this need not be limited to actual flying activity; it can be reflected in countless other ways. Things such as the pilot's personal bearing and behaviour, his relationship with briefing officers and other airport staff; his concern for the comfort of his passengers and their enjoyment of the flight; even the way he taxis and parks his aircraft and the condition in which he leaves it, all of which help to engender an overall mood of professionalism.

Pilots whose aim is excellence in their art will find in the long run, that there is far more satisfaction to be had in building a solid reputation for a skilled professional-type performance, than there ever can be in the cheap substitute offered by sporadic indulgence in irresponsible, if spectacular, exhibitionism. ———

STARTING WITH A BANG!

The damaged wing in the photographs on the opposite page belong to a Piper Aztec that was damaged by an internal explosion while the port engine was being started. Luckily no one was hurt, but as the pictures show very well, the damage was substantial – and expensive!

THE accident is typical of a number that have occurred to light twin-engined aeroplanes during the last few years. In each case, a fuel leak somewhere within the wing space produced an inflammable mixture of fuel vapour and air in the right proportions, which was ignited the next time the engines were started.

For an explosion of this type to take place, three ingredients are of course always necessary: fuel and air, mixed in the right proportions, and a source of ignition. In normal circumstances, the safety standards to which the aircraft has been designed, ensure that any possible ignition source is eliminated or separated from fuel-occupied space. Fuel vapour is usually confined to the fuel tanks and fuel venting systems and, in the case of avgas, the mixture is usually too rich to be explosive; i.e. there is insufficient air to support combustion.

When a fuel leak develops however, these normally safe conditions no longer exist, because the leaking fuel vaporizes outside the fuel tank and mixes with the air. If this occurs in an enclosed, confined space such as the inside of a wing, the resulting proportions of fuel and air can produce a vapour mixture that is highly inflammable. Two of the factors required for a wing explosion are thus present and only the ignition source is required to make it happen.

An ignition source capable of setting off such an explosion could be provided by an engine backfire during starting, or an electrical short in the wing wiring; e.g. in the stall warning system, pitot heater, navigation light wiring, or the fuel gauge circuit. Some of these circuits are not protected by separate switches and are energised all the time the master switch is on. In the most apt conditions, with the fuel-air mixture proportion at its most inflammable, even a slight electro-static discharge could be sufficient to set off an explosion in the wing.

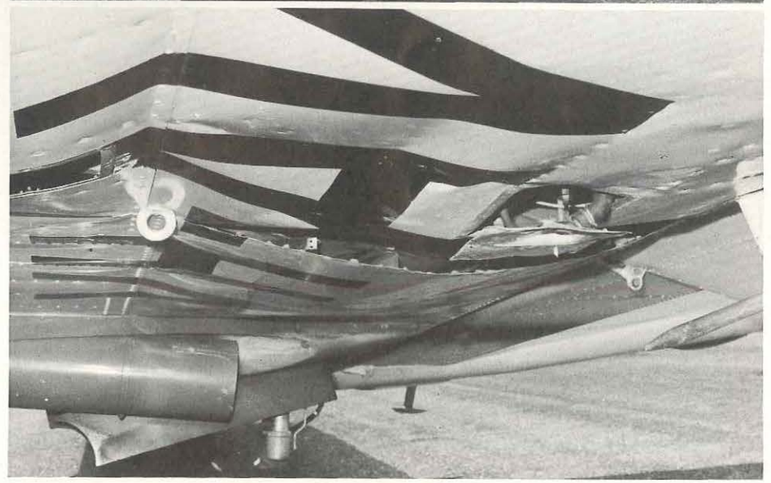
Fuel leaks which could lead to this situation can of course develop in a number of ways; a loose connection in the fuel tank outlet, drain, or vent line; a leaking seal in a tank filler neck; or a faulty fuel gauge installation. But a much more insidious source of fuel leaks, and one that has been increasingly a factor in wing explosions in recent years, is the deterioration that takes place in the flexible, wing-installed fuel cells of aircraft that have been in service for some time, particularly in hot dry climates.

This deterioration is a slow process and takes place as a result of the fuel gradually removing the plasticizer from the rubber layers comprising the walls of the flexible fuel cell. All remains well while there is fuel in the tank, because the fuel itself acts as a substitute plasticizer. But if the tanks are allowed to remain empty for any length of time, they dry out and the rubber hardens. In this condition the cells are liable to damage. The deterioration seems most marked in aircraft which have been "hangared" in the open for lengthy periods in hot weather. The effect is also more pronounced on the upper surfaces of the fuel cells, probably because the black synthetic rubber material of the cell acts as an absorbent or trap, for heat radiated into the wing cavity from its upper skin. The effect is greatest when the aircraft is left standing in the sun, as there is no ventilation of the narrow airspace between the tank and the upper skin of the wing.

The subject of fuel cell deterioration and its prevention was discussed in detail in Airworthiness Advisory Circular No. 40, but the main points for pilots to watch may be summarised as follows:

- Keep the fuel tanks topped up as much as possible.
- When it is necessary to operate without filling the auxilary tanks, leave a gallon or so of fuel in them to prevent the cells drying out.
- As far as possible, avoid leaving the aircraft standing in the sun.
- If for any reason fuel cells have to be left empty for more than five days (whether or not the cells are installed in the aircraft), a thin coating of light oil should be flushed or sprayed on to the inner surfaces. This prevents the cell material from drying out and cracking.
- Be alert for any signs of deterioration, such as fuel staining on the underside of the wings, or any excessive smell of fuel at openings in the wing structure, particularly in the lowest sections of the wings, such as in the undercarriage wheel wells.

Although visual inspections for fuel cell leaks are difficult to carry out with the fuel cells installed, it is not advisable to remove the cell from the aircraft unless a leak is strongly suspected. However, if there is clear evidence of a leak, the cell should be removed and pressure tested. It should be borne in mind that cells can easily be damaged during removal and re-installation. Thus, a quite serviceable cell might be removed and pressure tested satisfactorily, but still develop a leak while it is being refitted to the aircraft.



Because of the nature of the deterioration, leaks in fuel cells are likely to be very small and widely distributed. For this reason they are generally difficult to find. It is quite probable that in the early stages of a leak, fuel will not actually be seen dripping from the tank because it is vapourising almost as quickly as it does so. Over a period of time however, the cumulative effects of the leak leave tell-tale signs of fuel staining on the wing structure. The difficulty and danger of the problem lies in the fact that vapour from a leaking fuel cell may form an explosive mixture well before the leak has been in existence long enough for the fuel staining to become clearly visible.

For this reason it is important to check carefully for symptoms of fuel leaks during daily inspections. Special attention should be given to the wing areas where the fuel tanks are located, and to openings in the lower sections of the wings where fuel vapour, being heavier than air, is likely to be discharged. Care should also be taken to ensure that all drain holes are clear and free of vapour, and that the surrounding under-surfaces of the wing are carefully inspected for signs of fuel staining. If any signs of a fuel leak are detected, it is of course of vital importance that its source be investigated and corrective action taken without delay.

Pilots carrying out pre-flight inspections should remember that the extra few seconds it takes to thoroughly check the under-surfaces of the wings for possible fuel leaks could be cheap insurance. It could save many costly man hours on repairs to the aircraft, as well as possible injuries. In certain circumstances it could even save lives! ———➧

Why won't they learn?

The classic combination of low cloud and rising terrain claims another victim

WITHOUT actually counting them, it would be difficult to say how many accidents in this category have been reviewed in the Aviation Safety Digest since our first issue went to press in June 1953, but they must be almost legion.

Yet, although the danger should be apparent in itself to pilots attempting to continue visually; although the reality of the hazard has been confirmed and established and proven beyond all possible doubt by a host of costly and tragic disasters; and although a large number of these actual cases have been critically examined and discussed in detail in the Digest over the years, there are still some pilots who refuse to recognise the danger signals that invariably portend accidents of this type.

One of the more recent examples of this almost incomprehensible attitude concerns the pilot of a Fuji aircraft, who with three passengers, was attempting to fly from Adelaide Airport to a private airstrip in the south-eastern district of South Australia.

The weather on the morning of the proposed flight was under the influence of a "high" to the south of Tasmania, producing moist south-easterly winds of 15 to 20 knots. The Adelaide area forecast, issued at 0745 hours local time, indicated that there would be five eighths of stratus cloud at 1,000 feet, two eighths of cumulus at 2,500 and five eighths of strato-cumulus at 3,000 feet. Areas of drizzle were expected on the coast and mountains, with stratus cloud forming on the Mount Lofty Ranges. The visibility was expected to be 20 miles, reducing to four miles in drizzle.

Arriving at the airport at 0700 hours, the pilot called at the briefing office, collected a copy of the area forecast and discussed the weather situation with the meteorological officer on duty, during which he was told that Mt. Gambier aerodrome, in the same area as his destination, had been closed overnight because of poor weather.

Despite this adverse prognosis, the pilot submitted a comprehensive VFR flight plan, which he had apparently prepared before coming to the airport, indicating the aircraft would proceed from Adelaide airport across the Mt. Lofty Ranges, via the Mt. Barker reporting point at 2,500 feet, and on to the next nominated reporting point at Meningie, 45 miles to the south-east. Although there was no requirement for him to do so for a VFR flight, the pilot had shown the lowest safe altitude for the Adelaide-Mt. Barker leg as 2,500 feet. The highest terrain on the direct Adelaide-Mt. Barker track is 1,550 feet, two miles from Mt. Barker itself, but only three miles north of the mid point of this leg, the ranges rise to 2,693 feet.

The pilot then went to his aircraft and carried out a daily inspection. After his passengers had arrived and boarded the aircraft at about 0800 hours, the pilot started the engine and taxied for departure. At 0809 hours, while taxi-ing to the holding point for runway 12, the pilot called the tower for his airways clearance. He was told that VMC did not exist on the planned track and was given an amended clearance to proceed via Port Noarlunga and to leave the Adelaide Control Zone at 1,500 feet. This reporting point is 12 miles south of Adelaide airport, on the southern boundary of the Control Zone.

The pilot acknowledged the amended route and the aircraft took off, turned right in accordance with the tower's instruction, and tracked southwards along the coast. At 0820 hours, the aircraft reported over Port Noarlunga at 1,500 feet and was passed the area QNH. There were no further transmissions from the aircraft.

* * *

At about 0840 hours that morning, the wife of a farmer, inside her home on the Mt. Lofty Ranges three miles east of the township of Mt. Barker, was surprised to hear an aircraft flying low. The weather at the time was foggy and the sky was overcast by low cloud. She caught a glimpse of it through a window as it approached the house at low level and went outside to watch it. It passed directly over the house on a south-easterly heading, almost in the base of the cloud, and continued on out of sight behind trees to the east of her position, apparently heading directly towards the highest part of the timbered main ridge of this section of the Mt. Lofty Range, which lies betweeen the farming property and Mt. Barker township. Low cloud was obscuring the top of the ridge and soon afterwards, the engine noise, which had been quite normal, ceased suddenly and she heard a sound like trees falling. Her husband, who had also heard the aircraft pass overhead, immediately telephoned the local police and set off in the direction of the ridge to try and find the crash site. Meanwhile, two other farmers on nearby properties had heard the engine noise cease and the sounds of impact follow, and also set off to investigate. Within a few minutes the three searchers met up with the police party and they found the wrecked air-

Left: The manner in which the aircraft was finally arrested by the trees is apparent from this photograph. Despite the fact that the airframe structure was virtually destroyed, the cabin area remained substantially intact with the result that all four occupants survived.

Right: The heavily timbered nature of the ridge on which the aircraft crashed is shown in this view of the wreckage.

craft on its nose amongst the trees close to the crest of the ridge, only 100 yards south of its highest point. Three seriously injured occupants were waiting for rescue a short distance away. The fourth occupant, who had escaped almost unhurt, had already gone to seek help.

* * *

The site of the crash was almost on the pilot's original Adelaide—Mt. Barker flight planned track, only two miles from the township of Mt. Barker and at an elevation of 1,500 feet. Although the wreckage remained substantially in one piece, and the cabin area was largely intact, the damage sustained by the aircraft was very extensive and beyond any possibility of repair. It was evident that the aircraft was fully serviceable before impact and that it had first struck the tree tops on a heading of 210 degrees magnetic. It had then descended through the trees, breaking off branches as it went. The outer section of the port wing was torn off and left in the fork of a tree, and the aircraft plunged to the ground 180 feet beyond the first point of impact. It had come to a violent stop as the wings collided with two substantial trees on either side of the nose.

The pilot held a private licence and had nearly 750 hours experience, 600 hours of it on the aircraft type involved in the accident. He was very familiar with the Adelaide area, and had flown across the Mt. Lofty Ranges on many previous occasions.

From accounts given by the four occupants of the aircraft after the accident, it was possible to reconstruct the sequence of events that befell the aircraft between the time it departed from Adelaide airport and it struck the ridge. It was evident that the flight was perfectly normal after departing from Adelaide airport, until after the pilot reported at Port Noarlunga. Here on the coast, the weather was good, but instead of continuing southwards along the coast to outflank the cloud-enshrouded Mt. Lofty Ranges before turning east towards his destination, the pilot immediately turned and flew east-north-east over the rising terrain in the direction of Mt. Barker, apparently intending to rejoin his original flight planned route at this point. Flying just below the overcast cloud, the aircraft tracked along the southern edge of the Mt. Bold Reservoir at a height of about 500 feet above the ground, and though it was now beginning to encounter wisps of cloud at it own level, continued to Echunga, the elevation of which is 1,100 feet. It was now quite obvious that the higher ground beyond this point was covered by the low-lying stratus cloud, but instead of turning back, the pilot, after consulting the Adelaide WAC chart that the front seat passenger was holding for him, turned north and followed a road running parallel with the main ridge of the range. By this stage, the aircraft was flying in the base of the cloud, and although the occupants could still see the ground below most of the time, there was almost no horizontal visibility. From time to time also, the aircraft would pass through patches of cloud. Becoming alarmed at the lack of visibility and the proximity of the rising ground below them, one of the rear seat passengers wondered if he should speak to the pilot. However, as he "presumed the pilot knew what he was doing", he refrained from comment.

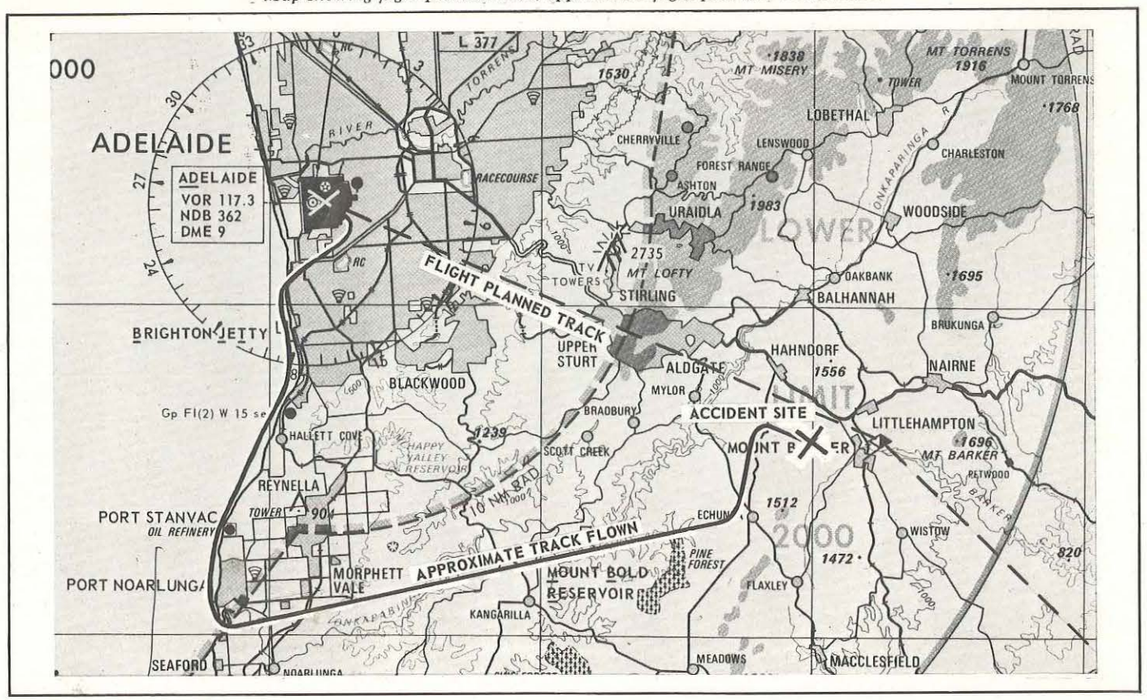
The aircraft now began to pass through further patches of cloud during which all sight of the ground was lost, and the pilot turned the aircraft on to a north-easterly heading. Emerging from a further patch of cloud, the occupants suddenly sighted trees immediately ahead. The front seat passenger shouted "pull her up" and the pilot flung the aircraft into a steep climbing turn to starboard, but was unable to avoid the trees and the starboard wing struck the upper branches. Realising the aircraft was about to crash, the passenger in the left rear seat, who had his seat belt fastened tightly, crossed his arms in front of his head and as they descended into the trees, he braced himself against the padded back of the pilot's seat in front of him. In the final impact, as the aircraft struck the ground and came to rest against the tree trunks, he was thrown forward violently against his seat belt and severely winded, but was not seriously hurt and remained fully conscious. As soon as the aircraft came to rest, he undid his seat belt and kicked his way out through the canopy window on the starboard side. After assisting the other injured occupants from the aircraft and making them as comfortable as possible, he walked to a farmhouse where he telephoned the police to report the accident.

* * *

It was clear from the investigation that the accident was the direct result of the pilot's decision to attempt to cross the Mt. Lofty Ranges, despite the adverse weather forecast, the warning from Air Traffic Control that VMC conditions did not exist on his proposed route, and the obvious nature of the cloud conditions on the ranges themselves. It is extremely difficult to understand the pilot's motives in leaving the satisfactory flying conditions on the coast for such a dangerous and doubtful course of action for, by continuing south along the coast, he could have safely skirted the ranges with less than an additional 30 miles flying to his destination. It seems hardly likely that the pilot could have regarded the ATC instruction as indicating that only the first leg of his flight planned track between Adelaide airport and the boundary of the control zone required diversion. At the height at which he was cleared to fly, ATC's jurisdiction over his aircraft extended only to the boundary of the control zone. Port Noarlunga is the reporting point on the coast on the southern boundary of the control zone, and an instruction to leave the zone at this point, coupled with the advice that VMC did not exist on his proposed route within the zone, should have indicated to the pilot the need for diversion around the higher sections of the Mt. Lofty Ranges.

The only possible explanation for the pilot's actions would seem to be that he believed he knew the area so well that, despite the adverse conditions, he was confident of his ability to find a visual route through the ranges, even though the aircraft would clearly need to be flown in conditions a great deal worse than those prescribed as the minima for visual flight. Apparently another victim of the "it won't happen to me" hallucination common to many pilots who fly in the face of long-established and well-proven aviation safety principles, the pilot in this case seems to have been determined to continue his flight against all indications to the contrary and despite the dangers to which his aircraft and its occupants were obviously being exposed. As has been pointed out many times before, it was for the very purpose of guarding against such situations that regulations like those contained in the Visual Flight Rules were introduced when harsh practical experience had shown them to be necessary. There is an abundance of evidence and experience, both old and new, to exemplify the wisdom of such rules, and it is difficult to know what more can be done to convince pilots that, by disregarding them, they are taking their own lives, and the lives of their passengers, literally in their own hands.

Map showing flight-planned track, approximate flight path and accident site.



AIR SAFETY SYMPOSIUM

AS most readers know, Aviation Safety Digest does not engage in advertising. However, as its whole purpose is to promote air safety, it is only right that the Digest should draw its reader's attention to an Air Safety Symposium to be held soon in Melbourne. The Symposium, which is to be conducted at the National Science Centre, 191 Royal Parade, Melbourne on 23rd and 24th August, is being convened by the Australian Federation of Air Pilots, with the co-operation of the Department and the airline companies.

In addition to an address by Mr. P. Burgess of the British Aircraft Corporation on the Concorde, the symposium will have three panels. The first, entitled "The Cockpit and Safety", will comprise two papers on area navigation, a paper by Mr. Don Thielke of the American Flight Engineers Association, and a paper discussing human engineering cockpit design, produced jointly by Professor Ron Cummings, Mr. Alan Ross of the Aeronautical Research Laboratories, and Mr. R. Baxter of Qantas.

The second panel, "The Pilot, The Aircraft and Safety" will cover:

- "The Pilot and Air Safety": Captain G. Reinke, Director of Air Safety, A.F.A.P.
- "Psychological factors in aircraft accidents": an R.A.A.F. psychologist.
- "The protection and care of pilot's eyes": Dr. J. Colvin, consultant ophthalmologist to D.C.A., the R.A.A.F., and N.A.S.A. in the United States of America.
- "Safety in Simulation", with emphasis on Qantas 747 conversion experience: Captain J. B. Fawcett, Assistant Flight Superintendent (Training) Qantas.
- "Handling the Concorde": A BAC test pilot.
- "Accident Investigation": Mr. D. S. Graham, Assistant Director-General (Air Safety), D.C.A.

Under the general title "Airports, Approach Aids and Air Safety" the third panel will embrace:

- "Runway Considerations": Mr. J. Laver, Senior Airport Engineer, D.C.A.
- "Runway Slipperiness and Associated Problems": Captain J. Guggenheimer, President, A.F.A.P.
- Reserved.
- "Integrated flight systems of the Lockheed Tri-star": Mr. Jim Wu, Conceptional and Design Engineer, The Lockheed Corporation.
- "Runway Vision Radar": The Lockheed Corporation.

On the Wednesday evening, 23rd August, a celebration banquet will be held in the Great Hall of the Melbourne Arts Centre. On Friday, 25th August, the day following the Symposium, tours have been arranged of the Aeronautical Research Laboratories and TAA's 727 and DC9 simulators.

The registration fee of $25 covers attendance, the banquet, lunch on Thursday 24th, morning and afteroon teas, and bound copies of the Symposium papers. Accommodation has been arranged at the nearby Zebra Motel at $11.90 per day.

Further details and registration forms are available from the Secretary, 1972 Technical Symposium, Australian Federation of Air Pilots, 136 Albert Road, South Melbourne, Victoria, 3205.

CROSS WIND LANDINGS

ARRIVING over a country aerodrome in Victoria, the owner-pilot of a Tiger Moth estimated from the windsock that the wind was blowing from the east at about 10 knots. Anticipating that these conditions would produce only a slight crosswind component on the 12 duty strip, the pilot decided he would practise some crosswind landings and carried out a circuit and approach for a landing in this direction. After touching down, the aircraft bounced but when the pilot saw that it was not drifting, he decided to continue with the landing and applied sufficient power to cushion the aircraft's descent. But as it touched down for the second time, the port wing suddenly lifted and the aircraft swung rapidly off the strip and into a cultivated area in the centre of the aerodrome. Unable to check the swing even with full rudder and aileron, the pilot opened the throttle to go around, but immediately closed it again when he realised the swing had progressed too far. As the aircraft skidded downwind, the port wheel dug into the soft earth, one of the undercarriage bracing struts collapsed, and the aircraft pitched foward on to its nose and overturned, coming to rest on its back. It was subsequently determined that, at the time of the accident, the wind was indeed blowing from the east but was gusting to about 25 knots, giving a crosswind component on the 12 strip in excess of the maximum permitted for the aircraft type.

It is generally recognised that the Tiger Moth is not an easy aircraft to handle in a crosswind, and some readers may feel it is a little unfair to select such an accident to illustrate the consequences of mis-managing a crosswind landing in a light aircraft. However, the Department's records show that the problems experienced by this pilot are by no means confined to the earlier training types and that crosswind landing accidents are continuing to occur in more modern aircraft, despite the inherent directional stability of the nose-wheel undercarriage.

Typical of these is a recent accident involving the pilot of a Cherokee in Western Australia. Arriving over his destination, which had only a single, sealed east-west runway, the pilot circled the aerodrome twice while he assessed the wind strength and planned his approach. The wind was in fact a southerly of about 10 knots, blowing virtually at right angles to the runway, and as it did not particularly favour either direction, the pilot eventually decided to land into the east.

Encountering turbulence generated by the gusty, crosswind conditions on final approach, the pilot maintained a speed of at least 75 knots until he had crossed the threshold. After rounding out however, the aircraft floated for over 1,100 feet before touching down initially on the main wheels, in the centre of the narrow runway. The nose wheel quickly dropped to the ground and, still at high speed, the aircraft skipped three or four times. It then ran straight for a short distance, but almost immediately the nose wheel began to oscillate and the aircraft swung rapidly to starboard under the influence of the crosswind until it was heading towards the edge of the runway. The pilot attempted to regain directional control but his efforts were in vain and the aircraft left the sealed surface and headed directly towards two cone markers on the flight strip boundary. Although by now he was pressing hard on the left rudder pedal, the pilot was still unable to check the swing and the aircraft smashed through the markers before running into a bank of soft sand. The nose wheel broke off, and the aircraft came to a sudden halt on its nose, extensively damaged.

Planning ahead

Planning for a crosswind landing, like any other type of landing, should begin well in advance of the actual approach and touch down. Correction for drift is quite different to that normally required, and allowance must be made early in the circuit to avoid distortion of the circuit pattern. Special care is needed on the downwind leg to ensure that the aircraft tracks parallel to the intended landing path and thus maintains the correct distance from it. The pilot must also remember that ground speeds on the crosswind and base legs will be different to those he is used to, and he should be prepared to commence the turn on to final approach earlier or later than usual, depending on the wind direction, in order to roll out of the turn correctly lined up with the runway.

The approach

Most pilots will recall, from their student days, the emphasis given to the fact that a good approach makes for a good landing, and that a good approach rarely follows a poor circuit. This is especially so in crosswind conditions where any error in assessing drift on final approach will almost certainly result in a poor or misjudged landing.

There are two basic methods of compensating for drift during an approach to land out of wind—

- By heading the aeroplane slightly into wind with the wings level and tracking, or crabbing, along the intended landing path;
- By lowering the up-wind wing and, holding on opposite rudder to counteract the turn, side-slipping the aircraft sufficiently to descend in line with the landing direction.

Of these two techniques, the crabbed approach is undoubtedly the easier and most straightforward method of compensating for drift. Once a crab angle sufficient to cope with the conditions has been established, aircraft handling, at least up until the point of touchdown, is quite straightforward and similar in all other respects to a normal approach.

The side-slipping technique is another matter entirely. Quite apart from an undeniable degree of discomfort which affects pilot and passengers alike, this method has several major drawbacks and under certain conditions in some aircraft types, should not be attempted. In some aircraft, side-slipping with flaps extended beyond a particular setting is not recommended because of the possibility of shielding the tail surfaces from the airflow and producing a sudden nose-down pitch which could be difficult to correct close to the ground. Furthermore, in many aircraft types, flight manual requirements prohibit extended side-slips with low fuel quantities because of the danger of uncovering the tank outlets and causing engine failure from fuel starvation, which could be extremely embarrassing at low height!

Yet another and perhaps not quite so obvious shortcoming of this type of approach is the possibility of "running out of control". In a very strong crosswind, considerable into-wind aileron and a correspondingly large rudder deflection will be necessary. In these circumstances, there may be insufficient remaining control travel for the pilot to right the aircraft should an exceptionally strong gust or unexpected turbulence cause an upset near the ground.

Touchdown

In a crosswind landing, the wind force acting over the entire side area of the aircraft tends to push it towards the downwind side of the runway. This force is proportional to the square of the crosswind velocity; thus, in a 10 knot crosswind, the side force on the aircraft would be quadruple that produced by a 5 knot component. Generally, the centre of pressure of this crosswind force acts aft of the centre of rotation (the main undercarriage), so that a yawing moment which tends to make the aircraft weathercock into wind is usually produced.

Undercarriages are not designed to withstand heavy side loads, a fact brought home only too clearly by both the accidents described at the beginning of this article as well as by other, similar occurrences described in the "In Brief" sections of recent issues of the Digest. It is imperative therefore, that aircraft are not permitted to contact the ground while drifting, and at the moment of touchdown is aligned with the runway.

As in the case of the crosswind approach, there are two basic methods of counteracting drift at touchdown. Both of these are simply extensions of the techniques already described. If the crabbed approach is used, the touchdown technique consists of flaring the aircraft in the normal way, with the drift correction still applied, and then as the speed diminishes and the aircraft begins to settle towards the runway, rudder is smoothly but firmly applied to yaw the aircraft into line with the landing path just before it touches down. As the aircraft is straightened up in this way, opposite aileron should be used to keep the wings level.

Despite the obvious advantages of the crabbed approach, this exercise of "de-crabbing" immediately before touchdown calls for a very high degree of

The "crabbed" approach, with the aircraft headed slightly into wind so that its approach path is aligned with the runway.

pilot skill and judgement. The pilot must resist the temptation to yaw the aircraft into line with the runway too soon or, although still pointing in the landing direction, the aircraft will quickly commence to drift towards the downwind edge of the runway. Any attempt at this low height to re-align the aircraft by making a co-ordinated turn into wind will almost certainly result in the aircraft striking the ground whilst drifting downwind. Conversely, if the pilot waits too long to align the aircraft, it will also touch down at an angle to the runway, subjecting the undercarriage structure to the very loads that the whole technique is intended to prevent. Even if the pilot has correctly judged his height above the runway and he starts to reduce the crab angle at what he estimates to be precisely the right moment, he may find that decaying airspeed during the hold-off might well have reduced rudder effectiveness to the extent that, even with full pedal deflection, there may be insufficient rudder control available to yaw the aircraft into line with the intended landing path before the wheels touch the ground.

By contrast with these difficulties, landing off a side-slipping approach does not require such precise judgement or timing. The aircraft is already aligned with the runway and, after what is virtually a normal flare and hold-off, the aircraft touches down without drift on the up-wind main wheel. The fact that the up-wind wing remains lowered also provides some measure of protection against strong sideways gusts.

The side-slipping approach. In this case, the effect of the side slip counteracts the drift produced by the crosswind.

The combination method

The crosswind landing technique which probably gives the greatest degree of control without making unnecessarily high demands on pilot skill is the combination crab-slip method. In this type of approach and landing, the pilot compensates for drift on the approach by crabbing the aircraft into wind, which is held until after the aircraft is flared for landing. But as the speed begins to diminish and before the aircraft starts to settle towards the ground, the pilot transitions to the slip method, first of all yawing the aircraft into line with the runway while the speed is still sufficient to maintain rudder effectiveness. Then, when the aircraft is tracking straight down the runway, the upwind wing is lowered smoothly to prevent further drift and the flare continued until the upwind wheel touches the ground. After touchdown, the aircraft is kept straight by using a combination of rudder and upwind aileron.

Directional control after touchdown

Maintaining directional control after touchdown in a tail-wheel aircraft generally presents no major difficulty provided a wheel landing technique is used. The aircraft is held straight initially by the careful application of rudder, and then judicious use of brakes as the tail wheel is lowered to the runway. Aileron applied into wind helps to prevent the up-wind wing from rising in a strong gust.

In nose-wheel aircraft however, there are limitations of the nose-wheel steering system to contend with. Although a few modern general aviation aircraft have fully castering, non-steerable nose wheels, the great majority have some form of steering system. On some of these types, the steering is not direct, but is arranged through a spring linkage so that, when the wheel is off the ground and the strut is fully extended, the wheel automatically aligns itself with the centre line of the aircraft.

But on most types, the nose wheel is coupled to the rudder pedals by a direct acting linkage so that the wheel turns whenever rudder is applied and it is this

system which can lead to handling problems in crosswind landings. For no matter which crosswind technique is used, some rudder application is necessary to align the aircraft with the runway and if the nose wheel is allowed to contact the ground with rudder still applied, the aircraft will immediately swing in the direction in which the wheel is turned, regardless of the wind direction.

It therefore requires a deliberate effort on the pilot's part to centralise the rudder pedals before the nose wheel touches down, in order to avoid the onset of an uncontrolled swing and ground loop. Pilots must also bear in mind that a similar manoeuvre could result if, in an endeavour to hold the aircraft on the ground, too much forward elevator control were applied at too high a speed, thus transferring most of the aircraft's weight to the nose wheel, and in some instances, lifting the main wheels clear of the runway altogether.

General technique

As a general rule, pilots should carry out powered approaches in crosswind conditions. The use of power enables a pilot to regulate the rate of descent over a very wide range to compensate for varying wind strengths and it also results in a smaller change in attitude during the landing flare compared with that for a full-glide approach. Furthermore, whenever the wind is strong and gusty, no matter from which direction it is blowing, it is always desirable to use a slightly higher approach speed to provide a greater measure of control and a higher margin above the stalling speed. However, the use of too high a speed in a crosswind can lead to many kinds of problems and it must also be borne in mind that as the crosswind angle increases, the headwind component decreases until, when the wind is blowing at right angles to the runway, the headwind component is reduced to zero. An excessively high approach speed in these circumstances, no matter how hard the wind is actually blowing, will result not only in a significant increase in the landing distance, but also a much higher touchdown speed which could well lead to handling difficulties in some types of nose wheel aircraft.

Some pilots, in an attempt to offset the crosswind effect, aim to land near the downwind edge of the runway, apparently reasoning that by allowing themselves this additional manoeuvring space, they would have more chance of recovering control should the aircraft commence to weather-cock into wind after touching down. These pilots however, overlook the fact that, in this situation, it would not take an especially strong gust to blow the aircraft off the runway altogether, possibly into a rough or otherwise unserviceable area. Other pilots, thinking along slightly different lines, plan their approach for the upwind side of the runway, to provide an additional margin should the aircraft begin to drift downwind before the wheels contact the ground. This technique also has an in-built snag in that if the aircraft did weather-cock after touchdown the pilot might not have room to regain directional control before it ran off the runway. It is far better to adhere to an established technique and plan to touch down as near to the centre line as possible at the normal aiming point.

Pilots should at all times guard against the error of touching down first on the downwind wheel. This raises the upwind wing, presenting a very large surface area to the wind, which not only increases the chances of the aircraft being blown laterally off the side of the strip, but can induce a rolling motion which can be very difficult to correct once it has developed. A similar effect can be produced if an aircraft touches down near the downwind edge of a heavily cambered runway.

Practice

Pilots should be capable of handling a variety of crosswind conditions competently and safely. In addition to operations at major airports where procedures frequently call for landings out of wind, they may be confronted at any time with unexpected situations such as a temporarily obstructed duty runway or an in-flight diversion to an aerodrome where the wind may be blowing at any angle across the single available strip.

As precise judgement is required to estimate height and drift angle in crosswind conditions, and a high degree of coordination is necessary to correctly align the aircraft with the touchdown direction, proficiency in crosswind landings can be maintained only by regular practice. Traffic at busy secondary airports of course, will not always permit operations contrary to the normal circuit direction, but frequently, even on the duty runway, there is a small component which should be properly allowed for, rather than simply ignored and the aircraft's tricycle undercarriage trusted to take care of the side loads and directional stability problems.

Maximum permissible crosswind components are of course designated by the Department and are specified in flight manuals issued to each aircraft. Pilots must remember however, that these maximum values are based as much on pilot ability as aircraft limitations, and are quoted for the competent pilot who is in current practice. Pilots should therefore exercise discretion in assessing these limitations for themselves to ensure that their operations are confined to crosswind components which are well within their capabilities.

WITHOUT COMMENT!!

Towards the end of a VFR flight from Leigh Creek, S.A. to Tyabb, Victoria, and eight minutes before last light, the pilot of a Cessna 337 reported that he was over Bacchus Marsh, cancelled his SARTIME, and advised that he would be remaining there overnight.

The aircraft was then observed on radar to continue via the light aircraft corridor to Tyabb, where it landed 21 minutes after last light.

—from a recent Incident Summary

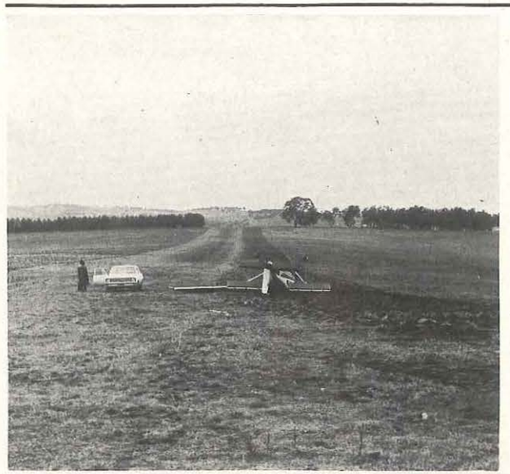
In Brief In Brief In Brief In Brief

In preparation for an air race, the pilot of this Cessna 180 had spent two and a half hours being endorsed and familiarising himself with the aircraft type. On the morning of the race, he made all necessary preparations and then taxied to the departure point. Given the "go" signal, the pilot advanced the throttle to full power and commenced the take-off. The aircraft ran straight ahead for about 50 yards, then diverged slightly to the right. The pilot corrected, but the aircraft then swung violently to the left. The ensuing ground-loop dislodged the starboard undercarriage and the aircraft finally came to rest on the starboard wing and elevator. Fortunately the occupants were not injured, but the aircraft was substantially damaged. At the time, the weather was calm and could not have contributed to the accident in any way. A commercial pilot experienced on Cessna 180's, who was watching the start of the race, said afterwards that he believed the pilot had tried to raise the tail prematurely and had lost control as a result.

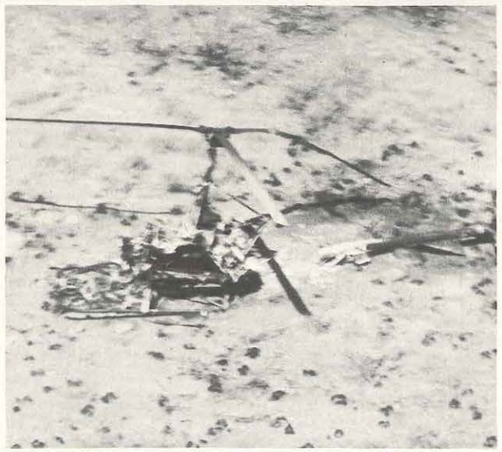
* * *

The pilot of this PA25 Pawnee was experienced in agricultural operations and held a Class 1 agricultural rating. The company for whom he worked had been employed by a timber authority to conduct aerial seeding operations in the lightly timbered, mountainous terrain of the Great Dividing Range. On the day of the accident, the pilot had successfully carried out a number of sorties, varying the load as the area dictated.

The pilot had been conducting all his seeding runs down hill, but with only one clean-up run left to do, he decided to turn left, and make his finishing run up-hill. After commencing the run however, the pilot realised he would not be able to outclimb the rising terrain. He dumped the load and turned to the right, but was unable to stop the aircraft from mushing into the trees. As the photograph shows, the aircraft was destroyed, but the pilot escaped with only minor injuries.



Because of deteriorating weather in the direction of his destination, towards the end of a flight from Moorabbin to Mudgee, the pilot of this Cessna 210 diverted to land at a relative's property in the Orange district.
Although he had landed at the property airstrip only three weeks before, when the area was fully serviceable, he did not know that the pastures on either side of the strip had since been harrowed, leaving a serviceable landing strip only 60 feet wide.
In the late afternoon light, made dull by the heavy overcast cloud, the pilot did not recognise the nature of the surface on either side of the strip. Towards the end of his landing run after a normal touch down, the pilot turned the aircraft to the left, intending to backtrack towards the homestead, but on entering the soft uneven surface, the aircraft decelerated rapidly as the nose wheel dug in and slowly nosed over on to its back. The pilot, who was the only occupant, was not injured.



Engaged on survey work in Western Australia, with pilot and a surveyor on board, a Hughes 269B helicopter made a landing in an area covered in patches of spinifex. After the passenger had alighted, he saw that a patch of spinifex beneath the engine exhausts had caught fire. He shouted to the pilot who, still wearing his headphones, was engaged in completing his shut-down checks. The pilot did not hear him so he ran around to the front of the helicopter and signalled to the pilot. The pilot understood the situation immediately and re-engaged the clutch and tried to regain sufficient rotor RPM to take off again. The engine responded initially but then died. By this time the flames had spread and were leaping around the cabin door, and the pilot was forced to abandon the aircraft. Within seconds it was engulfed in fire and was completely destroyed.

While cruising in level flight between Roma and Maryborough, the engine of this Meta Sokol suddenly began to vibrate severely. The pilot made a quick trouble check but the engine instrument indications seemed normal and a magneto check did not isolate the trouble. With the vibration intensifying, the pilot had no choice but to close the throttle and attempt a forced landing. At the time, the aircraft was flying over heavily timbered terrain and the only area in any way suitable was a cultivated field less than 1,600 feet long with trees 70 feet high at one end and 20 feet high at the other.
With the undercarriage lowered, the pilot made a cross-wind approach towards the tall timber. After touching down initially, the aircraft skipped twice on the undulating ground and finally landed only 550 feet from the tall trees. Realising he had no hope of stopping the aircraft in the distance remaining, the pilot attempted to turn the aircraft to the right, but it skidded sideways and the undercarriage collapsed on the rough ground. None of the three occupants was hurt.
The engine was later examined and the severe vibration was attributed to defects in the fuel injection system causing fuel starvation in one cylinder. Performance calculations indicated that, in this type of aircraft, a successful landing in the field would be almost impossible.