No. 68 MAY 1970

AVIATION SAFETY DIGEST

DEPARTMENT OF CIVIL AVIATION AUSTRALIA

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Contents

COVER: At dawn on the fifth of this month, Sydney's new International Terminal handled its first commercial traffic. The Pan-American 707 arrived from the United States, while the 727 was preparing to depart for Port Moresby.—D.C.A. photograph by T. Martin.

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DISASTROUS END TO VFR FLIGHT

When a Cessna 206, en route from Ceduna to Parafield, South Australia, had failed to report by the expiration of its SARTIME, the emergency phases of search and rescue were progressively introduced. An aerial search, employing seven aircraft, was begun at first light the following morning but was hampered by widespread heavy rain and poor visibility. The wreckage of the aircraft was finally located, two days after it had disappeared, close to its planned track, 15 miles east of Kyancutta. All six occupants had been killed in the crash.

The aircraft, based at Parafield Airport, had been hired by a private pilot to travel to Ceduna for a day's fishing and return to Parafield. Five friends of the pilot were accompanying him as passengers.

Early on the day of the accident, the pilot lodged a flight plan for the return flight at the Parafield briefing office, indicating that the aircraft would not be reporting en route, but nominating a SARTIME of 1930 hours local time to Parafield. The aircraft departed Parafield just before 0630 hours and, after an apparently uneventful flight, arrived at Ceduna in generally wet weather some two hours later. The party were disappointed to find the weather unsuitable for their day's fishing and, after the aircraft had been refuelled to capacity, they all travelled into town by taxi. They went to the local hotel where they were served with drinks and afterwards coffee, and they later had lunch at the hotel before returning to the aerodrome by taxi at about 1320 hours.

At the aerodrome at about this time, the Flight Service Officer on duty had just finished making an inspection of the flight strips to see if they were still serviceable after all the rain that had fallen.

Aerial view of accident site looking back in direction from which aircraft had come. Note the complete absence of any wreckage trail in the surrounding undergrowth.

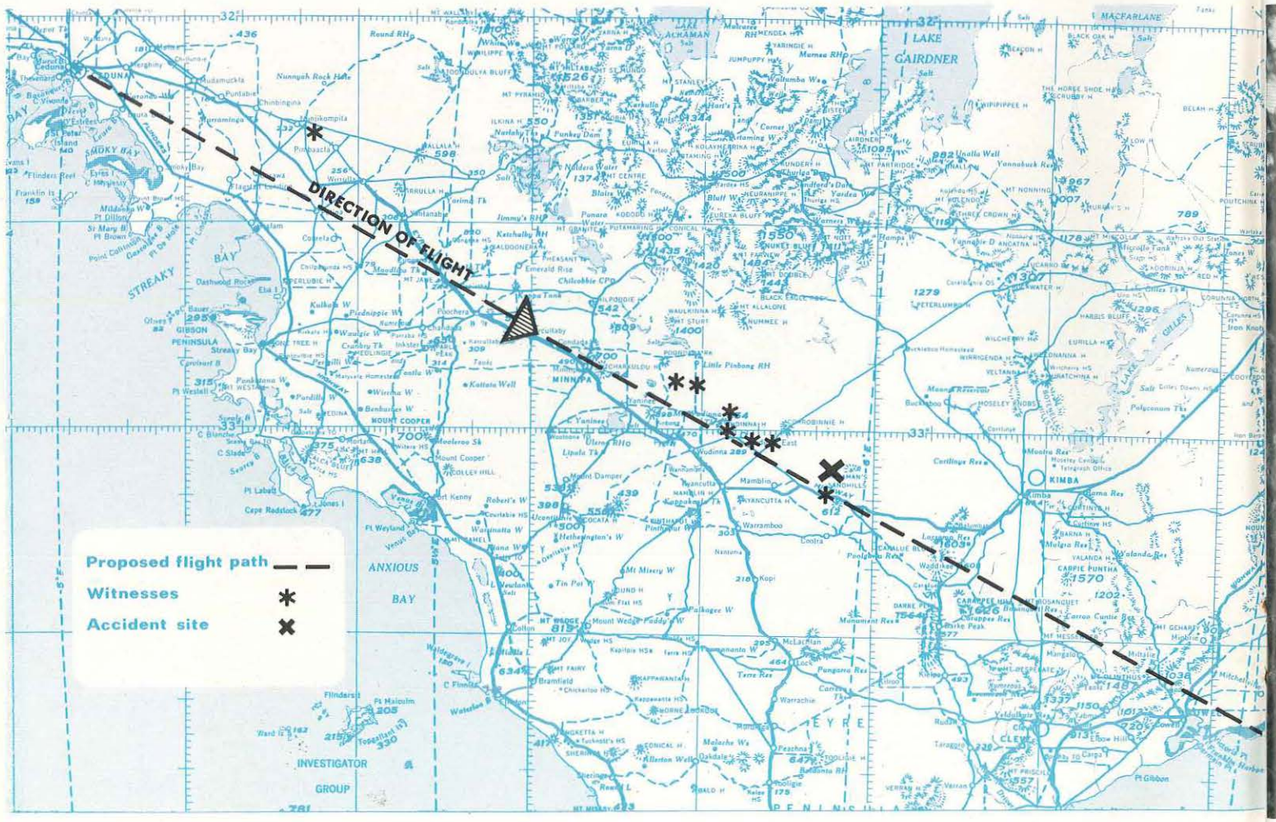
The Flight Service Officer had found that the strips were quite firm, but while out on the aerodrome he had noted that the sky was completely overcast by low cloud.

As he was driving back to his office, the Flight Service Officer was surprised, in view of the conditions, to see that a Cessna 206, parked on the apron, was being loaded and apparently being made ready for departure. Leaving his vehicle, the Flight Service Officer met the pilot near the entrance to the briefing room, and recognised him as one he had seen several times before while at Parafield. The Flight Service Officer greeted him, remarking that it was "foul weather for flying". The pilot made a non-committal reply and they went into the office together. The Flight Service Officer then provided the pilot with the appropriate area and terminal forecasts and a Special Aerodrome Weather Report which had been issued only a short time previously.

The latest official Ceduna weather observation showed that the cloud base was 1,000 feet and the visibility eight miles. The area forecasts showed that the weather conditions had deteriorated generally since the aircraft had arrived at Ceduna. Low stratus cloud had developed and there were extensive areas of rain falling from overcast middle level cloud, reducing visibility in the showers to four miles. Though the area forecasts indicated that a VFR flight to Adelaide was marginally possible, a further deterioration would reduce conditions to less than those for VMC.

The pilot seemed uncertain of his responsibility for deciding whether or not the flight should proceed and asked "Do you reckon I'll make it?" The Flight Service Officer told him the decision was his, but went to some pains to point out the poor weather conditions that could be expected along the route. Throughout the briefing the pilot gave the impression that he was unconvinced of the

Map showing flight planned route of aircraft from Ceduna, location of witnesses, and accident site.

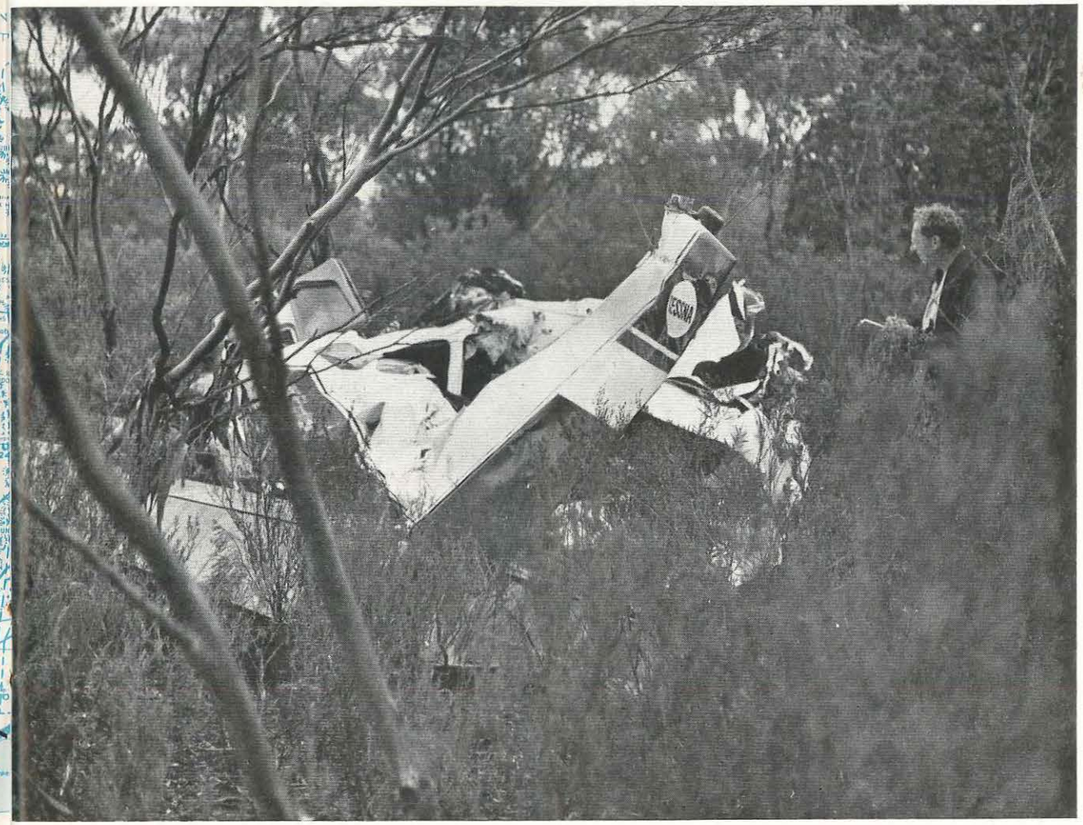


seriousness of the forecast conditions, and that he was only anxious to be on his way. The Flight Service Officer concluded the briefing by stressing the importance of maintaining a listening watch for the latest weather information, and urged the pilot to call Parafield Tower when about 30 miles out to ensure that Parafield could accept his aircraft in the existing weather. The pilot replied that if conditions became too bad, he would land at Cowell, or Cleve. He then thanked the Flight Service Officer and left the briefing room.

At 1328 hours, the aircraft called to report taxiing and the Flight Service Officer again reminded the pilot to maintain a continuous listening watch and advised that conditions at Parafield and Adelaide airports were now marginal for VFR operations. A few minutes later, after the aircraft had taken off, the Flight Service Officer passed the pilot a Notam he had just received, advising that Adelaide was temporarily closed to VFR operations, with visibility reduced to one mile in rain. The pilot acknowledged this message at 1407 hours, saying that he would "try to get through". This subsequently proved to be the last transmission received from the aircraft.

* * *

The site where the wreckage was discovered, 125 miles south-east of Ceduna, was in an area of virgin bush, consisting of thick scrub and low trees. The terrain in this area was generally level and some 450 feet A.M.S.L. The impacting aircraft had left no wreckage trail, and the disposition of the compacted wreckage itself, together with lack of the damage to trees and scrub beyond its immediate vicinity, left no doubt that the aircraft was in a very steep spiral dive to the right when it struck the ground. A detailed examination of the wreckage found no defects that could in any way be related



The wreckage as it was found. The lack of damage to the surrounding undergrowth clearly indicates that the aircraft struck the ground in a near-vertical descent.

to the cause of the accident. Damaged watches recovered during the examination indicated that the accident had occurred a few minutes after 1500 hours.

In the course of enquiries made during the investigation, it was found that a number of witnesses had seen or heard the aircraft in flight not long before the accident. One witness, working on a property only three miles from the site of the crash, actually heard the sound of impact, but was not able to tell from which direction the noise had come. It was heavily overcast and raining at the time and visibility was reduced to about half a mile. This witness was unable to find the wreckage during a subsequent ground search he made of the property.

The evidence of witnesses further back along the aircraft's track indicated that it had followed a flight path close to the planned track, with alterations of heading from time to time, apparently made to avoid the worst of the rain and low cloud areas. The witness evidence indicated that the aircraft had been flown very low at times, evidently to maintain visual reference with the ground. One witness, at his home eight miles north of Pygery and 26 miles from the accident site, heard the noise of the aircraft approaching and went outside to have a look. About a mile away to the north-west he saw the aircraft come into sight over a rise, flying very low and just in the base of the cloud. There was a light drizzle at the time and the sky was overcast with very low cloud. The aircraft continued towards the east in a direction that would take it just to the north of Mt. Wudinna, and disappeared from sight about a mile away, apparently still in the base of the cloud.

Eight miles further along its track, the aircraft was sighted briefly again through a break in a cloud approaching the area north of Mt. Wudinna. The aircraft was close to the base of very low cloud. Shortly afterwards, it was sighted by another two witnesses in level flight in better conditions at a height of about 1,500 feet. It appeared to be flying close to the cloud base and passed through a shower as it approached from the west. The aircraft continued eastwards towards an extensive dark area of heavy rain and low cloud and disappeared from sight about three miles away without any change in heading.

* * *

It was evident that, up to this stage of the flight, the aircraft had been flown in weather that was at best marginal for a VFR flight, without any attempt to return to Ceduna or to divert elsewhere. Similar conditions ahead of the aircraft would thus have been unlikely to deter the pilot from continuing towards the area of heavy rain in the hope of finding a way through it. It is also possible that lighter areas would have been visible through the rain, above the underlying area of cloud, giving the pilot the impression that visual flight could be maintained. Once the aircraft had entered heavy rain however, the forward visibility could have been restricted to the point of losing the visual horizon, especially as the aircraft had no windscreen wipers. The track being maintained by the aircraft when last seen would have passed a few miles to the north of the accident site and to have reached the point where it crashed, the aircraft must have turned to the right after entering the area of heavy rain and cloud. It seems probable therefore that the pilot had attempted such a turn to maintain or regain visual flight. But such a decision, if left too late, would have placed the aircraft in conditions of extremely poor visibility or even in cloud altogether, either of which would require the ability to fly the aircraft solely by reference to instruments if control was not to be lost. The fact that the flight terminated so tragically soon afterwards, in a steep spiral dive to the ground, testifies all too clearly to the fact that the pilot did not possess this capability.

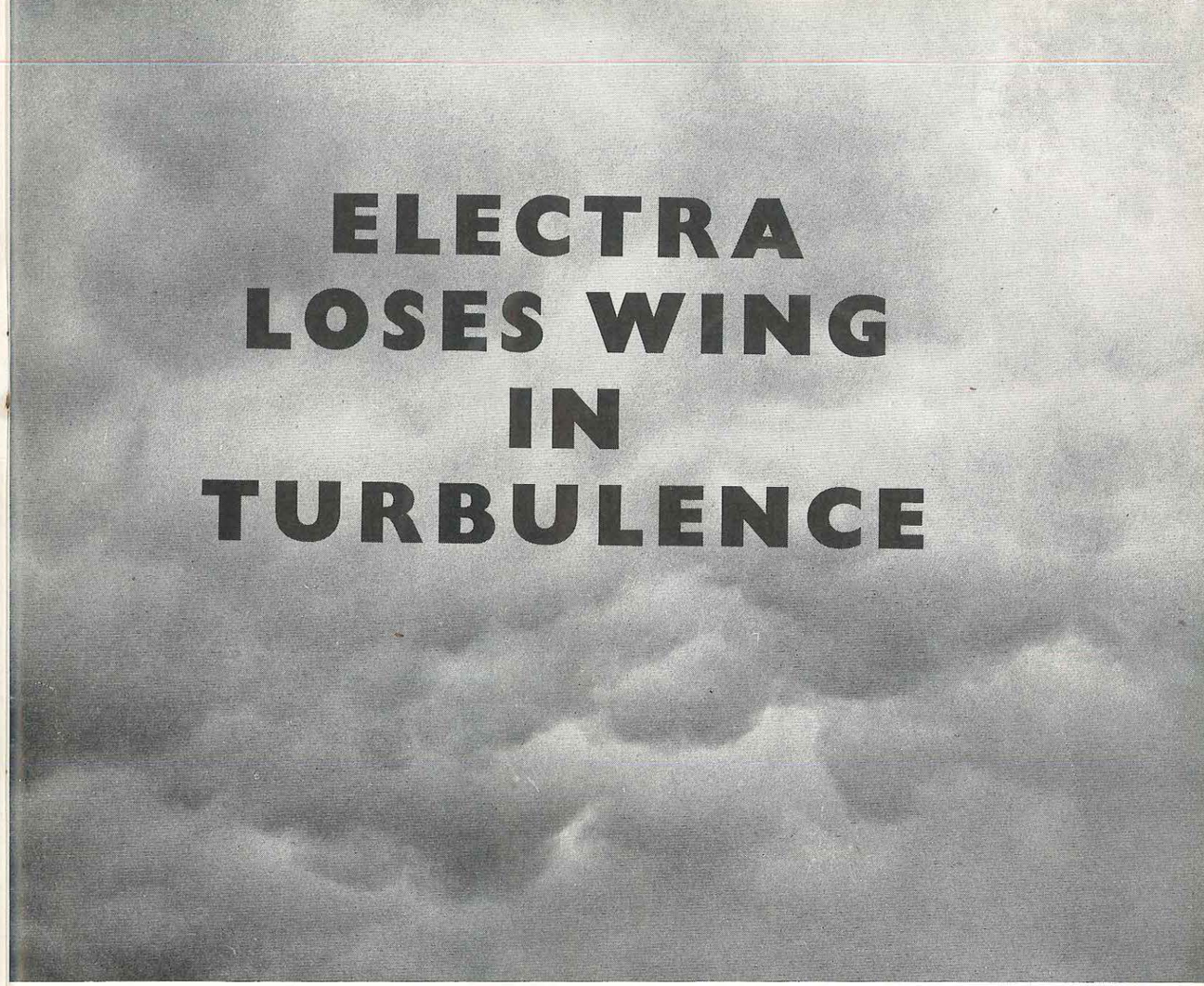
The circumstances of this accident suggest that the pilot might not have been fully cognizant of his responsibilities as pilot-in-command. Pilots in similar situations must recognize and accept the fact that they are the captain of an aircraft and not merely the driver of an aerial vehicle. In exactly the same way as a sea captain is responsible for the safety of his ship, the pilot-in-command has the ultimate responsibility for the safety of his aircraft and all it is carrying. The responsibility is his and his alone, no matter what advice he might have been given, and regardless of any pressures imposed on him to complete the flight as intended. The responsibility is a heavy one, demanding a definite level of maturity, but it must be accepted with all its implications if a flight is to be conducted in a safe, professional manner. It is axiomatic that pilots-in-command are expected to be responsible enough to delay or discontinue a flight when it is evident that weather conditions could jeopardise its safety.

Pilots must remember that Visual Meteorological Conditions as specified in the AIP and the Visual Flight Guide are the **minimum** allowable conditions for visual flight, regardless of the experience or local knowledge of the pilot. Where a pilot is lacking in recent experience or knowledge of local weather conditions, it may be prudent for him to set himself a higher minimum standard.

Cause

The probable cause of the accident was that the pilot, who was not qualified for instrument flight, lost control of the aircraft when he proceeded into weather conditions which deprived him of visual reference.

ELECTRA LOSES WING IN TURBULENCE



(Summary of Report issued by National Transportation Safety Board, United States)

While making a scheduled passenger flight from Houston to Dallas, Texas, U.S.A., a Lockheed Electra entered an area of severe thunderstorms. During an attempt to turn back, the aircraft was upset by turbulence and entered a steep spiral dive. Shortly afterwards, and probably as the crew were attempting to regain a normal attitude, the starboard wing failed and the aircraft fell to the ground and was destroyed. All 85 occupants were killed.

The aircraft had departed from Houston at 1611 hours local time with an estimated time interval to Dallas of 52 minutes. Twenty-five minutes later while cruising at Flight Level 200, the aircraft approached an area of severe thunderstorms which lay across its route. Just after 1636 hours the crew requested a clearance to deviate to the west and to descend to 15,000 feet, but the controller at Fort Worth Control Centre suggested a deviation to the east as other aircraft were diverting that way. Replying, the crew indicated that their radar showed a favourable area to the west. The controller then approved a diversion to the west and shortly afterwards the aircraft was cleared to

descend to 14,000 feet. Seven minutes later, at 1643 hours, the crew requested a further descent and were cleared to 5,000 feet.

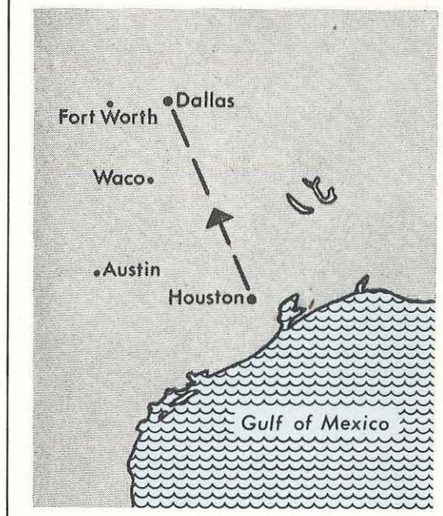
At the time, the air traffic control radar at Fort Worth was displaying a large area of precipitation echoes across the aircraft's route. The area was about 10 miles wide and extended westward in a line from a point some five miles east of the intended flight path. The echo was so bright that it was not possible to see aircraft targets through it, and at 1646 hours the controller asked the Electra whether the area they were entering appeared fairly clear or if there were openings in it. The crew replied that it was not clear but they thought they saw an opening through it. The crew then asked if there had been any reports of hail in the area. They were told that there were no reports as their aircraft was the only one that had been so close to the precipitation area and all other aircraft had diverted to the east around it. Less than a minute later the aircraft requested permission to make a 180 degree turn and were cleared to do so "right or left". The crew's acknowledgment of this clearance was the last transmission received from the aircraft.

The wreckage of the aircraft was found scattered over an area three miles long and 2,000 feet wide. The starboard wing, the tail surfaces and the port side engines had separated from the fuselage in flight. The starboard wing had failed in upward bending in two places, just outboard of the fuselage, and just outboard of the No. 4 engine. By contrast, there was no evidence of overstress in the port wing. The starboard tailplane and fin had failed in bending in an anti-clockwise direction.

All the fracture surfaces were typical of those caused by overloads and there was no evidence of fatigue or in-flight explosion. Nor was there anything to indicate that the aircraft had been struck by lightning or that it had sustained hail damage. Similarly, there was no evidence of fire having occurred before the in-flight structural failure.

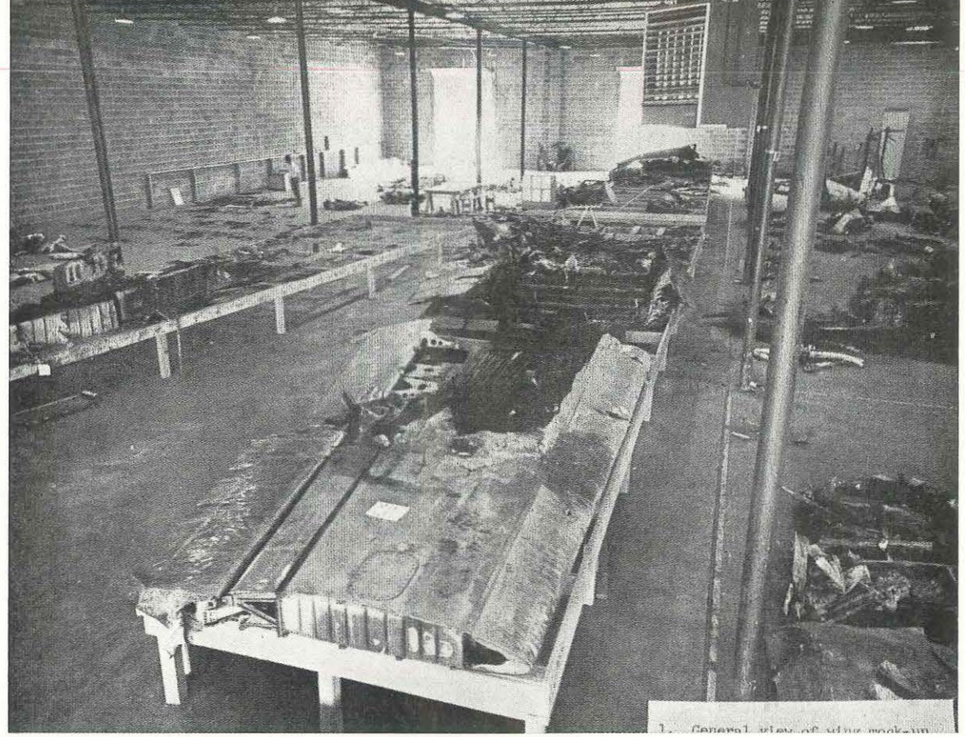
The aircraft was fitted with a flight data recorder and a cockpit voice recorder and both these units were recovered from the wreckage and examined. The cockpit voice record indicated that the crew first became aware of the storm, when about 60 miles from it. Replying to the first officer's comment on the storm the captain remarked that "it looks like a pretty good one" and that they had "better deviate to the west". The crew then requested the diversion already described. At 1637 the captain said "it looks like there's a hole up ahead" and made an announcement to the passengers that there was a "little line of thunderstorms ahead and that they would deviate a little to the west" for a more comfortable trip. Four minutes later the captain made another announcement to the passengers, advising them he was turning on the seat belt and no smoking signs in case "it's a little choppy in the area". The captain stated that his radar was working and that he would be able to "go well under and to the west of all the thunderstorms, but they will be visible to you to the right". When he had finished this announcement, the captain remarked "I guess I can go under".

At 1645 hours the captain instructed the flight engineer to turn on the engine heat temporarily "until we get above twelve degrees or a clear area". He then told the first officer to ask the controller if there had been any reports of hail. It was then that the controller informed the crew that no other aircraft had been as close to the precipitation area, but had diverted to the east around it. At this, the captain told the first officer not to talk to the controller "too much", because he was trying to get the crew to admit they had made a "big mistake coming through here".



Locality map showing proposed route of aircraft.

Shortly afterwards the first officer remarked that "it looks worse . . . over there", and the undercarriage warning horn began to sound. The captain said "Let it ring", then "Let's make a one eighty". The first officer requested permission to make the turn and shortly after they were cleared to do so, a sound similar to hail or heavy rain was recorded. Then the captain said "Let me know



The wreckage of the Electra's wing being "reconstructed" during the investigation.

when we come around there to reverse heading for roll-out." At 1647 hours 35 seconds, the first officer called "three forty", and the undercarriage warning horn sounded again just before the captain answered "Right". Seconds later, a fire warning bell began ringing and there was a noise of break-up. Almost immediately afterwards there was a sound induced on the recorder by changing electrical power and the recorder ceased operation two seconds later.

Statements were obtained from a number of eye witnesses who saw the wreckage falling to the ground. Several witnesses reported seeing a stroke of lightning, which was followed by an explosion. The aircraft then fell on fire to the ground. Although some witnesses believed the lightning struck the aircraft, others said that it passed close to the aircraft. The witnesses were unanimous however, that the lightning was followed immediately by the in-flight explosion and fire. At the time of the accident it was raining and hailing with high winds and some of the witnesses noticed a rolling or boiling motion in the leading edge of the clouds.

The weather in the area of the accident at the time was characterized by considerable thunderstorm activity associated with a pre-frontal squall line. Thunderstorms were reported from Waco, south-west of the accident site to Corsicava, some 50 miles to the north-east. The surface weather chart issued at 1600 hours by the National Meteorological Centre showed a cold front extending south-west from southern Illinois to west central Texas, and a pre-frontal squall line from near Memphis, Tennessee to about 65 miles south-west of Fort Worth.

The consensus of opinion of other aircrews operating in the general area at the time of the accident was that the storm centre was one to stay away from, and most of them had diverted to the east around the storm. One captain, operating to Dallas from Austin, 190 miles to the south-south-west, said that as he approached Waco from the south, he could see a line of thunderstorms visually and on his radar. He requested permission to divert to the west of Waco but the Fort Worth controller advised him to deviate to the east. He accepted this advice because his radar showed the line of storms ended about 70 miles east of Waco. The crews who operated east of the line of thunderstorms reported smooth flying conditions throughout their flights to Dallas.

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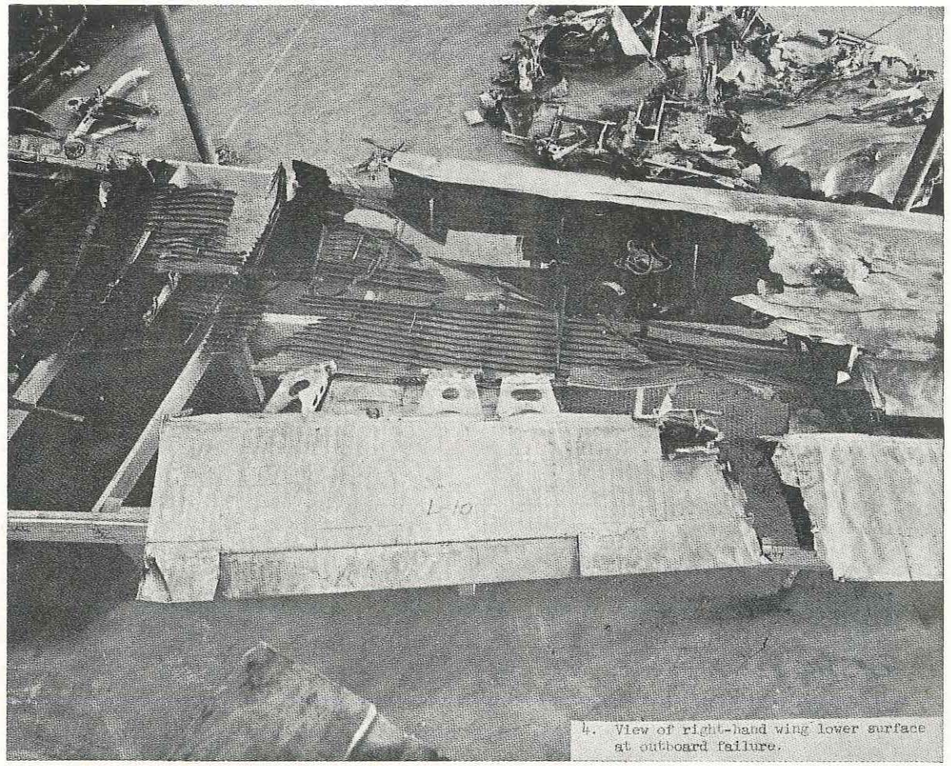
It was obvious, quite early in the investigation, that loads in excess of the airframe strength had been imposed on the structure, but the nature and origin of these loads were not immediately apparent. But the long history of the L-188, coupled



The underside of the "reconstructed" starboard wing showing the position of the outboard failure.

with the Board's findings during the investigation, indicated that the design structural strength was not the cause of the accident, and the investigation was then directed to determining whether the accident was caused by an overload or had resulted from the effects of prior damage.

The investigation revealed no indication that any prior damage existed in the primary structure of the aircraft. Among the types of overloads considered were those caused by a lightning-induced explosion, weather phenomena (including gusts and turbulence loads), pilot-induced manoeuvring loads, and a combination of weather and pilot-induced loads.

Because witnesses had observed a flash of lightning near the aircraft, which was followed by a flash of fire or explosion, the Board considered the possibility that this lightning stroke might have triggered an explosion in a fuel tank or ignited fuel fumes. This theory was rejected as inconsistent with the evidence, which indicated that no fire had occurred before the wing broke up.

The possibility that a lightning strike, or nearby flash of lightning, had caused the pilot to lose control of the aircraft, either by temporarily blinding him or by affecting his basic attitude instruments was also considered. According to the statements of the witnesses, the flash occurred almost simultaneously with the appearance of the fire, but the flight recorder indicated that the upset was initiated some 20 seconds before the failure of the wing, at which time the fire first appeared. The Board therefore concluded that the flash of lightning could not be related to the cause of the accident.

Reconstructing the sequence of events from the evidence of the investigation the Board believes that, as the aircraft approached the storm system which lay across its path, it began to encounter moderate or slightly more than moderate turbulence and the pilot commenced a gentle bank to the right. Within 10 to 15 seconds of the initiation of this turn, the captain indicated he intended to make a 180 degree turn, the bank angle increased

to 66 degrees, and a total excursion of 2.7"g" occurred. In the next 10 seconds, the bank angle exceeded 110 degrees and the aircraft entered a 40 degree descent. The Board believes that the aircraft was first upset laterally, probably by a gust, just as the pilot increased the bank to the right, and this lateral upset progressed into a spiral manoeuvre.

During the attempted recovery from this spiral, the inboard section of the starboard wing was subjected to positive bending and torsional moments in excess of its ultimate strength. Because of the effect of the rolling moment created by the pilot's attempt to level the wings, the port wing was not subjected to loads as high as those imposed on the starboard wing. The evidence indicates that the wing failed, with the wingtip and wing leading edge moving upwards, and with the wingtip moving aft. The initial failure occurred in the section of the wing which is usually critical for compressive stress in the positive, high angle of attack, loading condition. Such a loading condition normally occurs in a pull-out from a dive.

No evidence was found to indicate that any in-flight fire existed before the wing failed. Except for the tail area, the smaller pieces of structure which separated in flight were generally unburned and unsooted. The only indications of in-flight fire were the soot patterns on the starboard tailplane and the heat damage on the trailing edge and flap sections of the main portion of the starboard wing. The fact that the initial failure occurred in the starboard wing was clearly established by the soot and fuel wash patterns on the tailplane. For these to have occurred, the tailplane had to be in place after the integrity of the fuel tanks had been disrupted.

The crew of the aircraft had flown from Dallas to Houston several hours before departing Houston to return to Dallas. At the time, there was no thunderstorm activity in the area which would have affected their return trip, and this observation may have influenced their interpretation of the weather warnings given to them on their departure from Houston. The company and Weather Bureau data available to the crew contained adequate information on the condition and extent of the severe weather. Regardless of the accuracy of these weather forecasts however, the crew observed the storm at least 60 miles away from an altitude of 20,000 feet. They were also advised, after requesting a deviation to the west, that other aircraft, including company aircraft, were deviating to the east. The weather radar on board the aircraft should have delineated the eastern edge of the storm area as well as any low spots between cell tops. The evidence indicates that while the storm system was extensive to the west, there would have been low spots between the tops of the cells. These low spots could have been misinterpreted by the crew as a "light area" or separation between cells, particularly if the radar antenna was tilted up eight degrees, as indicated by the radar antenna cockpit control recovered from the wreckage. Hail, having generally a lesser reflectivity to radar than other forms of moisture, coupled with misleading information presented by a higher than normal antenna tilt, could have induced the crew to continue to press for a deviation to the west. Even so, the crew's knowledge that another company flight from the west was deviating to the east parallel to the storm front, together with the repeated comments on deviations to the east from the controller, should have been sufficient for the captain to reconsider his decision to penetrate the weather area.

After the penetration of the storm had been initiated, the decision to reverse course was not in keeping with recommended company procedures for operation in areas of turbulence. Normally, once in an area of turbulence, the crew is expected to maintain the aircraft in as straight and level an attitude as possible, and manoeuvring is to be kept to a minimum until the turbulent area is cleared. The possibility of gusts being added to control inputs, and resulting in an upset, is one that the Board believes must be assumed by pilots.

The Board believes that this accident occurred as a result of a combination of circumstances, any one of which, in isolation, would not have caused the accident. The crew's attempt to penetrate the weather area across their route to Dallas was an unsound decision. Their real difficulties began however when they changed their minds and attempted to turn out of the area. The turbulence encountered up to that time was not severe enough to damage the aircraft but it probably played a part in upsetting the aircraft after the pilot began his 180 degree turn. This lateral upset progressed to a longitudinal upset because of the loss of vertical lift caused by the steep bank. The pilot then attempted to recover by rolling the aircraft back to the left and applying back pressure on the controls. During this manoeuvre, the loads applied to the aircraft were in excess of the ultimate strength of the aircraft and the starboard wing failed. All the other structural failures were secondary to this initial failure.

Probable Cause

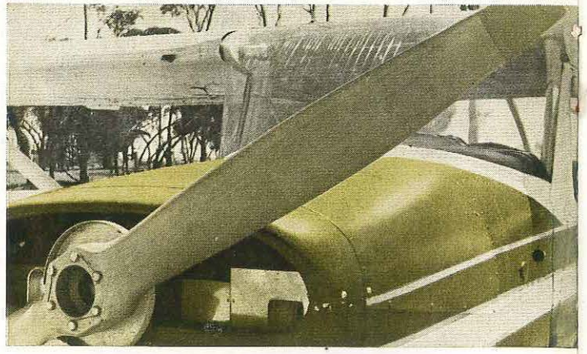
The Board determined that the probable cause of this accident was the stressing of the aircraft structure beyond its ultimate strength during an attempted recovery from an unusual attitude induced by turbulence associated with a thunderstorm. The operation in the turbulence resulted from a decision to penetrate an area of known severe weather.

NINE MORE WIRE STRIKES

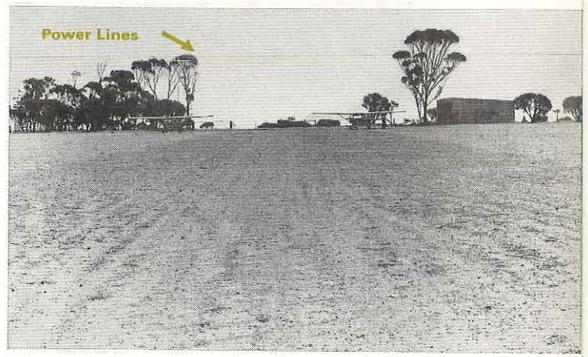
IN the last issue of Aviation Safety Digest, a good deal of space was devoted to discussing the very serious and costly burden at present being imposed on the aviation industry by collisions with overhead wires. This further emphasis on a subject that had already been given considerable publicity in the Digest was prompted by the frequency with which such collisions are continuing to occur in a wide variety of operational situations. Several different aspects of the overall problem were considered, and in every case it was clear that the only real solution at the present time lies in an increased awareness of the danger of wires, and a greater exercise of vigilance, with all this word implies.

Since this last issue of the Digest was prepared, no less than another nine reports of collisions with overhead wires have arrived on the Editorial desk and we believe we would be failing in our duty if we neglected to pass on to our readers these further "exhibits" in the case that was argued so forcibly in our March issue. In the hope of reinforcing the points made previously therefore, we will examine each of these additional object lessons in turn, noting in each case the cause of the accident or the factors that contributed to it. As with those reported previously, the accidents described have not occurred during any one type of operation, but over a wide range of light aircraft usage that is typical of what could be encountered almost any day in rural areas throughout Australia:

(1) Before departing for a private property in Western Australia, the pilot of a Cessna 150 made three attempts to contact the property owner, but without success. When he eventually arrived over the landing area on the property, the pilot saw there were two graded strips, the longer aligned north-south, and the shorter one east-west. As the wind was blowing from the east at about 30 knots, the pilot made two inspection runs of the east-west strip from a height of about 200 feet, noticing that there were trees on the western boundary of the paddock, on either side of the western threshold of the strip, and that a telephone line also ran above the fence on this side of the paddock. He did not however, see a two wire power line crossing the strip, some 150 feet in from its western end.



Marks left by the wire on propeller and windscreen. The leading edge of the starboard wing was also damaged.



View from point of touch-down, looking back towards approach path. The power line struck by the aircraft is indicated.

The pilot made an approach to land from the west and after passing over the trees and telephone line, descended steeply with full flap. As he rounded out, the pilot sighted the high tension wires, but too late. The propeller struck the wires throwing them against the windscreen and they were drawn across the leading edge of the starboard wing, damaging it substantially. The aircraft slewed to the right but the pilot was able to maintain control and landed safely.

View looking in direction of flight from point at which Callair's tail wheel became hooked on the wire.

The strip on the property had been in existence for about two years but, some six months before the accident, the local electricity authority had run the power line across the property over the east-west strip. The owner had then marked the north-south strip with white painted drums, intending this to indicate the strip to be used but, because his hangar was situated by the western boundary of the paddock, he had kept the east-west strip graded for use as a taxi-way. From the air, it retained the appearance of a strip and there was nothing to show that it should not be used for this purpose.

Significant Facts

- In not contacting the owner before departing for the strip, the pilot denied himself the opportunity to be warned of the power line crossing the east-west strip.
- The owner had not marked the clearly defined east-west strip in any way to show that it was unsafe to use as a landing area.
- The pilot's aerial inspection of the proposed landing area and its surroundings were inadequate. The poles carrying the power line, though some distance away from the strip in either direction, were clearly visible from the air against the background of the paddock.

* * *

(2) After being given a sketch plan of a paddock to be sprayed in Western Australia, the pilot of a Callair carried out an aerial inspection and noted the position of two power lines. The pilot elected to make his spraying runs in a direction which required him to climb during each run to fly over one power line which crossed the paddock 20 feet above the ground.

When he had sprayed more than half the area, the pilot, in the course of a spraying run, signalled to one of the markers on the boundary of the paddock to take up a new position, then looked back to check that he was doing so. When he looked forward again, he saw the power line was immediately ahead of the aircraft. He attempted to climb over the wire but it caught on the tail wheel assembly. The pilot applied power to attempt to break free of the power line, but the aircraft decelerated rapidly and struck the ground heavily in a level attitude.

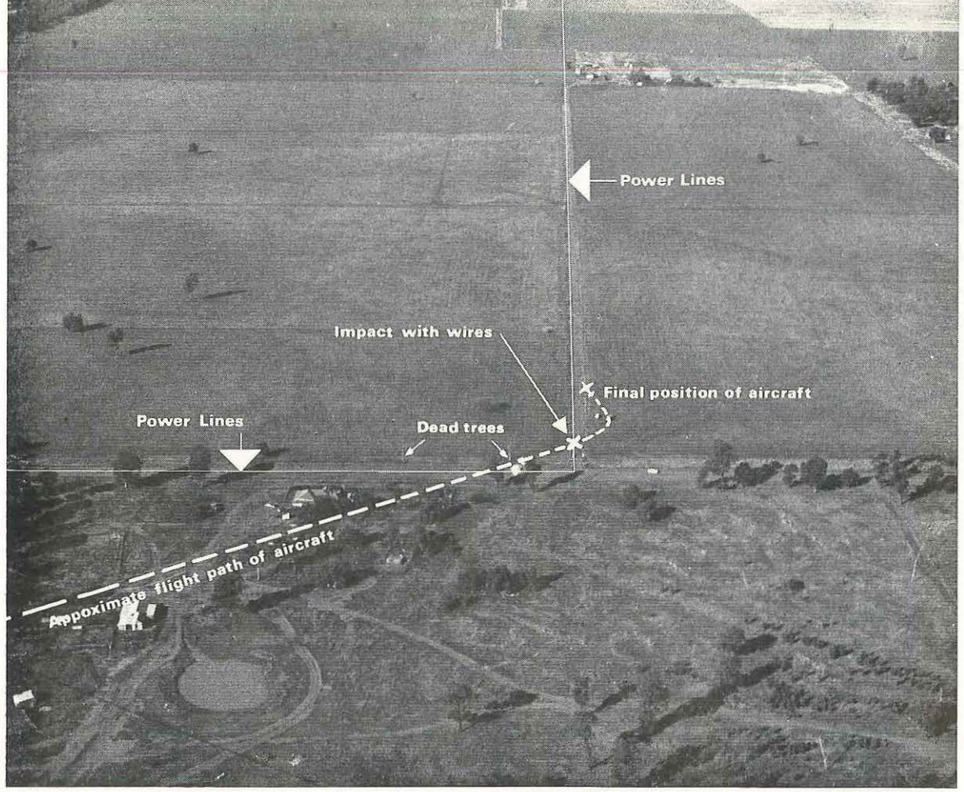
The pilot, who was wearing a crash helmet and a lap and shoulder harness, escaped without injury, but the aircraft was badly damaged.

Cause

The pilot did not exercise the amount of care demanded when flying in the vicinity of power lines.

* * *

(3) At a country aero club in N.S.W., an instructor and student pilot were conducting a period of general revision training in a Cessna 150. After completing a number of exercises, including a forced landing, the aircraft was climbed back to 3,000 feet and the instructor again closed the throttle to simulate an engine failure. The student selected a field and established the aircraft in an approach pattern for a landing into wind.



Above: Aerial view of paddock chosen for forced landing practice, showing aircraft's approach path and location of power line.

Below: The accident site in the paddock. The overhead wires above the fence at left were those struck by the aircraft.

The instructor saw that the field selected was of marginal length for a forced landing but, as the student's planning and judgement during the descent were good, he let him continue. On reaching a height of about 300 feet, where the exercise would normally have been discontinued, the instructor decided to allow the student to descend still further in order that he would realise for himself that the field was too small. This had the desired effect and drew an exclamation from the student on the smallness of the field, but neither instructor nor student noticed that there was a power line on the near boundary of the field, crossing the aircraft's path at an angle of about 60 degrees.

Just as the instructor was about to call "go around," the aircraft flew into the wires. The aircraft slid sideways along the power line and descended to the ground. The impact with the ground was not severe, most of the damage to the aircraft being sustained by the collision with the power line. Neither instructor nor student was hurt.

It was found afterwards that, although the area being used for the forced landing practice was within the flying school's authorised low flying area, the power line was not marked on the map displayed in the school's briefing room as required by A.N.O. 80.4.2.5. As well, the scale of the map itself was 1″ : 4 miles instead of the larger scale 1″ : 1 mile as required by the ANO.

Significant Facts

- The instructor allowed the student to descend to an unsafe height.
- The instructor did not maintain an adequate look-out for obstructions in the aircraft's path.
- The obstruction was not displayed on a map of the low flying area as required by Air Navigation Orders.

* * *

(4) In Queensland, a private pilot flying a PA.25 was spraying a field of cotton on his own property. On the northern side of the field, two power lines converging at an accute angle, crossed the proposed flight path. The pilot, believing he was quite familiar with the disposition of wires on his own property, did not closely examine the relationship of the lines but thought they were only about 40 feet apart at the point where he intended to cross them on his first spraying run. The pilot therefore

The privately-owned Pawnee as it came to rest after flying into the second power line. Portion of the line can be seen in the background.

planned to clear the first power line by some 40 feet and then to descend to level out just feet above the crop. This procedure he believed, would ensure that the aircraft was also well clear of the second power line when he passed over it.

The two lines were actually about 220 feet apart at this particular point however, with the result that, when the pilot descended towards the crop after crossing the first power line, his line of flight carried him directly into the second power line. One wire caught on the aircraft's undercarriage, rapidly arresting the aircraft and it struck the ground nose first, 150 feet beyond the point of impact with the wire. During the short time in which the aircraft was decelerating, the pilot managed to dump the contents of the hopper, and the impact with the ground was not severe. The pilot, who was fully restrained by the shoulder harness he was wearing, was not injured.

Although the pilot held only a private licence, he had some experience in aerial spraying, having operated a spray-equipped DH.82 and an Avro Cadet on his own property for some time before buying the Pawnee. In this instance it was not the pilot's operational technique that led to the accident, nor any lack of in-flight vigilance—it was simply that he failed to properly inspect the obstructions in his proposed flight path before planning the operation. Working on what he **believed** were the relative positions of the wires, he planned the approach in a way that would have given him adequate clearance and allowed him to concentrate on levelling off at the correct height on reaching the crop. But if the pilot had inspected the wires after deciding on this plan, it would have been evident to him that the location of the second power line did not permit a descent so soon after crossing the first line.

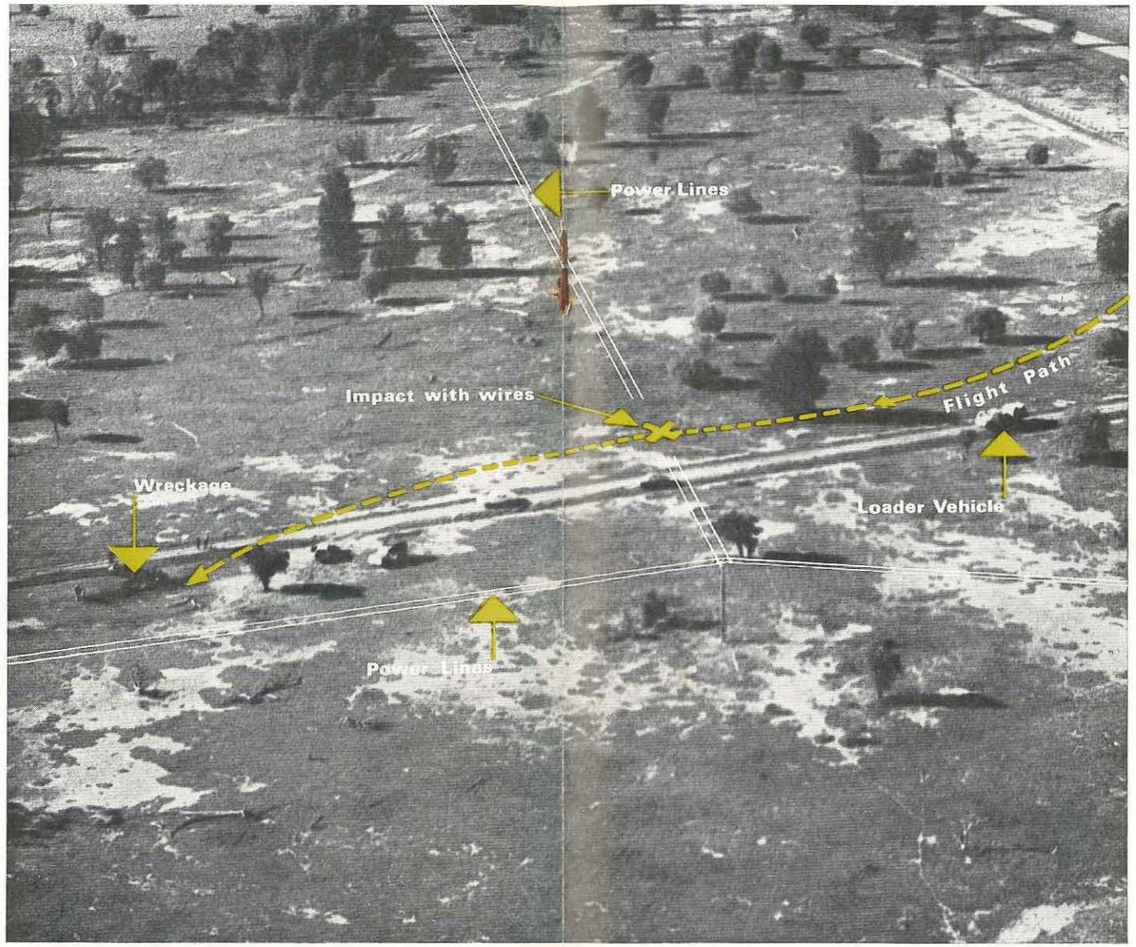
Perhaps the most telling point of this particular story is that the pilot was treating his own property—an area with which, it would be reasonable to expect, he would be quite familiar. If a property owner cannot be certain of the location of the wires he sees almost every day of his life, how much less can an agricultural pilot expect to remember the location of every obstruction in an area he has treated some time previously?

Cause

The pilot did not adequately inspect the area and note the location of obstructions.

* * *

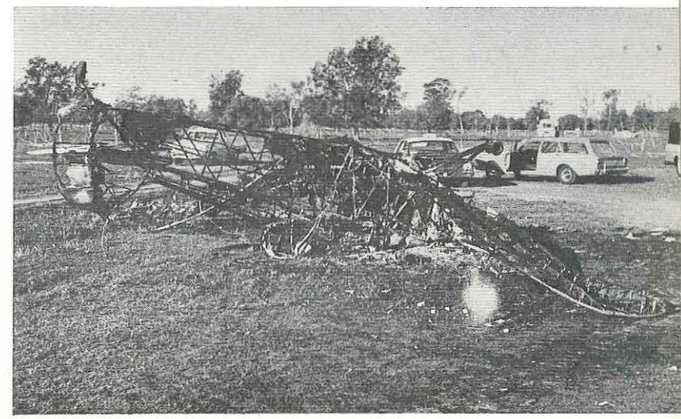
(5) The wreckage in the picture is that of an agricultural Pawnee that had just been flown to a property in western N.S.W. to begin the day's work. The pilot landed normally on the property's agricultural strip at the end of the ferry flight but, finding that his loader-driver had not arrived with the lorry, he decided to take-off again and look for him so that he could direct him to the airstrip. Very soon after he had climbed away from the strip, the pilot sighted the lorry entering the gate of the property. The pilot dived on the vehicle from behind, flying over it at comparatively high speed in the direction of the airstrip and at a very low level. Almost immediately the aircraft had overtaken the vehicle, it flew into a two-wire power line which the pilot had not seen, strung 30 feet above the road. The wires rapidly decelerated the aircraft and it hit the ground nose first, somersaulted on to its back and almost instantly caught fire. The pilot was able to escape unaided but suffered serious injuries and burns.



Because the aircraft was not actually engaged in agricultural operations at the time of the accident, but rather was performing what can only be regarded as a ferry flight, the exemption to Air Navigation Regulation 133 applying to an aircraft involved in "aerial work of a nature which necessitates low flying" could not be deemed to apply to the operation. Thus, in flying at a height lower than 500 feet in these circumstances, the pilot was contravening A.N.R. 133 (2) (b).

Cause

The pilot flew the aircraft at an unsafe height.



Above: View of burnt-out wreckage, looking in direction from which the Pawnee approached. The gates of the property through which the loader vehicle had just passed can be seen in the background.

Left: Aerial view of accident site showing relative positions of loader vehicle, wires and wreckage.

* * *

(6) In northern N.S.W., a private pilot was making a business trip to a country property in a Cessna 182. Arriving over the airstrip on the property, he inspected it from a height of 500 feet, noticing that because of a hill rising beyond its western end, it was a "one way" strip and that at its eastern end there was a large tree right in the approach path. However, the pilot failed to see a three wire power line which also lay across the approach path, because its supporting poles were hidden by trees some distance away to either side.

The pilot made an approach to land to the right of the tree, then aligned the aircraft with the strip. On short final approach, he suddenly saw the wires of the power line about 20 feet in front of the aircraft. The pilot applied full throttle, pushed the control wheel forward and flew directly at the wires, cutting them cleanly with the propeller. He then continued the approach to make a normal landing. Damage to the aircraft was confined to a broken VHF aerial.

After they had landed, the passenger travelling with the pilot in the Cessna mentioned having had a "close shave" with the same wires in another aircraft a week previously but, being occupied with "the scenery" during the approach on this occasion, he had "not thought" to warn the pilot. Local residents also told the pilot that there had been a few "near misses" during approaches to land on

the strip and that they were "expecting it to happen sooner or later".

It was confirmed during the subsequent investigation that the landing area was a "one-way" agricultural strip and did not meet the minimum standards required for an authorised landing area.

Significant Facts

- The pilot used a sub-standard airstrip.
- The pilot did not acquaint himself with the position of all obstructions in the approach path.

* * *

(7) While spreading superphosphate in hilly terrain in Victoria, a Snow Commander flew into a single wire power line which crossed a valley 300 feet above its floor. The aircraft cut the wire with its propeller. The propeller and portion of the engine were damaged but the aircraft remained in flight and the pilot was able to return to the strip and land.

The pilot had made an aerial inspection of the area before beginning the operation but, as the single wire power line spanned a distance of about 700 yards, and its supporting poles were "camouflaged" against the background of timber on the valley sides it was almost impossible to see.

In reporting the occurrence, the agricultural operator who owned the aircraft was understandably indignant, pointing out that "if one were building an aircraft trap, a wire suspended and camouflaged like this would be ideal". However, he did not appear to appreciate that the Department has no power to control the erection of such power lines by electricity authorities. Hard as it may seem, the only effective safeguard against hazards of this sort at the present time is still greater vigilance.

Significant Facts

- The power line was only a single wire line and spanned a valley at a height above terrain much higher than normal.
- The supporting poles for this span were 700 yards apart and merged into the background of timber on the hillsides.
- The pilot's inspection of the area in the circumstances was inadequate.

* * *

(8) Before landing at a private airstrip on the Yorke Peninsula in South Australia in the course of a business trip to the property on which the landing area was situated, the pilot of a Cherokee Arrow carried out an aerial inspection.

The pilot saw that the shorter east-west strip, though into wind, was unusable because of a complex of power and telephone lines close to its approach end, so he then examined the longer north-south strip. He saw that there was another power line to the south-west of the strip which, from the position of its poles, did not cross the southern approach to the strip. Knowing that the property owners had their own aircraft and used these strips frequently, the pilot decided it would be safe to land from the south. While making a precautionary approach in this direction however, the aircraft struck yet another power line which the pilot had not seen, about 100 yards short of the strip threshold. The pilot applied full power and climbed away and finding the aircraft was still functioning normally, he then made an approach from the north and landed safely. Damage to the aircraft was confined to the propeller and one wing tip.

Examining the area after he had landed, the pilot saw that the poles of the power line he had struck during his final approach were obscured from the air by tall pine trees.

Significant Facts

- The pilot did not contact the owners of the property before setting out on the flight, thus denying himself the opportunity to be warned of the obstructions in the vicinity of the strip.
- The poles supporting the power line were obscured and there was nothing to indicate its presence in the approach path.
- The pilot's aerial inspection, though undertaken with some care, was insufficient in the circumstances.

* * *

(9) At a country flying school near Geelong, Victoria, a pilot holding a restricted private licence hired a Cessna 150 to make a local pleasure flight, with a friend as passenger.

After flying in the training area for some time, the passenger suggested they fly along the nearby coast. Although this would take the aircraft beyond the boundary of the training area, the pilot agreed and, at an altitude of about 500 feet, they flew south-west down the coast towards Lorne. When about three miles from Lorne, where the thickly timbered slopes of the Otway Ranges rise steeply from the shore line, the pilot decided it was time to return to the aerodrome.

Instead of turning to port over the water, which could have been accomplished quite safely at the height at which the aircraft was flying, the pilot turned to starboard towards a valley running inland at approximately right angles to the coast. On either side of the valley, the terrain rises above the height at which the aircraft was flying, and the pilot applied power, intending to climb and continue up the valley.

No sooner had he done so than there was a loud bang from the starboard side of the aircraft as the starboard wing struck and severed one cable of a high tension power line which spans the valley. The aircraft continued to fly normally however and the pilot was able to return to the aerodrome and land. The damage sustained by the aircraft is shown in the pictures.

The pilot said afterwards that he did not see the power line at any time. This is hardly surprising in the circumstances as the line spans a distance of 2,000 feet and, at the point of impact, is about 250 feet above the valley floor and nearly 400 feet A.M.S.L. From the air, the only cues to the location of the power line are the steel pylons on which it is carried but, as the two that support the line on either side of the valley are on high terrain and surrounded by dense timber, they would not be visible from an aircraft flying in the valley at or below 500 feet A.M.S.L.

Cause

The pilot flew the aircraft at an unsafe height.

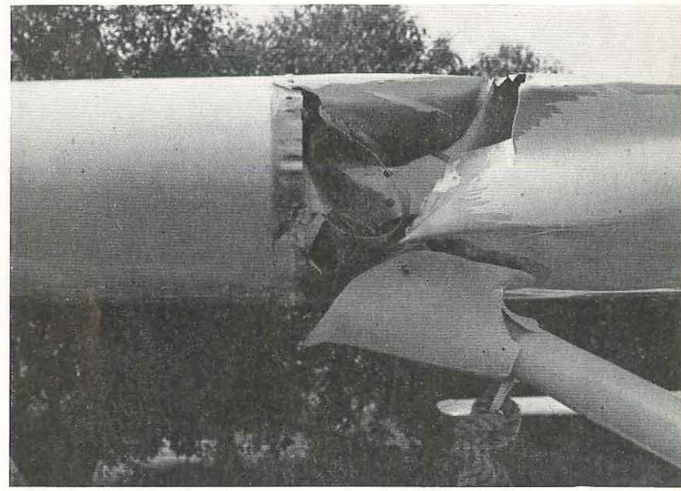
* * *

What more need we say about the necessity for extreme care when operating anywhere but on normal cross country flights from a government or licensed aerodrome? These and other accidents that have been featured in the Digest in recent months prove beyond any doubt that unseen wires can be a very great hazard to any aircraft that for **any** reason has to fly close to terrain. Because the likelihood of encountering wires is growing constantly greater as their distribution in rural areas increases, the only safe course is to assume that wires **will** be a hazard in **any** operation involving flight near the ground, and to take the precautions necessary to avoid them.

Better than any other words of advice, the accident histories we have cited show what some of these precautions must be, if similar disasters are to be avoided in the future.

Above: The Cessna 150 after it had returned to the aerodrome. Note the hole in the leading edge of the starboard wing.

Below: Close-up showing extent of damage inflicted by high-tension cable. It is probably fortuitous that the impact was taken at the lift strut attachment. Had it been further outboard, the final result might have been very different!



Composite photograph showing the high level power line spanning the valley into which the Cessna 150 turned.

Wheels up . . . AGAIN!

Turning on to base leg in the circuit area at Mt. Magnet, Western Australia, the pilot of a Piper Comanche went through his pre-landing checks and continued on to a long final approach. After crossing the runway threshold, he flared the aircraft for a normal landing, but it sank on to the ground with all three undercarriage legs fully retracted.

Earlier in the day, the pilot had conducted a charter flight, with one passenger, from Kalgoorlie to Mt. Magnet, and then a further charter, also with one passenger, from Mt. Magnet to a homestead airstrip. During the landing approaches at the end of each of these flights, the pilot suspected that the electric elevator trim system was malfunctioning. After an uneventful flight back to Mt. Magnet, the pilot joined the circuit, planning to make a long final approach to enable him to further check the trim system, and still leave sufficient time to retrieve the situation if a fault developed. Late on the downwind leg of the circuit, the pilot began his pre-landing checks, and turning on to base leg, changed fuel tanks, moved the undercarriage selector towards the "DOWN" position, and lowered partial flap. He continued to watch for signs of a trim malfunction during the remainder of the approach but none was apparent and, planning to land well down the runway, he crossed the threshold with power on at a height of about 75 feet. Gradually retarding the throttle, the pilot then flared the aircraft for landing. With some power still applied, the aircraft settled slowly towards the runway and it was not until the propeller and underside of the fuselage struck the ground that the pilot realised too late the undercarriage was not extended. The aircraft slid to a halt on the gravel surface, with the propeller, flaps and lower fuselage all badly damaged.

Subsequent investigation revealed that the undercarriage retraction system, and the up and down lock warning lights, were all capable of functioning normally at the time of the accident. At the accident site however, it was found that, although the pilot had moved the undercarriage selector from the "UP" detent and over the raised protective "stop" midway between the limits of its travel, he had not pushed the selector fully down and it had remained against the base of the stop in the intermediate position as shown in the photograph. This movement was not sufficient to actuate the electrical lowering system and the undercarriage remained retracted throughout the approach and landing. The pilot admitted that at no stage after selecting the undercarriage down did he look again at the selector switch or check that the green undercarriage warning light was on.

The investigation also disclosed that the undercarriage warning horn had not sounded during the approach to land. Before raising the aircraft from the runway, the operation of the horn was checked and it was found to function only when the throttle was almost fully closed. A further check of the electrical system after the aircraft had been ferried back to Perth for repair, confirmed that although the horn was set in accordance with the instructions and tolerances in the aircraft manufacturer's maintenance manual, it would only sound when the throttle was closed almost to the idle position. Thus, during the powered approach, the throttle had not been retarded sufficiently to permit the horn to sound.*

* The subject of setting warning horn throttle switches is to be discussed in a future issue of the Airworthiness Advisory Circular.

Above: The undercarriage switch still in the neutral position after the aircraft had come to rest.

Below: Marks left on the runway show that the undercarriage was fully retracted at touch-down. The arrows indicate propeller slash marks.

Notwithstanding the lack of audible warning, other means were available to the pilot to indicate to him that the undercarriage was not extended. Furthermore, the operator's operations manual requires pilots an final approach to re-check the pre-landing vital actions. This includes ensuring that the undercarriage selector is in the "DOWN" position and that the warning light has changed from amber to green. Although the pilot was familiar with this check-list and was experienced in the operation of retractable-undercarriage aircraft generally, it is obvious that on this occasion he did not properly complete the prescribed cockpit checks.

It is clear that during his final approach, the pilot was pre-occupied to some extent with the suspected trim fault, as is evident from his planning of the circuit to allow for a long final approach, during which he intended to further check the trim system. This diversion undoubtedly contributed to a lapse in concentration during the critical latter stages of the circuit and the approach to land, and resulted in his omission to ensure that the undercarriage was extended. The cause of the accident was thus that the pilot failed to use the means available to him to ensure that the undercarriage was down and locked before landing.

* * *

Interrupted or forgotten cockpit checks have been a characteristic of a very high proportion of the wheels-up landing accidents described in past issues of the Digest. It is simply not sufficient for a pilot to merely go through the motions of cockpit checks, including extending the undercarriage, and then rely on the warning system to remind him, if, for any reason, the undercarriage has not extended properly. As in this accident, it needs only a landing approach made with power to render the audible warning system ineffective in preventing a landing with the undercarriage retracted. Distractions both inside and outside the cockpit, and diversion of the pilot's attention away from essential tasks can occur in the course of almost any operation and it is to cope with these very situations that standard checking procedures have been evolved. The only way to prevent accidents of this type is for pilots to be alert to the consequences of ignoring or overlooking all or part of these procedures, and increasing their vigilance accordingly.

Bell helicopter victim of power settling

(Summary of Report issued by Department of Civil Aviation, New Zealand)

In Nelson Province, New Zealand, a Bell 47G-3B-1 helicopter was engaged in recovering deer carcasses from mountainous terrain. While approaching the pick-up zone from a height of 150 feet above ground level, the aircraft suddenly shuddered violently, dropped its nose and began to settle vertically at a very high rate of descent. The pilot was unable to arrest the descent and the helicopter struck the ground, bounced, rolled over and caught fire. One of the passengers jumped clear at initial impact but the pilot and the other passenger were trapped in the wreckage and died in the fire. The helicopter was destroyed.

The helicopter, with the pilot and two passengers, had taken off from its base at 0600 hours on the morning of the accident, to hunt deer on the Mount Arthur Range. A number of animals were shot and the helicopter made two ferry trips with carcasses to a collection point on the side of the range nearer the aircraft's base. During the latter trip, the helicopter was refuelled and shortly after 1000 hours it returned to uplift the passengers and to ferry out additional carcasses. According to the sole survivor, the accident occurred when the helicopter was approaching a point on the steeply sloping mountain face 4,800 feet AMSL. The witness said that the helicopter was about 150 feet above the ground when it encountered what "felt like a huge downdraught". The witness, who had considerable experience as a passenger in helicopters in this type of operation, said that following a "fierce shudder" the nose dropped and, from the high rate of descent, he saw that they were going to crash. Before the "fierce shudder" occurred the approach had been normal. At the time of the accident the weather was fine with only a light north-easterly breeze, but it is possible that this could have varied in the area in which the accident occurred as the result of local topographical effects.

From an examination of the wreckage and ground marks, it was determined that the helicopter initially struck sloping, tussock-covered terrain in a nose-down attitude, while slipping to the left. After the initial impact the helicopter somersaulted, rolling to the left on to a knoll 20 feet down the slope. It finally came to rest 30 feet further down the slope with the cockpit bubble broken, the tail rotor fractured and one rotor blade doubled back beneath the wreckage. Both fuel tanks were torn from their mountings and the fire which broke out after impact completed the destruction of the aircraft. Examination of the wreckage failed to reveal anything which could account for the fierce shuddering and high rate of descent described by the witness. No part of the helicopter had become detached before impact and there was adequate proof that no malfunction had occurred in the engine, transmission or controls.

Although the pilot had accumulated more than 5,000 hours of helicopter experience, most of this had been obtained in the course of servicing oil drilling rigs and in similar low altitude operations over comparatively unbroken terrain. During the short time the pilot had been in New Zealand he had flown helicopters in mountainous terrain, but had undergone no training in this specialised type of operation. The pilot was probably unfamiliar with limitations imposed by mountain flying such as lower manoeuvrability at high density altitude, increased rotor blade angles of attack, and available power output. Of much more importance, however, was his unfamiliarity with the vagaries of local wind behaviour over and around mountainous terrain and possible dangers inherent in encountering them. The demands of mountain flying necessitate specialised training if they are to be fully understood. Recognition of this fact has led the Royal New Zealand Air Force to provide it for all their helicopter pilots, and for at least one very experienced helicopter operator to insist upon a minimum of one month's closely supervised flight training for all newly appointed pilots, regardless of previous experience, before permitting them to undertake solo operations in mountain areas.

The precise form of approach used by the pilot just before the accident occurred could not be determined with certainty, but in the opinion of the survivor, the descent path was initially at an angle of about 45 degrees. Although local wind conditions were not known with certainty, an experienced helicopter pilot, who was famiilar with the area, considered that the approach had probably been made downwind.

During the investigation it was learned that, only a few days before the accident, the pilot had been confronted with a similar situation but had managed to avoid ground contact by diving away to one side. This would have been conventional practice in such an emergency. In the case of this accident, it is apparent that the pilot had provided himself with an escape route in the form of a deep gully to port, and as the helicopter initially struck the ground on its port skid and continued to roll towards the left, it is probable that he attempted to make use of this escape route.

In the view of the New Zealand investigating authority, the violent shuddering and very high rate of descent encountered are symptoms typical of a condition known as vortex ring state, or power settling, in which a helicopter is virtually settling in the downwash from its own rotor. Tests conducted abroad have shown that the Bell 47G helicopter does not enter this state at all readily; in fact, its performance under circumstances leading to power settling is recognised as being remarkably good. Nevertheless, incurrence of power settling is physically possible and, once that stage has been reached by the average helicopter, recovery is very difficult unless ample height below the onset point is available.

Power settling manifests itself under conditions of (a) a vertical, or nearly vertical descent at a rate of at least 300 feet per minute, (b) absorption by the rotor system of some engine power, usually between 20 per cent and 100 per cent of that available, and (c) nearly zero horizontal velocity. In these conditions a helicopter can enter air which has just previously been accelerated downwards by the rotor, power settling being a transient state of downward flight, during which an appreciable portion of the main rotor system is being forced to operate at angles of attack above the maximum coefficient of lift. Blade stall starts near the hub and progresses outwards along the blade as rate of descent increases. The application of collective pitch and power results only in stalling more of the blade area, thereby producing an even more rapid rate of descent. It follows that since inboard portions of the blade are stalled, cyclic control response will be reduced accordingly. Settling can be quite hazardous if inadvertently incurred near the ground and rates of descent exceeding 2,200 f.p.m. have been recorded. Its symptoms include heavy vibrations throughout the airframe and controls and some loss of control effectiveness. Recovery is normally made by taking off collective pitch, dropping the nose and accelerating into forward flight towards air space which provides enough room to allow for the inevitable loss of height.

In the case of this accident, lack of cyclic control effectiveness may have been a reason why the pilot was unsuccessful in reaching his escape route. In any event, it is apparent from the survivor's account that the emergency was encountered when the helicopter was no more than some 150 feet above the ground.

The investigation noted that although the symptoms described by the survivor strongly favour the conclusion that the accident was the result of power settling, a possible contributory factor was suggested by a highly experienced helicopter pilot. The possibility was that lift dissipation, resulting from an attempt to land down-wind from too steep an approach angle, would have necessitated too large a change in rotor disc attitude to prevent the helicopter from overflying the selected touch-down point.

Probable Cause

It was determined that the probable cause of this accident was the unintentional incurrence of vortex ring state, or power settling, at a height and in a position making recovery virtually impossible before the helicopter struck the ground.

Shot Down in Flames!

A TRUE STORY

(Only the name and call-signs are fictitious)

SCENE

A flying training area shared by two country flying schools in southern Victoria. A student pilot is practising some precautionary search sequences in a Cessna 150, Papa Tango Victor, and elsewhere in the training area his instructor is imparting wisdom to another student in Cessna 172, Papa Tango Zulu. As is the custom in this training area, both aircraft are maintaining a listening watch on 119.1 mHz. Enter a Beech Musketeer from the other flying school. It pursues the Cessna 150 for a time then "jumps" it from above, turning away at the last moment.

MUSKETEER PILOT: [*In triumphant voice*] "Papa Tango Victor, you have just been shot down in flames!"

INSTRUCTOR IN 172: [*He is startled at this transmission, but correctly guesses what is going on and picks up his microphone*] "Aircraft calling Papa Tango Victor, say again?"

MUSKETEER PILOT: "Oh, Papa Tango Victor, I thought you might like to know I've just shot you down in flames!"

INSTRUCTOR: "No you didn't! I'm not flying Papa Tango Victor. What is your call sign and position?"

[*There is a stunned silence before the Musketeer pilot answers in a subdued, hesitant voice*] "Er . . . it's one of the aircraft from Tulipgrove".

INSTRUCTOR: "This is Papa Tango Zulu. Were you at anytime close to Papa Tango Victor or he to you?"

MUSKETEER PILOT: [*still subdued*] "No . . . not too-o-o close".

INSTRUCTOR: "Keep clear of other aircraft and don't talk nonsense on the R/T!"

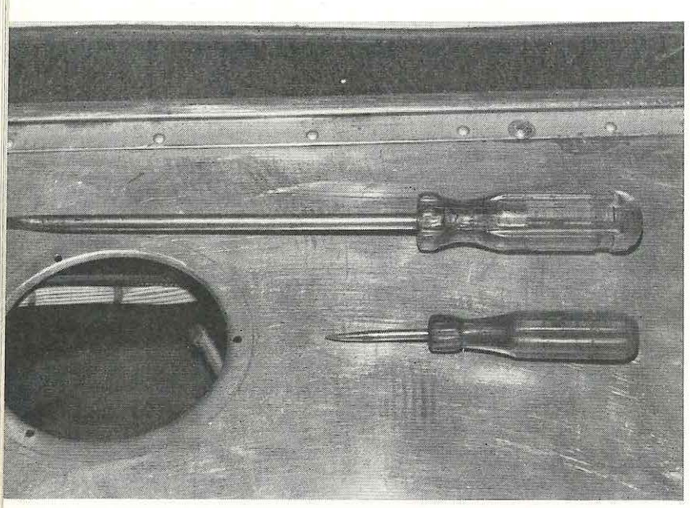
* * *

The student pilot flying the Cessna 150 had taken no part in this exchange, and it was found afterwards that his VHF receiver was working only intermittently. As a result of this broken reception, he had managed to make out only his aircraft's call sign and something about "flames", repeated twice. Thinking his aircraft must be on fire, the student's first impulse was to make a precautionary landing in the training area. Fortunately however, after checking his aircraft, he decided to return to the aerodrome.

Apart from the hazards that would have been inherent in a student pilot making a supposedly emergency landing in an unfamiliar area and on an unknown surface, there is a very real danger of mid-air collision in making a "pass" at another aircraft in this way—especially one being flown solo by a student pilot.

Flying in close proximity to other aircraft is safe only when performed by properly trained and disciplined pilots, as in formation flying. Even quietly formating on another aircraft without authority could be dangerous. The pilot of the other aircraft may well think he has the sky to himself and there is no way of knowing what he is going to do next.

In this case it seems that the Musketeer pilot might have been carried away by some of the air-to-air sequences in a recent, spectacular and much-publicised film. Certainly the cinema, or one's favourite armchair in front of the T.V., is the **only** way this type of flying can be enjoyed today. There is **no** place for it in Australian civil airspace!



MORE SPANNERS IN THE WORKS

WELL, not spanners exactly, but in fact two screwdrivers that were found in "the works" of a privately owned Cessna 180 that was flown in to Archerfield, Brisbane, for a 100 hourly inspection.

Although neither screwdriver was actually fouling controls when discovered, their position was such that they could easily have been caught in the control linkage. The larger screwdriver, some 12 inches in length, was found beneath the cockpit flooring. With its blade tucked beneath the fuel selector valve, it was lying diagonally below the elevator control cables and trim control chain. Figure 1 shows the larger screwdriver as it was found. The smaller screwdriver, about five inches long, was found on the cockpit floor, but hidden by the pilot-in-command's port brake pedal, below the port brake cylinder as shown in Figure 2. As is quite evident from the picture, only a small movement would have been necessary to make the screwdriver drop through the control pedal aperture in the flooring where it possibly could have fouled the rudder controls.

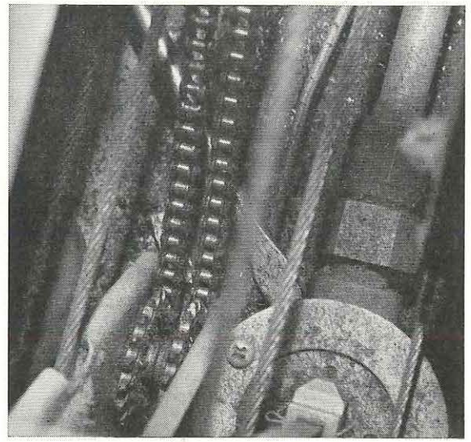


Figure 1

The recurring problem of forgotten tools and other equipment left in and on aircraft after maintenance work had been performed has been aired in the Digest on numerous occasions over the years. Whether or not this publicity has had any effect it is impossible to say, but there is no question that the problem is still a serious one and that it is common to both sectors of the industry —airline as well as general aviation. As well as the incident involving the Cessna, there have been four other occasions recently in which maintenance staff left equipment in or on regular public transport aircraft.

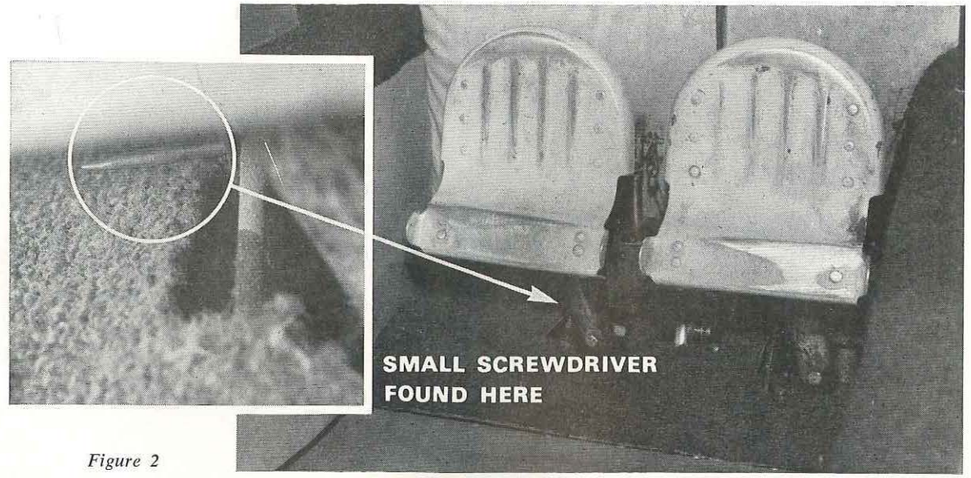


Figure 2

One of these instances involved a Boeing 707 just before it departed on a direct flight to Manila. This time the item forgotten was a fuel drain tool made from ¾" steel pipe, five feet long! The Boeing had landed at Brisbane en route from Sydney to Manila, where it was refuelled. While checking the fuel tank drains on completion of the refuelling, a maintenance engineer was called away briefly and for the moment placed the pipe on the fairing of the port undercarriage door. In this position, the pipe fitted snugly into the recess formed at the hinge of the fairing and would have been almost indiscernible to the person making the normal walk-around inspection before the aircraft departed. As a result of his distraction, the engineer forgot about the pipe and it was not until six hours later when he went to check the tanks of another aircraft, that he realized what he had done. Much to his credit, the maintenance engineer promptly reported the facts and, after a careful examination had been made of the taxiways and runway used by the aircraft when it departed, the pipe was found on the runway close to the threshold markings. It was evident that it had slid rearwards off the fairing either while the aircraft was turning to line up, or as power was applied to take-off. Prompt action was taken to contact the operator's office in Manila suggesting that the aircraft be inspected for any possible damage which the pipe might have caused. The subsequent inspection in Manila showed that no damage had been done.

The other three incidents all concerned items left in F-27 aircraft in Australia. In the first one, a brass blanking nut of a type used in the water methanol system of F-27 aircraft, was found near the edge of one of the runways at Perth Airport. It was not possible to determine the full circumstances which led to the loss of the nut on the runway, but it seems probable that the nut was unintentionally left in an F-27 undercarriage well while maintenance work was being performed on the aircraft's water-methanol system.

The second incident involving an F-27 was somewhat similar. But this time the forgotten item was a socket wrench complete with ½" socket spanner which was left on the wing of the aircraft. The wrench was seen by a stewardess as it fell from the wing of the aircraft while it was lining up for take-off at Tamworth.

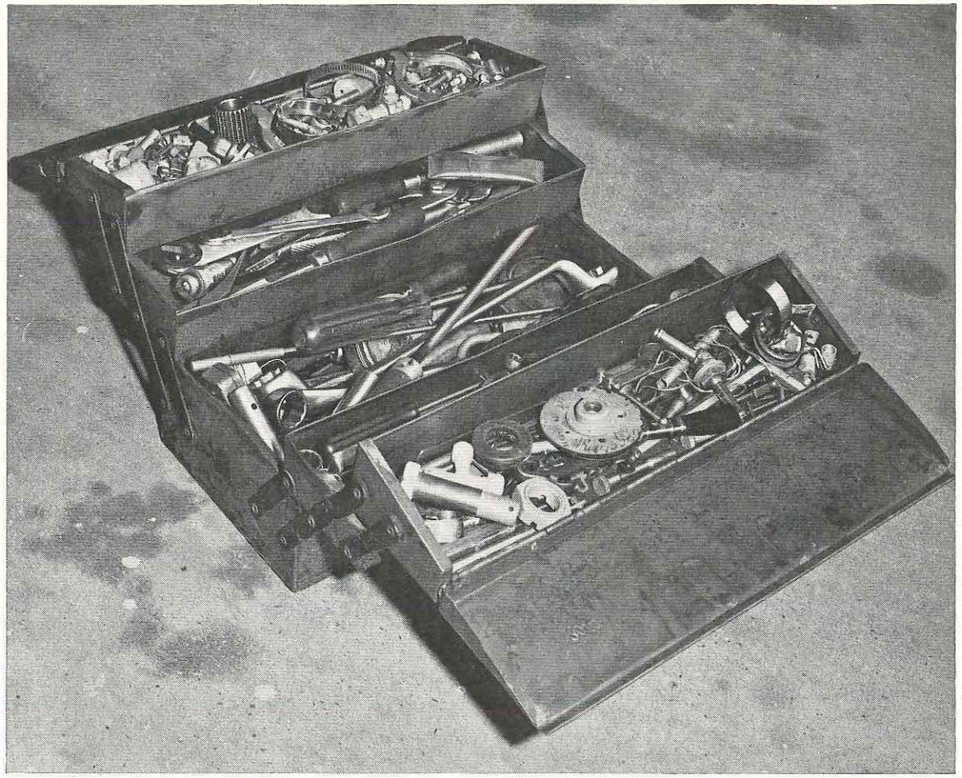
In the third case, the forgotten equipment was found quite by chance, still in the engine nacelle fairing in which it had been left. The find was made when the F-27, en route from Derby to Perth in Western Australia, made a night stop at Wittenoom Gorge. While the crew were making their walk-around inspection with the aircraft's step lamps illuminated, a smear or stain was noticed on the lens of the lamp recessed into the lower rear section of the port engine nacelle. Closer inspection of the discolouration showed that it was the silhouette of a pair of multi-grip pliers which were suspended internally across the face of the lens.

When the aircraft returned to Perth, it was found that the multigrips belonged to a maintenance engineer who had been working on the aircraft when the tail cone of the nacelle was last removed.

The engineer had been called away from the job before the cone was replaced and did not miss his multigrips until he wanted them the next day. Mistaking another F-27 for the one on which he had been working, he then made a search of the port engine nacelle and when he did not find them, concluded they must have been removed when the tail cone was refitted. It was not possible to finally determine who had actually been responsible for refitting the tailcone on the first aircraft, without checking that the nacelle was clear of equipment.

What is the underlying cause of all these incidents which could clearly pose a threat to safety in the air? Surely it is that the maintenance engineers concerned have not positively accounted for all their tools at the conclusion of a job. Cleaning up, when an item of maintenance has been completed, is surely a task that demands as much care and attention as the technicalities of the job itself. This is the **only** way to ensure that equipment is not left in obscure places in an aircraft. The importance of this phase of **any** inspection or maintenance work, cannot be over-emphasised. Similarly, if an implement or piece of equipment cannot be accounted for at the completion of a job, it is most important that the fact he reported promptly. In this way, action can be taken to locate the missing item before any damage is done.

The old adage "a place for everything and everything in its place" would be a good motto for all maintenance engineers to adopt. Untidy working habits not only make it more difficult to account for equipment at the conclusion of a job — they must inevitably lead to confused thinking which will ultimately be reflected in a reduced standard of workmanship. It would not be exaggerating to say that orderly maintenance methods could, in the long run, save lives.



a place for everything & everything in its place ???

It's time well spent

TWELVE months ago, in Digest No. 62, we published a rather hair-raising story of a Cessna 182 that took-off from Port Moresby with the control column locked. A catastrophe was averted only by the narrowest of margins and it was hoped that the account of this dramatic "save" would convince pilots how absolutely vital it is to check the movement of the flying controls to the full extent of their travel before each and every take-off.

Obviously there was at least one pilot who did not "get the message", for not long ago, much the same thing happened again, this time when a Pilatus Porter was departing from Essendon. On this occasion, it was the external control lock for the ailerons that was overlooked, and the aircraft took off with the lock still in place on the port wing. Fortunately the pilot was left with a small amount of aileron movement, and by adjusting the engine power, he was able to maintain sufficient control to complete a circuit and land again.

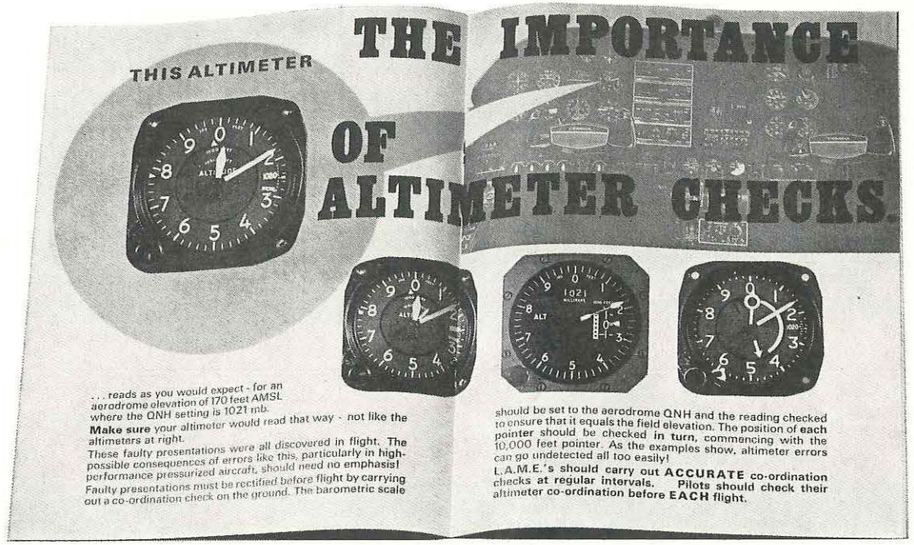
An untimely combination of circumstances contributed to the control lock being overlooked. It was the pilot's first commercial flight on the aircraft type after endorsement training; the responsibility for the pre-flight inspection was divided between the pilot and a ground engineer; and the pilot was interrupted in the middle of it to sort out a passenger loading problem. These factors by no means excuse the lapse, but they show how such omissions can and do occur. The point at issue of course is not the break-down of the pre-flight inspection, but the fact that the pilot did not subsequently detect the locked controls during his pre-flight cockpit checks. The operator's operations manual requires the pilot to test the controls before starting the engine, and again during the pre-take-off checks. It is clear in this case, that the pilot observed neither of these requirements.

Like most other items in a "vital actions" check list, the ritual of checking the flying controls for full and free movement before flight has been accorded the emphasis it now has, because control locks have been forgotten in the past and aeroplanes have crashed as a result. It is pointless therefore to treat the pre-take-off control check as a waste of time or only a matter of form because you "know" the aeroplane is airworthy. The check is there expressly for the purpose of providing for the odd occasion when the pre-flight inspection has been inadequate. As we should all hope, such instances may be rare indeed, but as we have already observed, they still happen sometimes!

To allow oneself to fall into the habit of short-cutting pre-flight checks is thus to throw away a safeguard that the accumulated wisdom of many years aviation experience has shown to be necessary. The effect is also insidious. In carrying out a "short-cut", but solemnly conducted pre-take-off control check, the pilot is assenting to the need for such checks and believes he is fulfilling the spirit of the exercise. Yet all the time the true value of the check itself is being unconsciously negated!

To fail to detect a control malfunction or obstruction during a pre-flight inspection may be a rare event. But for it to escape notice throughout both a pre-flight inspection **and** a properly conducted pre-take-off check should be almost impossible. Pre-take-off control checks conscientiously carried out are thus a "back stop" which, in terms of probability, reduce many times the chances of a "locked-controls" accident.

Remember, an engine failure even at worst, offers a sporting chance of a safe landing. A control failure usually offers none. Don't short-cut your way to disaster!



Hoist with our own petard!

THERE were some very red faces in the Editorial Office recently when we took a second look at the altimeters displayed on the centre page of our November issue (Reproduced above).

For much as it deflates our ego to have to confess it, we have unwittingly become the victims of the very mistake we were at such pains to warn our readers about. Far from being in error as implied, the centre altimeter in the group of three shown is reading quite correctly.

Originally it was intended to depict correct and incorrect presentations of all three altimeters in the Digest illustration. When space did not permit this, it was decided that one correct one, with the three faulty altimeters, would make an equally effective display. Unfortunately, when the display was being put together, the two photographs that had already been taken of the drum pointer type altimeters were mistakenly transposed, the correct presentation being substituted for the incorrect, and the error was not detected when the proofs were checked. It is thus clear that the Digest staff could benefit from a taste of their own medicine!

We would have been sadly disillusioned if we had been unwise enough to think, even for a moment, that our readers "mightn't notice" the error. The response has been quite staggering and enquiries and comments like "what **is** wrong with that altimeter?", "I can't see anything wrong with it?", and "You'll **have** to tell us what's wrong, it's driving us mad!", have poured in from near and far. The most interesting point about it all is that readers seemed to have assumed the trouble must be with their own interpretation of the altimeter, and not with the Digest illustration!

Oh well, at least it's gratifying to know that people read the Digest so thoroughly, and there is no doubt that we've made our point more tellingly than we expected, even if we would have preferred to do it with more aplomb! Perhaps after all, we should rejoice with that famous author (was it Mark Twain?) when he declared "How fortunate I am. If I make a mistake, many people take the trouble to point it out to me."