PRINTED BY HEDGES & BELL LTD., MARYBOROUGH, VICTORIA

AVIATION SAFETY DIGEST

DEPARTMENT OF CIVIL AVIATION AUSTRALIA

No. 41, MARCH, 1965

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Prepared in the Air Safety Investigation Branch,
Department of Civil Aviation, Commonwealth of Australia.

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A Cessna 310 of the Queensland Ambulance Transport Brigade based at Cairns, picks up a patient from a North Queensland station property.

Editorial

A series of tragic light aircraft accidents during our last winter prompted the Director-General to write to all pilots flying aircraft in this category. The theme of the Director-General's letter was to accent the hazard of operations in weather conditions below those accepted as being necessary for VFR operations by pilots not qualified for instrument flight.

Completed reports on the investigations of the accidents which provoked his letter, were not available to the Director-General at the time of writing his letter. He did however, have factual evidence of the qualifications of the pilots concerned and more than adequate circumstantial evidence to indicate that operation in weather below VFR standards was a predominant common factor.

The circumstances of three of the accidents are now described in this Digest and the applicability of the Director-General's letter is made clearly evident. In each case the pilot was not qualified for instrument flight. In each case analysis of the accident has indicated a loss of control following loss of visual reference and, finally, each case indicates that alternative action would have been available to the pilot prior to his entry into the conditions which were the ultimate cause of downfall.

By the time this issue of the Digest is distributed, we will be rapidly approaching another winter season. The majority of pilots will need no reminding that their operations should be limited to those compatable with their qualifications and experience. The small minority who have a propensity to tempt fate, would be well advised to carefully study the accidents covered in this Digest and accept, as a very well established fact, that loss of control and a catastrophic ending is the usual result of I.M.C. operations by those who are not properly qualified and recently experienced, in instrument flight.

Disaster Follows Take-off in FOG

At 7.23 a.m. on 16th June, 1964, communication officers at Cairns, Queensland, received a call from a Cessna 210—"Taxying at Burketown for Longreach, time interval 187 minutes, endurance 300 minutes, three persons on board". No further calls were received from the aircraft, and as subsequent attempts failed to contact it, the Uncertainty, Alert and Distress SAR phases were progressively introduced. Later in the morning, fears for the aircraft's safety were confirmed when it was learned that it had crashed shortly after taking off, killing all three occupants instantly.

The aircraft, normally based at Bankstown, N.S.W., had been flown to Burketown, Queensland, on a business trip four days previously. It was departing on the first stage of the return trip to Bankstown when the accident occurred. On the previous afternoon it had been re-fuelled to capacity in readiness for the trip and the pilot had then run the engine while he used the radio to order a forecast for the flight to Bankstown. After this the engine was shut down and the aircraft was not flown again that day.

The next morning the pilot and his passengers were up early to begin their trip and were driven to the aerodrome a little before 6.45 a.m. by one of the staff of the hotel where they had been staying. A heavy fog restricted visibility to about 100 feet and the driver remarked to the pilot that he surely wouldn't take off in such conditions. The pilot replied that he would wait a while to allow the fog to clear. The driver left the three men on their own at the aircraft and returned to the hotel. Half an hour later, with the foggy conditions virtually unchanged, the aircraft engine was heard to start, and was warmed up and run up, and then shut down. A few minutes later it was started again and soon afterwards the aircraft took off.

The take-off was heard by several people in the township and appears to have been normal until the aircraft began to climb away. At that stage the engine note was heard to rise to a crescendo as though it were either operating at very high power or overspeeding, and then cease abruptly. Almost at the same instant, a sharp bang was heard as the aircraft crashed.

Burketown is situated in flat low-lying terrain on the Albert River, 14 miles inland from the Gulf of Carpentaria. The aerodrome is located half a mile south of the township and consists of two unpaved runways lying NE-SW and NW-SE respectively. The river crosses the south-western end of the NE-SW runway and the aircraft parking area adjoins its north-eastern end in the closest position to the town.

The aircraft had taken off from the parking area into the south-west and the wreckage was found three-quarters of a mile beyond the river, almost in line with the direction of NE-SW runway. Examination of the wreckage and the spindly trees among which the crash occurred, clearly showed that the aircraft had dived almost vertically into the ground at high speed. The propeller hub was buried 15 inches in the ground, and the entire cabin area and the mainplanes had been crushed and telescoped. Only the tail assembly and the section of the fuselage aft of the luggage compartment remained substantially intact, though badly buckled in places. The damage to the engine and flying controls was so severe that it was impossible to determine their settings before the crash, but no evidence was found of any failure that was not the result of impact forces. The investigation established that the aircraft was intact and that all systems and controls were serviceable before impact.

The pilot, who was 31, held a commercial licence endorsed for Cessna 210, and had gained both a B1 Flight Instructor rating and a Class 1 Agricultural Pilot rating. His total flying experience amounted to well over 2,000 hours. Although while serving as a flying instructor he had given a considerable amount of instrument flying instruction, he had not qualified for an instrument rating.

The heavy fog that was experienced at Burketown on the morning of the accident was an advection type produced by warm air from the Gulf of Carpentaria moving inland over a land mass that had cooled throughout the night. Unlike the radiation fogs often found in New South Wales in the early mornings, this advection fog would not have been accompanied by a pronounced surface inversion or "lid" at a low

Aerial view of Burketown Aerodrome and Crash Site.

altitude. On the contrary, it is likely that the fog layer had considerable depth, as it persisted for four hours before lifting into a heavy layer of status later in the morning.

The pilot had made several previous flights to Burketown and was evidently anxious to make an early start for the homeward flight to Bankstown so that it could be completed in the one day. The northward flight four days previously had been made in the one day and had taken 9 hours 40 minutes, with three re-fuelling stops. Because of the difference in longitude between Burketown and Bankstown however, only ten and a half hours of daylight was available for the homeward trip. This meant that the aircraft had to depart from Burketown within half an hour of first light if an en route overnight stop was to be avoided.

The aircraft was equipped with a full instrument panel and the pilot may have believed that once airborne he could quickly climb into clear conditions above what he thought was a shallow fog layer. He had apparently set himself a time limit of 7.30 a.m. for take-off to enable the party to reach Bankstown before dark and it seems probable that all these factors weighed his decision to attempt a take-off, despite the severely restricted ground visibility.

The accident occurred simply because the pilot deliberately placed himself in a situation which demanded instrument flying ability beyond his capacity. It is sobering to reflect that the worst conditions in which any aircraft is permitted to take off are those specified as the minima for IFR flights in multi-engined turbo-jet aircraft departing from airports equipped with radio navigational aids. The *minimum* runway visibility in such operations is 800 yards — conditions vastly better than the estimated 100 feet visibility that existed at Burketown.

(DON'T) DO IT YOURSELF!

A few minutes after taking-off on a private flight, the engine of a Cessna 182B began to run erratically, so the pilot returned to the airport and landed. It was discovered that the drain cock under the filter bowl had accidentally jammed in the open position and in the ten minutes of flight time, about 20 gallons of fuel had drained into the rear section of the engine bay before being lost overboard.

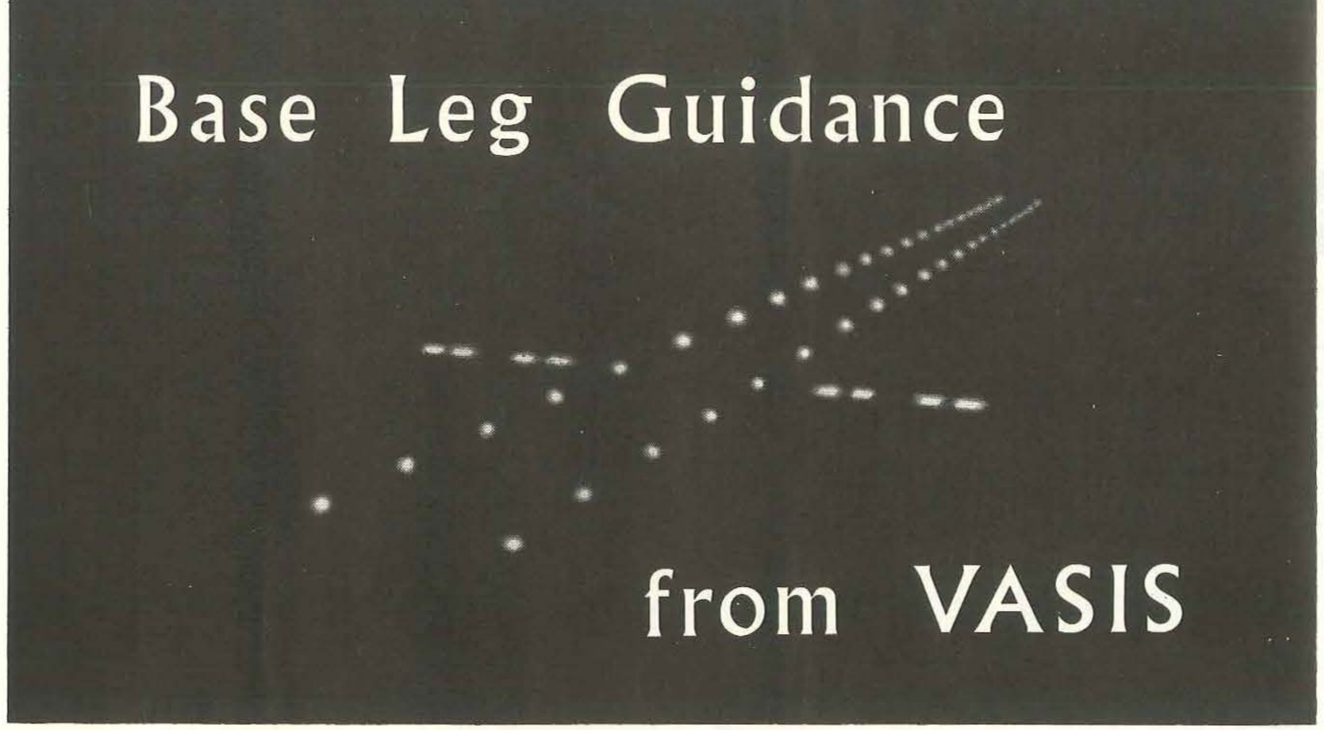
This owner-pilot was lucky. Only a few months previously another Cessna 182 caught fire during a take-off when fuel escaped into the cowling under almost identical circumstances. In this case the pilot landed straight ahead in a rough field and escaped injury, but the fire completely destroyed the aircraft.

In both instances the original filter drain cock, which is fitted with an extension pipe protruding clear of the engine cowling, had been replaced by a simple push-to-drain type of cock, from which fuel could be discharged inside the cowling. The modification provided a satisfactory means of making a water check, but it did not meet commonsense airworthiness standards. Design requirements, both in Australia and overseas, require fuel system drains to be positioned so that they always discharge clear of all parts of the aeroplane. The reason for this is simply to ensure that any fuel discharged from the drains is not retained within the aircraft structure where it could present a fire hazard.

Air Navigation Regulation 32 sets out the Department's requirements for modifications to aircraft, and previous issues of the Digest have pointed out that aircraft owners should not undertake even simple modifications without being absolutely certain that the airworthiness of their aircraft will not be affected. No matter how trivial an alteration may appear to be, it might easily introduce a hazard that does not become obvious until the system ceases to function normally. The case of the substitute fuel cock is an excellent example. It was not until the cock failed to shut off that the weakness in the modification was shown up.

The Department's records show that abnormalities of this sort occur more commonly than the average operator might suppose. We have statistics to prove it! It is in the operator's interests to take advantage of this accumulated experience by having all proposed modifications approved either directly by the Department or by a design organization recognized by the Department.

Base Leg Guidance from VASIS



Information on the characteristics and the operational use of Visual Approach Slope Indicator Systems have been published by the Department in special handbooks and in Aeronautical Information Circulars, and are now incorporated permanently in the Aeronautical Information Publications. Normally, this type of information would not be presented in the Digest.

So vital is one characteristic of the VASI System however, that it will bear repeating to ensure pilots are aware of it. For this reason, the Digest is making an exception to briefly discuss the azimuth spread of the systems as it affects air safety. The comments apply equally to both the "T" and the "Red-White" Systems.

The azimuth spread of a VASIS is significantly wider than the spread of the obstruction-free approach path on which effective operational landing lengths are based. It is thus possible for a VASIS to be flown "on slope" in an area where obstacle clearance is not provided. Limiting the VASIS azimuth spread to match dimensions of the obstruction-free approach area would greatly reduce the usefulness of the system, particularly in providing guidance on base leg. Conversely, it would not be practicable to provide an obstruction-free area over the entire azimuth spread of a VASIS.

In summary, a VASIS azimuth spread wider than the obstruction-free approach area is necessary for the most effective use of the system, and does not present a safety problem providing pilots are aware of this characteristic.

The point to remember is that VASI Systems were designed to provide some information to aircraft on base leg, and they fulfil this requirement, but it was never intended that pilots should rely solely on them for descent guidance while still on base leg.

Father Christmas in Trouble

In readiness for a short flight to a children's Christmas party in a country district, a passenger dressed as Father Christmas boarded a Tiger Moth which had called to pick him up at a nearby aerodrome.

The pilot left the engine running while the passenger climbed abroad. As he was seating himself in the front cockpit, part of his robes caught on the throttle lever and opened the throttle.

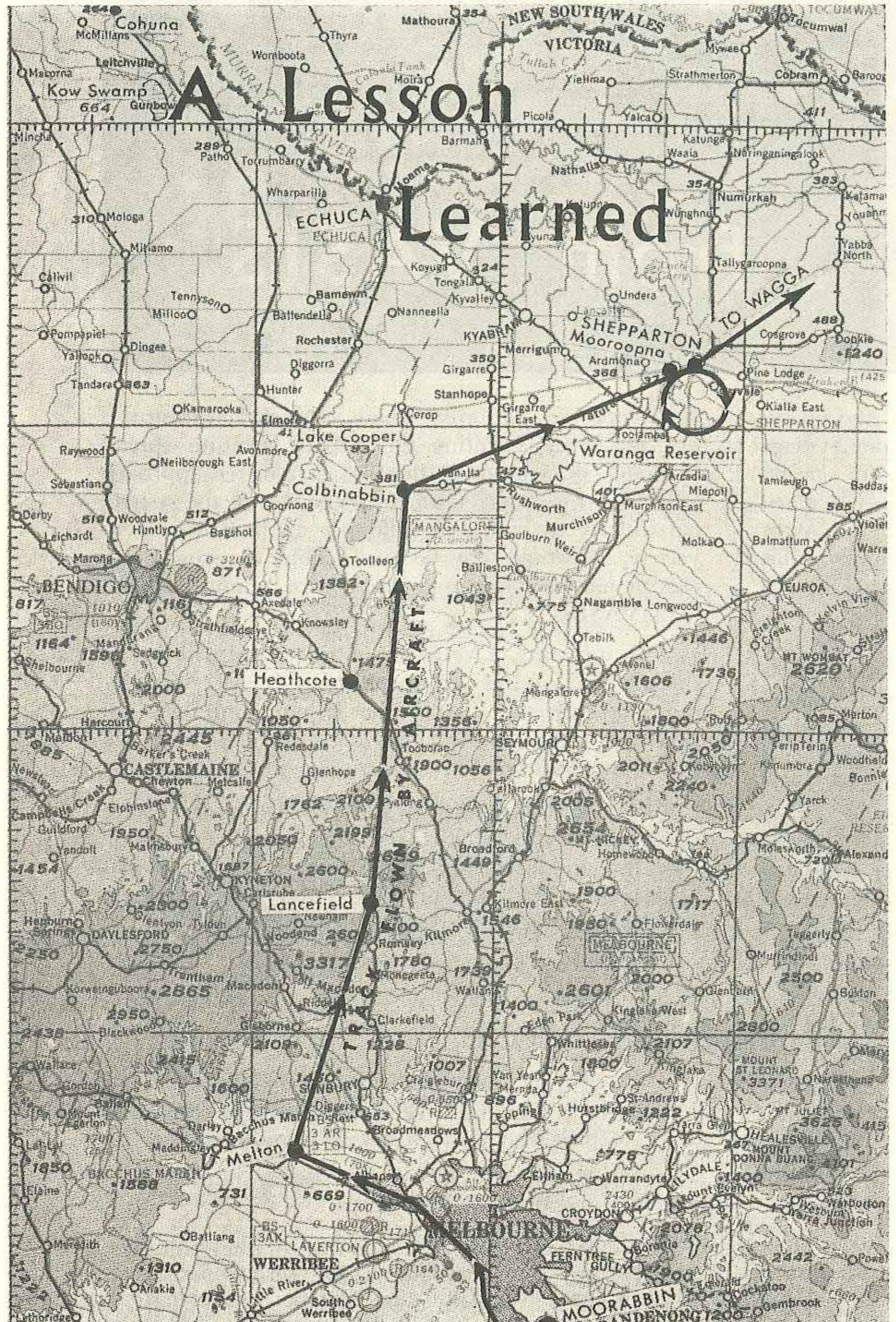
Before the pilot could take corrective action, the sudden burst of power lifted the tail of the aircraft and the spinning propeller chopped into the ground, damaging the tips of the blades. More serious damage was averted by the prompt action of an assistant standing near the tail of the aircraft who was able to grasp the tail plane as the aircraft tipped on to its nose.

A very minor oversight, but one which could easily have had expensive, if not dangerous consequences.

Pilot Contribution

Enthusiasm alone will not guarantee accurate navigation as this pilot discovered

A Lesson Learned



The flight from Moorabbin to Wagga and return was the final five hour solo cross-country flight required for issue of the unrestricted private pilot licence. The outward route was Melton, Heathcote and Shepparton to Wagga. Before departing I was thoroughly briefed by my C.F.I. and my flight plan was checked. Particular emphasis was placed on safety procedures, position reporting and so forth, and I set off, determined to carry out the flight in an exemplary manner.

Conditions were gusty and turbulent to an extent which made flying uncomfortable, and concentration and effort was needed to hold altitude and heading. This was aggravated by the fact that I was flying a new aircraft which had not yet been fitted with a directional gyro.

I reached Melton and turned on to the heading for Heathcote. Eleven minutes later I pinpointed myself over Lancefield, some four miles off track and realised that the wind was stronger and more westerly than forecast. I then made my first mistake. Instead of adjusting E.T.A.'s from the higher ground speed and correcting my heading by the map or by the 1 in 60 rule, I decided to be absolutely accurate and compute a new wind. While doing this I was requested by Melbourne to confirm I would be avoiding the Mangalore Control Zone. I knew from my pre-flight planning that this would be so and I therefore confirmed but I decided that as I had more easterly drift than anticipated. I should double check this point. I took out the VEC-2 from my L.A.H., continued computing a new wind and checking my probable clearance from the Mangalore Control Zone, all of which took some time.

After completing my calculations, I started to check my position, as I expected to arrive over Heathcote shortly. I had been so pre-occupied with my computer and maps that I had completely ignored the "10 Minute Markers" on my map and also my increased ground speed. A glance at my watch would have revealed that I had overflown Heathcote by several minutes. However, I could see Lake Cooper and Waranga Reservoir and was not alarmed. I continued on heading until it was obvious from these two landmarks that I was well north of Heathcote, so I flew on and eventually pinpointed myself over Colbinabbin as expected. I then turned on to the heading for Shepparton and advised Melbourne of my new E.T.A.

On E.T.A., I arrived over what should have been Shepparton but I was looking for two separate towns, Mooroopna and Shepparton — about three miles apart and joined by a railway line. Instead, I could only see one large town with a river and belt of trees running through it. From the map I immediately jumped to the conclusion that my earlier pinpoint could have been completely wrong due to a change in wind far greater than expected and a large deviation from track while working with computer and maps. It seemed that I could have mistaken Cohuna for Colbinabbin, Kow Swamp for Waranga Reservoir and the Cohuna-Elmore railway line for the Colbinabbin-Murchison railway line. If this were so, I thought, I could be over Echuca instead of Shepparton. Echuca also has a river running through it and a fork in the railway line north of the town with an airfield to the south.

In view of my lack of experience, the C.F.I.'s emphasis on correct position identification and my study of the article, "Confused in a Comanche" in the September issue of *Aviation Safety Digest,* I decided to take no chances. I started a wide circle to the south to check my position and after having a good look around informed Melbourne that, according to my flight plan, I should be over Shepparton but the railway lines appeared wrong and I would circle and confirm. I then realised that in the time flown and even allowing for major course deviations, it would have been impossible to have flown to Cohuna and Echuca and I positively identified my position at Toolamba where I could line up Lake Cooper and Waranga Reservoir and the railway lines running north-south through Toolamba and to the north-west from Toolamba. I immediately reported my position to Melbourne and on resuming track over Shepparton realised that what I took to be a belt of trees running through the town was in fact, the separating distance between Shepparton and Mooroopna as shown on the map. I continued the flight to Wagga in a state of some tension.

After refuelling I spent longer on the ground than I had originally intended. This served to relax me considerably and I approached the return trip to Moorabbin in quite a different frame of mind. Again the wind was not as forecast but I made no attempt at any computations and flew strictly on my flight plan, using my "10 Minute Markers" for position identification and correcting my headings by pinpoints. The return trip was accomplished without incident of any kind and, despite the unpleasant conditions, proved most enjoyable.

This incident was brought about mainly by my state of mind. I was not relaxed when I commenced the trip and was so intent on being technically perfect that I completely ignored the recommended navigational procedures. It is true that I was confused by the appearance of Mooroopna and Shepparton as shown on the map and as seen from the air but a little navigation instead of jumping to conclusions would have clarified my position.

COMMENT

The article "Confused in a Comanche" in our September issue, to which our contributor refers, set out five rules which experience has shown to be vital to accurate VFR navigation. This pilot's experience demonstrates that technical perfection in any one of these is of little value if the others are neglected in the process. Due attention must be paid to all five points if accuracy is to be achieved.

Comanche destroyed in Adelaide Hills

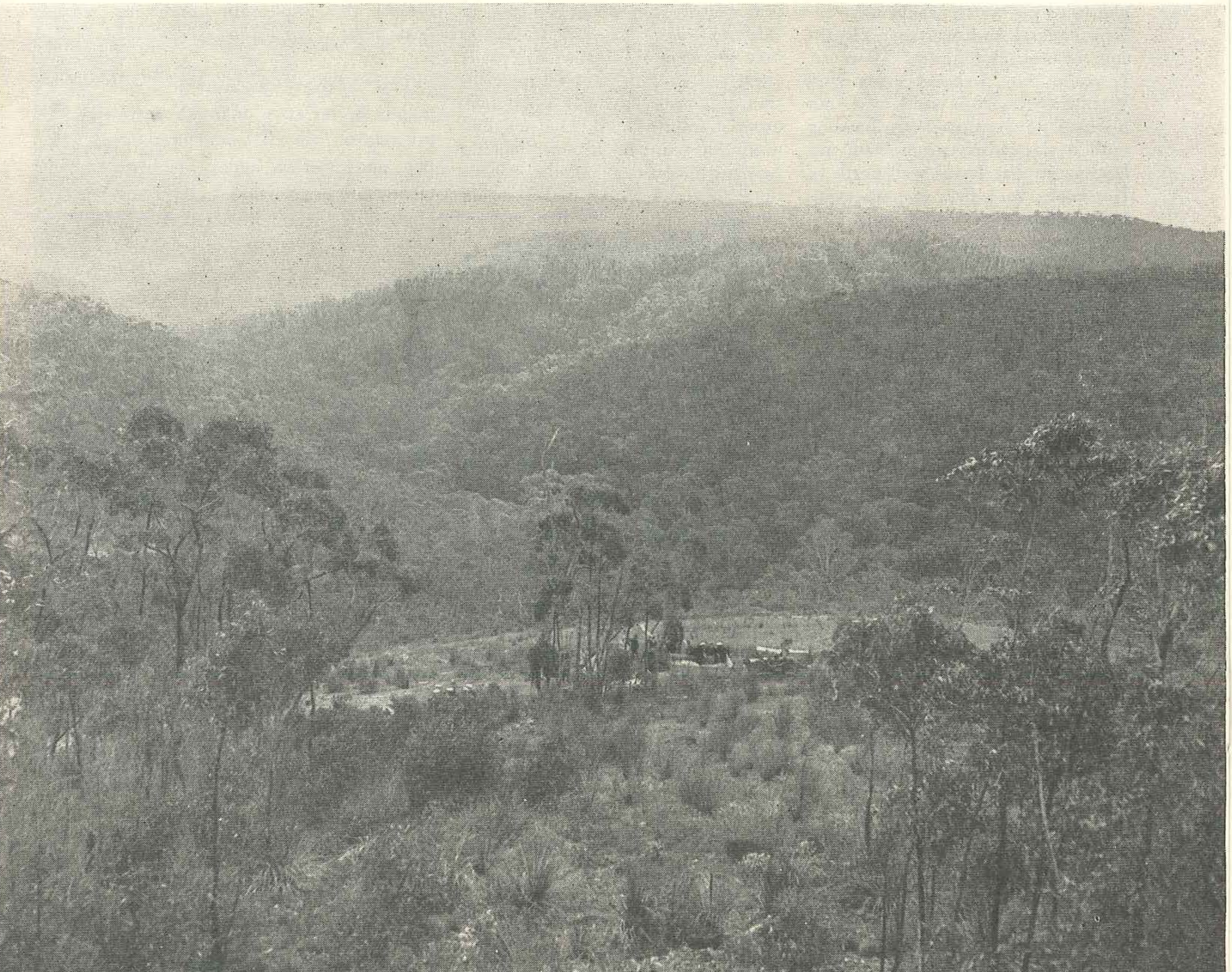
A few minutes before it was due to arrive at Adelaide Airport, a PA24 crashed into a cloud covered hillside nine miles from its destination. The aircraft was destroyed and the pilot and three passengers were killed.

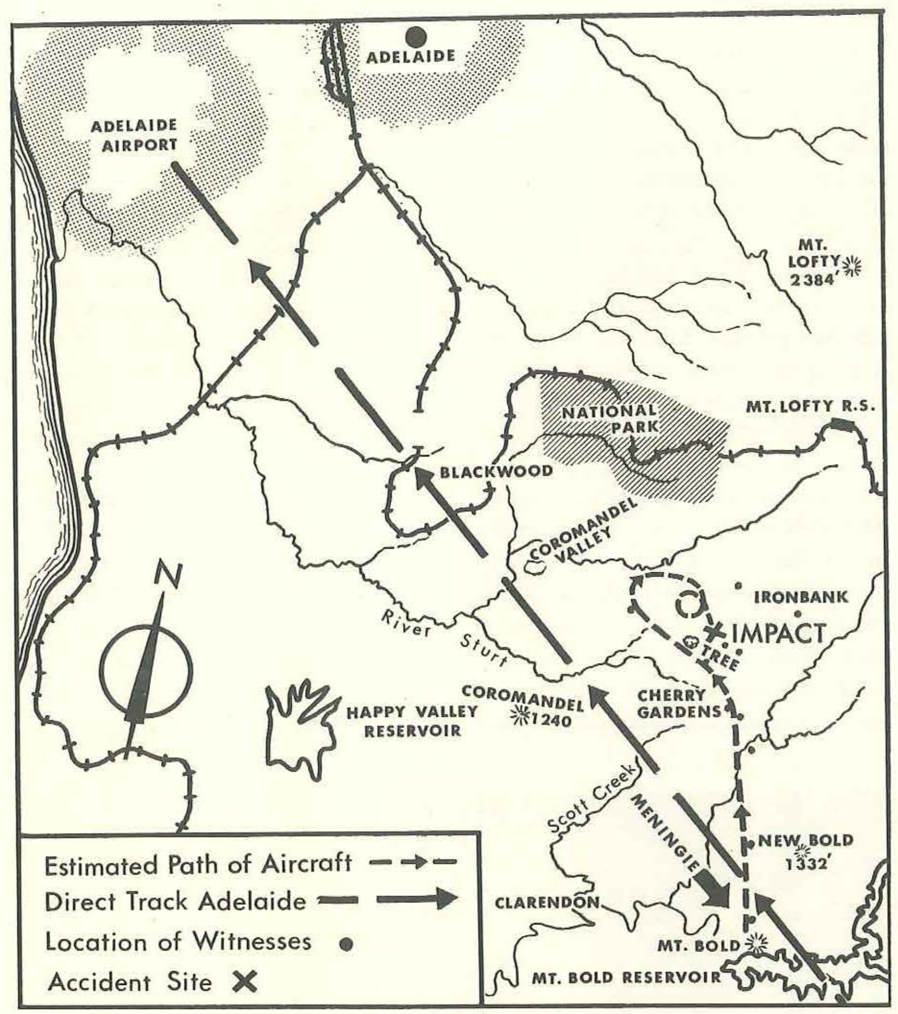
The aircraft had departed from Millicent, South Australia, at 0820 hours local time, for a private flight to Adelaide, with an ETA of 0955 hours. The pilot in command held a Private Pilot Licence and had flown a total of 140 hours. The flight proceeded normally at first, and over Meningie at 0922 the aircraft called Adelaide Control and was cleared to enter the controlled airspace. Thirty minutes later it reported at Mt. Bold, 14 miles south-east of Adelaide Airport and was cleared to make a VFR approach and instructed to call Adelaide Tower five miles out.

Subsequently the aircraft failed to report as requested, or to answer a number of calls directed to it, and a short time later, a report was received that it had crashed in the Adelaide Hills.

The site of the accident was on a lightly timbered north-western slope of a ridge nine and a half miles south-east of Adelaide Airport and five miles south-west of Mt. Lofty,

View looking back along final flight path from hillside immediately above accident site.





the highest point in the range. The ridge is 1400 feet above sea level and the aircraft struck the ground 150 feet below its summit.

The impact with the ground was severe, disintegrating the aircraft structure almost completely and forcing the engine and propeller more than two feet into the hillside. Despite the very extensive damage, it was determined that the engine was developing substantial power at impact and an exhaustive examination of the wreckage failed to disclose any defect which might have contributed to the accident. It was established that the aircraft had struck the ground while steeply banked to starboard in a pronounced nose-down attitude.

Two wristlet watches recovered from the wreckage indicated that the accident had occurred at 1000 hours. The weather in the Adelaide Hills area at the time of the accident was showery with three or four-eighths of stratus cloud at 1,000 feet, seven to eight-eighths of cumulus at 2,000 feet and visibility five to ten miles. Away from the ranges, the weather was mainly fine with broken cloud at higher levels. Evidence indicated that in the foothills on the eastern side of the Adelaide Hills, there was light drizzling rain but the ground was clear of cloud. On the higher slopes nearer Adelaide, the hills were enveloped in cloud with the ground visibility varying between 50 feet and 150 yards. It was also apparent that although the cloud had been at ground level on the eastern side of the hills on the direct Meningie to Adelaide track, V.F.R. flight would have been possible at the southern extremity of the Adelaide hills a few miles further south.

The aircraft was sighted by a farmer in the vicinity of Mt. Bold as it flew northwards in the general direction of Adelaide. The farmer was working in a valley in the hills which at this point rise to 800 feet, and observed the aircraft flying low over the ridges through patches of rain. The hills themselves were clear of cloud at this stage but the aircraft was believed to be only about 100 feet above the hill tops below the clouds.

In the general area of the accident some four miles further northwards, the weather was "foggy" with very restricted visibility. Although the aircraft was not sighted again because of the low cloud, a number of witnesses in this area heard it flying low for several minutes before the crash occurred. Their reports suggest that the aircraft flew on past the accident site then returned and circled for a few minutes before it crashed.

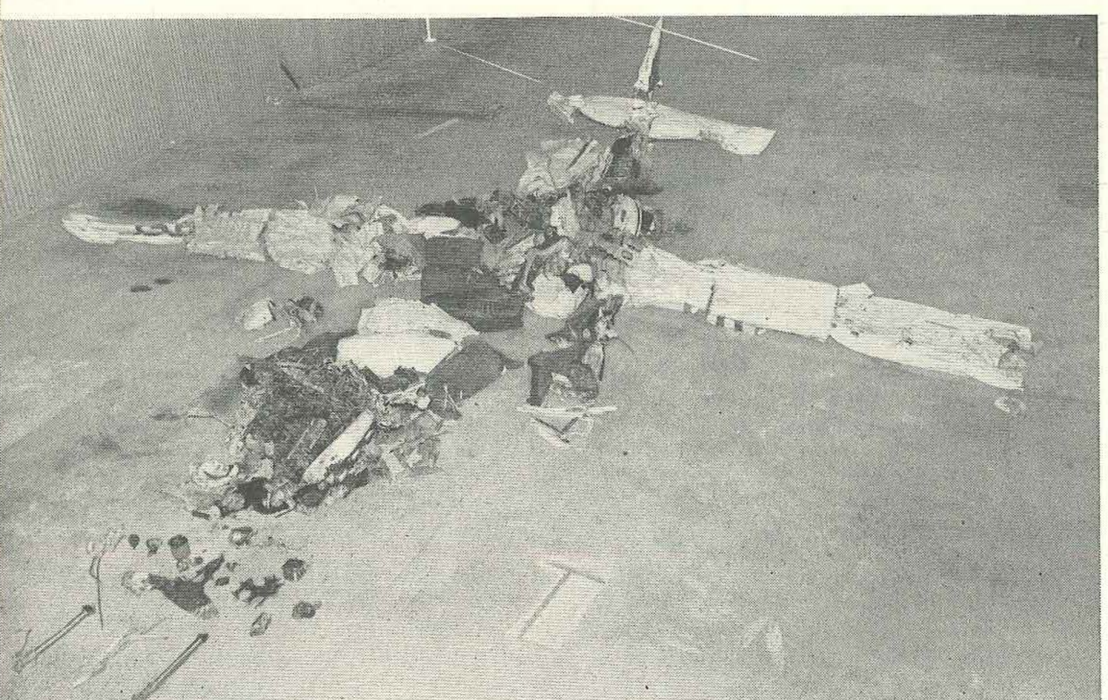
Two of the witnesses who were within 300 yards of the accident site, described hearing the sound of breaking timber just after the aircraft had flown very low past their position. The aircraft continued on until it was almost out of earshot, then returned in their general direction and crashed. Investigation of this report led to the finding of a large gum tree, the upper branches of which had apparently been struck by the starboard wing of the aircraft. It was also evident that the aircraft had then maintained its heading just above the trees for approximately one mile before commencing the turn which led it back towards the accident site.

From the available evidence, it was concluded that visual flight would have become impossible on the direct Meningie - Adelaide track shortly after passing the Mt. Bold position. The description of the aircraft's flight through the Mt. Bold area suggests that it was flying low in order to maintain visual reference to the ground, and the hearing reports from witnesses on higher ground further along the flight path indicate that it probably entered cloud within four miles of passing Mt. Bold. The aircraft apparently then flew on in cloud for about a mile before striking the tree. Although the aircraft did not sustain sufficient damage in this first impact to cause a loss of control, and evidence shows that it continued in level flight for some distance afterwards, it is possible that the subsequent turn to the right was induced by the tree strike.

The situation which developed was once again that of an inexperienced pilot endeavouring to maintain visual contact with the ground in conditions of lowering cloud and rising terrain. In such circumstances, the aircraft would have been flying increasingly close to the cloud base, then through intermittent patches hanging from the base of the cloud, until visual contact was eventually lost altogether. It is probable that the aircraft struck the tree a short time after this, precipitating a loss of control. Although striking the tree while flying in cloud no doubt contributed to the loss of control by greatly alarming the pilot, as well as inducing a turn, there is little doubt that the pilot, having had no training in instrument flight, would in any case have become disoriented when deprived of visual reference to the ground.

It is significant that at no stage did the pilot report any difficulty in maintaining VFR flight. Adelaide Tower could not possibly be aware of the precise conditions in the Mt. Bold area and had the pilot reported difficulty in maintaining VFR flight it is possible that ATC may have been able to offer an alternative route clearance or that the pilot could have proposed a route which would enable the flight to be continued under the Visual Flight Rules.

An Air Traffic Clearance proposed by ATC does not relieve the pilot from complying with statutory requirements, e.g., VFR and terrain clearance, nor from his responsibility for the ultimate safety of his aircraft. The Light Aircraft Handbook, for example, indicates at RAC5-1 the actions required of a pilot when he is unable to comply with the terms of an ATC clearance covering flight in controlled airspace.



The wreckage re-assembled during the investigation. Note the extreme chord-wise compression of the wings.

Crown copyright photograph

MORE ABOUT BIRD STRIKES

The importance of Incident Reports of bird strikes on aircraft has been emphasized from time to time. One obvious benefit of submitting reports covering all such occurrences is that the Department will be able to determine the areas of greatest risk in Australia, and thereby establish the nature of and priorities for our present research programme directed towards the suppression of this hazard.

It is probably not generally realized that all these reports are also collated and then disseminated on a world - wide basis, for evaluation by airworthiness authorities as a factor dictating aircraft design requirements. To this end, the International Civil Aviation Organization has developed a standard bird strike report form which it recommends member states should adopt. The design of the form ensures that all data relevant to airworthiness considerations is included in the report.

As a Department we have "a bit of a thing" about such specialized incident report forms for special types of occurrences. We have long adhered to the policy that it is better to have one readily available report form, adaptable to incidents of all types, than to have a multiplicity of forms, each for a specific type of occurrence. The bird strike problem provides a good example of this philosophy. We believe that if our standard Air Safety Incident Report (C.A. Form 225) is properly completed, both in the detailed items of the heading and the section for the narrative of the occurrence, then all the information required for airworthiness purposes will normally be available.

The narrative section of the report is intended to provide for your own expression of the sequence of events as they occurred, the results of these events, and any comments or suggestions which you might care to make. We have no wish to dictate the form of your narrative or inhibit in any way your form of expression — all we ask, in relation to bird strikes, is that we be able to determine at least the following facts from your narrative:

Phase of flight

Altitude and true airspeed

Flight conditions (IMC, VMC, above/in/below or between clouds, in icing conditions, etc.)

General weather conditions and whether day/night/dawn or dusk.

Whether any change to the intended flight was caused.

The size of the birds and whether alone or in a flock (also identify the type if you can).

The parts of the aircraft struck, the nature and extent of damage, and details of injuries to persons.

Some of these items may appear to be in the realm of "statistics gone mad". We can assure you that the requirement for them has been very carefully considered and that each has a particular significance to the overall problem of the bird strike hazard.

As already stated, the twofold objective of this programme is to reduce, as far as possible, the probability of bird strikes, and to evolve aircraft design characteristics which will minimize the danger of actual bird strikes. We seek the co-operation of both pilots and other members of the industry in this task of achieving greater safety in the air.

Control Lost During Approach

(Summary based on Accident Report issued by Department of Transport, Canada)

While on final approach to land at Toronto International Airport, Canada, a Viscount 757 lost power on both port engines. The aircraft swung to the left losing altitude and struck the ground inside the aerodrome boundary. The aircraft was badly damaged and a number of passengers were injured, one seriously.

The aircraft was completing a scheduled flight from Montreal to Toronto when the accident occurred. The flight had operated I.F.R. at 16,000 feet and had been normal except for a recurring synchronization problem with No. 2 engine, which was not considered serious. When eight miles east of Toronto Airport, with the field in sight, the aircraft commenced a visual approach to land on Runway 28.

On final approach about two miles east of the runway threshold the No. 2 engine began to surge. The aircraft was descending at about 600 feet per minute at 123 knots with the undercarriage down and the flaps set at 32 degrees. The engine instruments showed a wide fluctuation from normal R.P.M. on No. 2 engine with a slight torque variation but a fairly steady fuel flow. The captain exercised the throttle in the prescribed manner but this only seemed to aggravate the surging and the fuel flow indicator then fluctuated between 0 and 500 pounds per hour.

The captain decided to feather No. 2 engine but inadvertently shut down No. 1 engine using the HPC (High Pressure Cock). Having realized his error, he immediately attempted to re-light No. 1 engine and at the same time ordered the First Officer to feather No. 2 propeller. Both these actions were initiated but the re-light attempt was unsuccessful. Increasing power on engines 3 and 4, the captain then instructed the first officer to re-light No. 1 engine, and devoted his attention to controlling the aircraft.

The first officer made two unsuccessful attempts to re-light No. 1 engine and during which the stick shaker stall warning operated twice. By this time the aircraft was about 3500 feet short of runway 28, 300 feet above ground and was turning to the left of the runway heading. Despite the application of full starboard aileron and rudder, the angle of bank continued to steepen and when it reached 20°, it was obvious than an accident was imminent. The first officer closed the throttles on engines 3 and 4 and the captain was able to partially level the aircraft before impact.

The aircraft struck upsloping ground heavily with the port main wheels in a wing low nose high attitude, then bounced for about 700 feet striking trees and two snow fences. It slid across the south-eastern end of runway 14-32, and the port wing, complete with the port main undercarriage and engines 1 and 2, was torn from the aircraft 240 feet further on. The aircraft finally came to rest on a heading of 076° magnetic, 157 feet beyond the detached wing and 1790 feet from the impact point.

Investigation of the wreckage and subsequent exhaustive examination of engines 1 and 2 with their propellors and associated systems, failed to reveal any fault, with the exception of some foreign matter in the pitch control unit for the No. 2 propeller.

During the dismantling of this unit pieces of a rubber "O" ring were found which could have interfered with the high and low pitch ports. The unit had been installed eight months before and had flown 870 hours. A number of engine surging and synchronization problems had been recorded during this time, any or all of which could have been the result of the interference to the ports. The rubber ring was foreign to any used in the system and its origin could not be determined. The fault could have accounted for the surging observed by the captain but not for a complete loss of power.

The captain's action in exercising the throttle when the surging was noticed is the procedure recommended for a "partial flame out". The throttle is snapped shut then opened rapidly to the three-quarters open position and then closed again. This gives the engine a slight thermal shock to propagate the flame from the lit to the unlit engine burners. In the circumstances, the use of this procedure was correct. Following this action, the high pressure cock was left in the open position and the throttle closed. The engine remained in this power situation until the high pressure cock was closed and the propeller feathered by the first officer.

Before feathering the No. 2 propeller, the captain believed the engine had stopped and that the fuel flow was indicating zero. However unless there was a fault in the fuel system, zero fuel flow could not be indicated with the HPC in the open position and the propeller rotating. There would thus have been some indication of fuel flow regardless of the throttle position.

When the captain shut down the No. 1 engine in error, he did so by moving the HPC back through the closed position to the feathering position. The feathering button was not pushed. His action would have shut off the fuel supply to the engine and would have initiated a coarsening of the propeller pitch. Nevertheless, because about five seconds is required to feather the propeller by use of the HPC alone, and in this instance the HPC was only momentarily in the feathering position, the propeller could not have feathered though the engine would have flamed out. The captain's attempt to re-light the engine was made after the HPC had been re-opened and with the throttle still set for 145 pounds of torque. Thus, when he pulled the feathering button to apply ignition, a re-light should have occurred.

The first officer made the second and third attempts to re-light No. 1 engine. He carried out portion of the "unfeathering-air re-light" procedure and in fact called out the items to the captain on the final attempt. The procedure is as follows:

1. Close HPC (closed but not in the feathered position).
2. Check throttle closed.
3. Pull and hold the feathering button.
4. When RPM indication (approximately 1000 rpm) open HPC . . etc.

On neither attempt did the first officer get beyond Item 3, because at this point he was waiting for an indication on the engine tachometer. He apparently saw no RPM indication, and therefore did not re-open the HPC. Fuel was thus not fed to the engine and the re-light could not occur.

Examination of the engine revealed that it should have been capable of re-starting. Lack of carbon on the igniter plugs established that they had been firing during the re-light attempts. Evidence shows that number 1 propeller was windmilling at the time and also that the tachometer was operable, and it was determined that a steady 7200 RPM should have been indicated. It therefore seems possible that the first officer had mistakenly watched the No. 2 engine tachometer during his attempts to re-start the No. 1 engine.

In the configuration which existed during the final approach, with the undercarriage down and the flaps set at 32 degrees, the stalling speed of the aircraft would have been about 100 knots, and the minimum control speed 125 knots. The stick shaker stall warning came on twice during the emergency, indicating that at that stage the speed had fallen well below the minimum control speed.

Thus when the aircraft entered a uncontrollable turn to the left an accident was almost unavoidable.

The investigation concluded that the probable cause of the accident was a loss of control on final approach due to improper emergency procedures and misuse of engine controls.

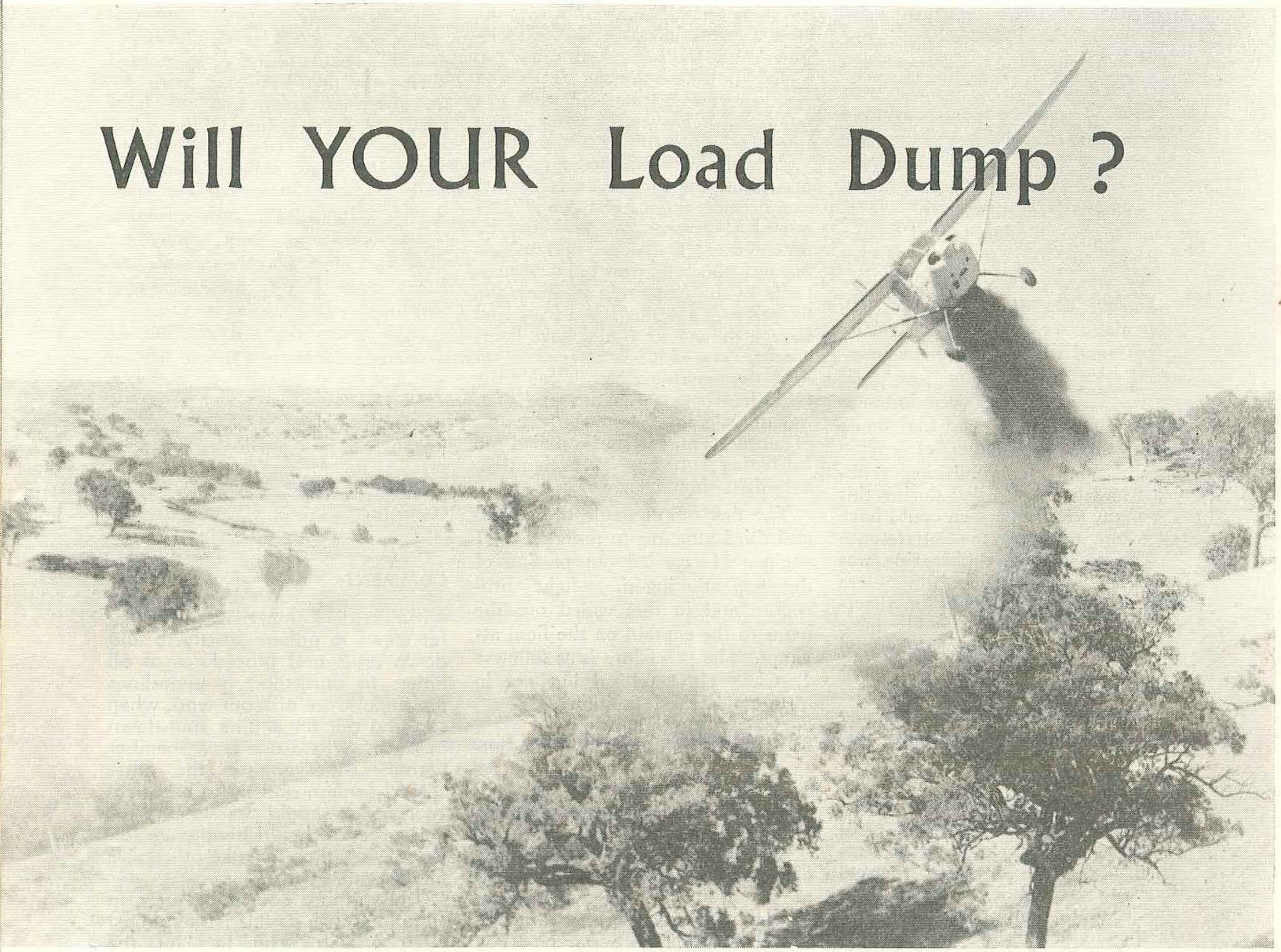
COMMENT:

The accident emphasises the need for crews to adhere strictly to laid down drills and procedures at all times. In particular, it underlines the importance of team work when carrying out an engine shut-down in flight. Where one crew member identifies the engine, the other should confirm and the subsequent shut-down should be monitored. This practice should always be followed, whether on take-off, cruise or descent.

The primary source of error in situations such as this is the almost overpowering urge to "hit the feather button" as a sort of reflex action. This applies especially to an emergency during an approach to land, probably because of the element of surprise and consequent lack of mental preparation in this phase of a flight. Whether it is an engine fire or malfunction, sufficient time must be taken to properly assess the situation and to follow a positive unhurried shut-down procedure.

It must also be remembered that when an emergency arises in flight the first essential is to ensure that someone continues to fly the aeroplane. All other actions must be regarded as secondary to this consideration.

Will YOUR Load Dump?

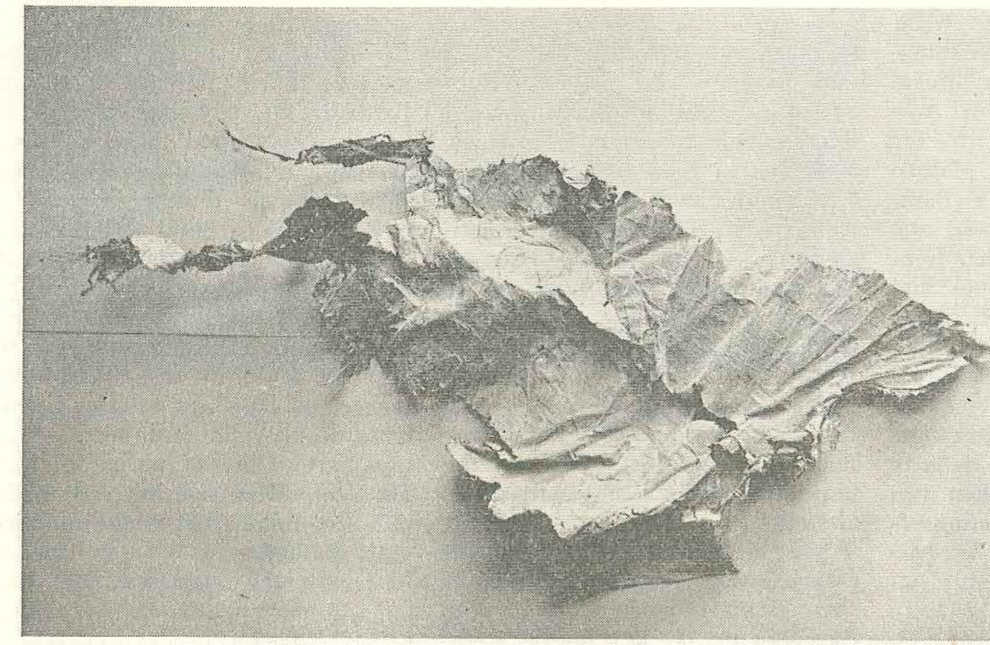


The aircraft was operating from a sloping agricultural airstrip located on one side of a valley in hilly country. The take-off direction was down the slope. The aircraft was refuelled about mid-morning and when flying resumed, eight hundredweight was uplifted without difficulty. For the second take-off the pilot called for the same load, and although the aircraft became airborne before reaching the end of the strip it failed to climb away and flew down the slopes towards the valley floor. The pilot selected the dump valve but the load did not dump and the aircraft sank on to the hillside, struck several large rocks and crashed. The aircraft was virtually destroyed but the pilot escaped with minor injuries.

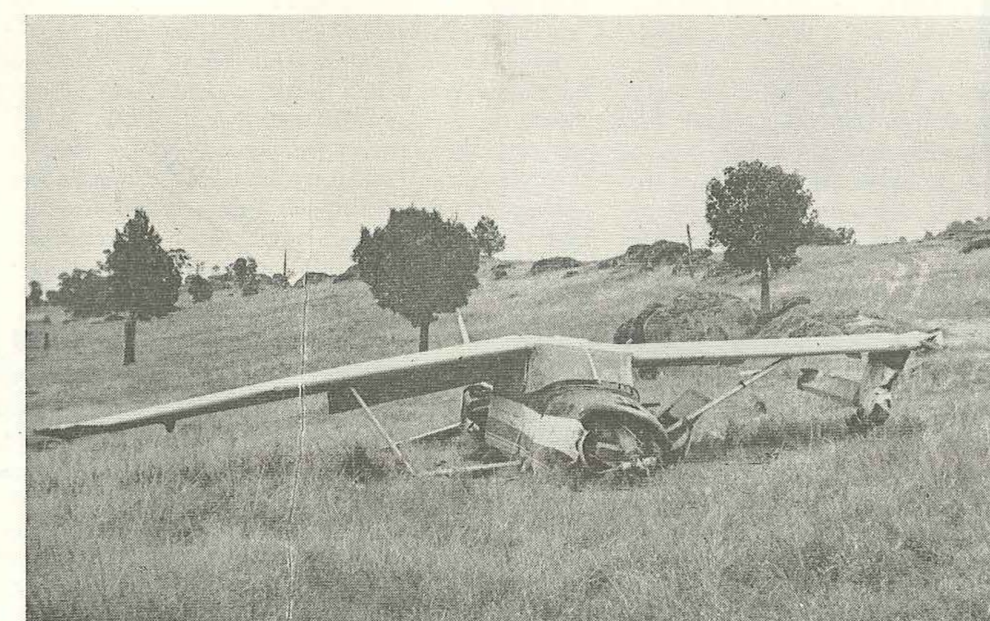
A large piece of reinforced packing paper was found in the wreckage associated with the base of the hopper and the louvres. This had probably prevented the dumping of the load. It was also probable that it had prevented the hopper from discharging fully on the previous flight, with the result that the aircraft could have been overloaded for the second flight. Numerous other pieces of packing paper were found in the bulk super-phosphate heap at the airstrip. The fertiliser had been transported in rail trucks lined with the paper and pieces had apparently been torn out when the trucks were being unloaded.

The pilot and loader-driver were aware of the presence of paper in the superphosphate heap and had taken some precautions to remove those pieces which came to their notice. The circumstances of this accident suggest that all concerned in agricultural aviation need to be fully aware of the problems posed by the presence of foreign matter in the loads being carried. The effect it might have on dumping mechanisms, and accuracy of loading should be particularly noted.

This is not considered to be a situation warranting mandatory procedures, but it would certainly seem that all agricultural operators and pilots should be conscious of the hazard and should implement preventative measures which ensure that the safety of their operations is not predjudiced.



THE SUSPECT —



— AND THE VICTIM

Debonair Dives into Hillside

Late in the afternoon of 1st August, 1964, a Beech 33 flying in conditions of low cloud and poor visibility crashed into a heavily timbered hillside near Ballarat. The aircraft was totally destroyed and both occupants were killed.

The aircraft, which was owned by a flying school at Moorabbin, Victoria, was engaged on a private flight from Parafield, South Australia, to Moorabbin.

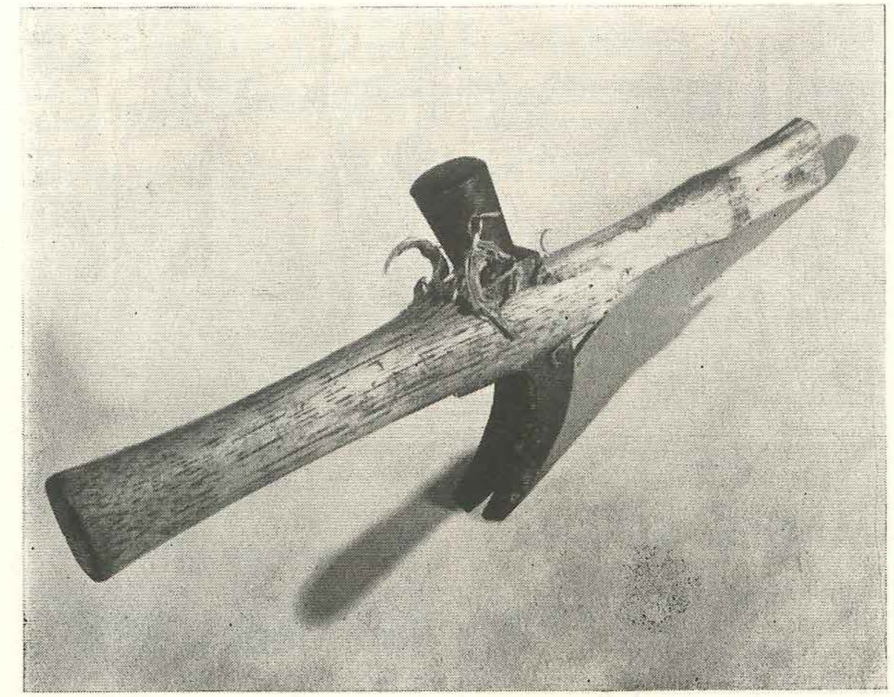
While submitting a flight plan to the airways operations unit at Parafield early in the afternoon, the pilot had perused the weather forecasts for his intended route and briefly discussed them by telephone with the duty forecaster at Adelaide Airport. The forecasts indicated that conditions over some sections of the route, particularly the ranges in the Ballarat area, would be marginal for VFR flight. When this was emphasized by the briefing officer, both the pilot and his passenger stressed that it was important for them to arrive at Moorabbin that evening. The pilot then submitted a flight plan which provided for the flight to operate VFR below 5000 feet, a total time interval of 172 minutes and an endurance of 350 minutes. The flight plan nominated a SARTIME and indicated that position reports would not be given.

The aircraft departed from Parafield at 0402 GMT and the pilot subsequently reported over Murray Bridge at 0425 GMT, estimating Bordertown at 0510. This was the last transmission received from the aircraft.

The aircraft was next seen at about 0630 hours as it flew low over Linton, which is 1150 feet above sea level and 17 miles south-west of Ballarat. At the time, the cloud base was estimated to be 500 feet and misty rain had been experienced there throughout the afternoon.

Three miles further to the south-east the aircraft was sighted again at low level. It was observed approaching from the west and flew overhead at a height estimated to be barely above the tops of tall trees. The cloud base was extremely low, with drizzly rain and mist and a ground visibility of no more than 500 feet. This sighting was made only five miles from where the aircraft crashed.

View looking east towards accident site in general direction of flight. The smoke marker shows the location of the wreckage.



This hammer was carried in the aircraft's tool kit. The position into which the head has been forced graphically portrays the violence of the impact.

The accident occurred at an elevation of 1300 feet on the south-western slopes of a heavily timbered hill 1500 feet high. The site is 14 miles south-west of Ballarat and twelve miles south-west of the intended track.

Examination of the scene showed that the aircraft had first struck a tree 30 feet above the ground, and had then been demolished as it descended through other trees. The engine was buried four feet in the ground and wreckage was scattered over an area almost 200 feet square. From the tree damage and wreckage, it was evident that the aircraft had dived steeply into the ground at high speed. The engine had been delivering considerable power at impact and the wreckage yielded no evidence of any defect that could have contributed to the accident. Both the flaps and the undercarriage were in the retracted position.

There were no eyewitnesses to the accident, but two farmers working in the hills $1\frac{1}{4}$ miles west from the accident site heard the aircraft shortly before the crash. About a minute later they heard the drone of the engine increase to a scream for a few seconds and then cease in a muffled explosion. Several other persons in the same area also heard the engine noise increase sharply before the sound of the impact. All the witnesses near the accident site described the weather as low cloud with light rain or drizzle. Their estimation of visibility varied between 200 yards and half a mile, and some thought the hill tops were in cloud.

From the evidence of all the witnesses, it was apparent that weather conditions existing in the area at the time of the flight had been substantially as forecast and the practicability of VFR flight would therefore have been extremely doubtful.

At the time of the accident, the aircraft was 12 miles to starboard of the planned track where the terrain was some 1000 feet lower than along the planned track in the vicinity of Ballarat. It was not possible however, to establish whether the pilot had inadvertently flown to starboard of his planned track or whether he deviated in an attempt to fly around the cloud-enshrouded higher terrain.

The reports from the witnesses at Linton indicate that the aircraft was being flown at a height of about 450 feet and just below the cloud base. After it had passed Linton, the weather conditions obviously forced the aircraft down until the pilot was flying just above the trees in "drizzly rain and mist" as seen by the witness five miles west from the accident site. From this point, the terrain rises by some 300 feet to the accident site, and the pilot would have had to gain height to clear it. In view of the lack of sighting reports during this stage of the flight and the weather conditions existing at the time, it is apparent that the aircraft entered cloud shortly after passing over the last eyewitness.

The witnesses' description of the engine noise, and the evidence that the aircraft struck trees whilst diving steeply with considerable power being delivered by the engine, indicates that the aircraft was not under control immediately prior to impact. The evidence indicates that the aircraft was being flown in an easterly direction shortly before the accident, but the examination of the accident site showed that it had descended in a north - north - westerly direction from the first point of impact with the trees. This could indicate either that the pilot had lost control while attempting to turn back, or that the turn resulted from a loss of control.

The pilot's log book indicated that he had received some instrument flying experience whilst in the R.A.A.F. some 20 years earlier but that he had not conducted any such flying since that time.

There is little doubt that the pilot persisted with his flight into worsening weather to the point where visual flight finally became impossible. Having been lured into low cloud amid rising terrain, a disaster was almost inevitable.

From the INCIDENT FILES

BIRD STRIKE DAMAGES CESSNA

During a charter flight between Tamworth and Moree, N.S.W., the pilot of a Cessna 182 was asked by a passenger to circle over a station property so that some photographs could be taken for a country newspaper.

After descending to 700 feet and reducing the airspeed to 90 knots, the pilot began a medium turn to starboard, concentrating on keeping the station buildings in the view of the photographer. The aircraft had almost completed a full turn when a heavy bump was felt on the port side. Looking quickly around, the pilot saw the remains of a large wedge-tail eagle fluttering towards the ground and that the leading edge of the port wing had been badly damaged.

Reducing the airspeed to 80 knots to minimize the aerodynamic loading on the damaged structure, the pilot found that full starboard aileron was necessary to maintain level flight. A large level wheat field lay directly ahead so he eased the aircraft into a shallow powered approach to land, reducing speed gradually from 80 knots after crossing the fence. The aircraft decelerated rapidly after touching down in the crop, but there was no tendency to swing or nose over.

The pilot said afterwards that although there were more suitable fields in the area, he had not wanted to risk a turn with the manoeuvrability of the aircraft so restricted. As a further precaution, he had avoided using the flaps during the approach and landing.

When the internal wing structure was inspected, it was found that three leading edge ribs had been severely damaged and the main spar slightly bowed.

Tri-pacer elevators jammed

When the pilot of a PA 22 tried to raise the nose of the aircraft during an approach to land, he found that the elevator controls had jammed in the gliding position. The restriction was overcome by gently rocking the control column until it freed, and the aircraft was landed normally.

A detailed investigation by an aircraft engineer eventually located the cause when the aircraft's cigar lighter was found in the elevator control mechanism beneath the floor. It had apparently fallen out of its mounting on the instrument panel and had lodged in the gaiter or "boot" around the base of the master control column beneath the instrument panel. From here it had gradually worked into a position where it could foul the control linkage.

The lacing on the control column boot was tightened to prevent the entry of any other foreign objects and the pilot was advised to remove the faulty lighter from the aircraft.

Lightning strikes . . .

Boeing 707

While making a simulated ADF approach to Avalon Airport, Victoria, a Boeing 707 engaged on crew training received a severe lightning strike just after entering a layer of stratus cloud and moderate rain. The strike holed the radar nose dome badly and the aircraft made a landing at Avalon as soon as possible.

Investigation of the damage showed that the strike had disintegrated the dome conductor strip, causing the fibre-glass dome to fracture and break up under wind pressure. The bulbous end of the radar scanner transmitter probe had also disintegrated and pieces of fibre-glass blown back from the broken radar dome had struck the leading edge of the port wing, slightly damaging a wing panel.

A new scanner and transmitter probe were installed, a new nose dome was fitted and the protective insulation replaced, and the wing panel was repaired before the aircraft could be cleared for flight.

Viscount

Twenty miles out of Canberra en route to Sydney, and while still climbing to cruising level, a Viscount 720 entered cloud and rain with moderate turbulence. A few minutes later, a dull report, accompanied by a faint flash was heard somewhere towards the tail of the aircraft. The crew suspected a lightning strike, but as all the aircraft systems continued to function satisfactorily, the flight was continued at turbulence penetration speed.

During the descent into Sydney, a loud intermittent metallic banging commenced. It was then seen that the H/F aerial had been severed and was lashing the port side of the fuselage. Speed was reduced and at 155 knots the aerial ceased whipping and lay along the fuselage. Sydney tower was advised and the approach continued. As the aircraft touched down, the captain took the addition precaution of feathering No. 2 engine to eliminate any chance of the propeller fouling the aerial as the speed reduced and the wire slackened.

After taxying in, it was found that the aerial had been broken eight feet forward from the fin.

Airspeed Indicator Unserviceable

Soon after taking off for a local flight from Bundaberg, Queensland, the pilot of a Cessna 172 noticed the airspeed indicator operating erratically. The reading at first increased as the angle of climb steepened, then fell off to 50 knots when the aircraft levelled off. The pilot advised Bundaberg communications unit of the circumstances and that he would have to make a fast landing.

When it was learned that the pilot was relatively inexperienced and that he had flown very few hours on the aircraft type, a local emergency was declared. Arrangements were made to send another 172 aloft to guide the pilot on his approach, and both aircraft landed without further incident.

The pitot pressure line was disconnected from the unserviceable airspeed indicator and compressed air blown through the line from the instrument end. Water was extracted from the line. Although the source of the water could not be conclusively established, it is believed that it had entered the line when the aircraft was washed earlier in the day.

Door not latched properly

The undercarriage of a Piper Apache had just been retracted as the aircraft climbed away from Perth Airport, when the entry door suddenly flew open.

The pilot increased the airspeed to minimize the effect of the open door on the control of the aircraft, then opened the small storm window on the port side to equalize air pressures. Two passengers seated on the starboard side were able to pull the door closed and hold it in position. The aircraft then returned and landed.

Before departing, the pilot had experienced some difficulty in starting the port engine and had climbed out of the aircraft to discuss the trouble with an engineer. This had delayed the flight for 15 minutes and in his hurry to make up the lost time, the pilot had not secured the door when he re-entered the aircraft.

Forced Landing Averted

Several miles after passing Melton, Victoria and entering the No. 2 Lane of Entry for Moorabbin Airport, the pilot of a Chipmunk reported that his engine was mis-firing and he might have to make a forced landing.

Melbourne operations immediately suggested he should land at Melbourne Airport which was only seven miles from the aircraft's position. The pilot replied that he was reluctant to fly over the closely settled suburbs to reach Melbourne Airport and he would look for a suitable landing area in his vicinity. Melbourne operations then requested a Cessna 172, also enroute to Moorabbin, to overfly the Chipmunk's position and report on the forced landing. In the meantime, the pilot of the Chipmunk had managed to clear his engine by opening and closing the throttle a number of times and he advised he was now confident of reaching Melbourne Airport. Escorted by the Cessna, the Chipmunk proceeded to a safe landing there and the Cessna was then cleared to continue to Moorabbin.

An inspection revealed that both spark plugs on No. 1 cylinder were fouled with carbon deposits. It was also found that the engine was in need of new piston rings. The pilot stated that the trouble had developed when he re-applied power after a long shallow descent. This descent at reduced power, together with the worn rings, had allowed the plugs to oil up and cause the mis-firing.

After the plugs had been cleaned the pilot flew the aircraft to Moorabbin where arrangements were made for the engine work to be completed.

FUEL LOST DURING FERRY FLIGHT

After finishing a spraying operation from an agricultural airstrip in Western Queensland, the pilot of a Cessna 180 was refuelling his aircraft before flying back to his base at Blackall, 80 nautical miles away. Holding the refuelling hose while he stood on an empty 44 gallon drum, he filled the starboard tank through a strainer funnel. As soon as the tank overflowed, he lifted the funnel out of the filler, placing his hand under the neck to retain the fuel in the funnel, jumped to the ground, then climbed up on another drum to insert the funnel in the port tank. He filled the port tank to capacity, secured the cap and climbed down again, then checked both tanks for water. Meanwhile his assistant had moved the refuelling equipment and drums from in front of the aircraft and shortly afterwards the pilot started the engine and took off.

Half an hour later, he noticed the starboard fuel gauge indicating low and the port gauge almost empty. By the time Blackall was sighted both tanks were indicating empty. The pilot made a straight-in approach to land and after taxying in climbed up to dip the tanks. The filler cap was not on the starboard tank and he realized that he had forgotten to replace it after the tank overflowed. The dip confirmed that both tanks had been emptied during the fifty minute flight. The fuel selector had been in the "Both" position throughout the flight.

COMMENT:

Over the last few years there have been many cases of premature fuel exhaustion caused by unsecured fuel tank caps. In nearly every instance, high wing aircraft have been involved. The hazard has been discussed in the Digest a number of times (see "Fuel Ejection" Aviation Safety Digest No. 37, March, 1964) but the extreme importance of checking fuel tank caps is apparently still not appreciated by some pilots.

Fire Dangers in Oxygen Systems

A recent circular issued by the Federal Aviation Agency in the United States discussed an incident in which a fire broke out in the cockpit of an aircraft while an oxygen bottle was being replaced during a maintenance inspection. The occurrence draws attention to the need for great care in the handling of aircraft oxygen systems and their components.

Oxygen systems are installed for emergency use in pressurised aircraft to supplement the reduced concentration of oxygen available in the atmosphere at high altitudes in the event of pressurisation being lost. They are also used in non-pressurised aircraft engaged in high altitude operations such as aerial survey work. When properly maintained, oxygen systems provide a safe and efficient service, but they can be dangerous when the proper procedures for their maintenance and operation are not followed.

The greatest hazard associated with oxygen systems is fire. Fire is normally the result of a rapid combination of a fuel with oxygen in the air, following the introduction of a source of ignition. Air contains only 21 per cent. of oxygen, so that a fire which occurs in a 100 per cent. oxygen concentration is of much greater intensity. Fires within oxygen systems may be started by heat, either from an external source or generated internally by the temperature rise which occurs spontaneously with sudden increase of pressure within the system. This phenomenon is known as adiabatic compression. If substances having a low ignition temperature are present, the rise in temperature can cause them to burst into flame and burn violently, or even produce an explosion.

Although fires in aircraft which have been initiated by oxygen systems are comparatively rare, investigation of the accidents and incidents that have occurred has clearly shown that the use of oxygen at high pressures requires special precautions to minimize the chance of explosion or fire. The ignition temperature of flammable substances is in general, considerably lower in an atmosphere of oxygen than in air, and normally incombustible materials such as metals will ignite in an oxygen atmosphere at temperatures considerably below their melting points. The possibility of spontaneous ignition of any of a wide variety of materials is thus much greater when they are subjected to oxygen at high pressures. The temperature rise produced by adiabatic compression when high pressure oxygen is suddenly admitted into a closed system containing low pressure oxygen or air, may be sufficient to produce this spontaneous ignition.

If fine particles of combustible material are present in a space filled by adiabatically compressed and heated oxygen, combustion may occur unless the ignition lag of the substance is greater than the time required to dissipate the heat. Combustible substances such as oil, grease, lint, dust, or even burrs formed on a valve seat during service, can set up conditions conducive to ignition. The ignition temperature of a combustible substance may vary considerably, according to the catalytic effect of the surface with which it is in contact, the size and shape of the space in which it is enclosed, and the effect of combinations of dissimilar substances.

The results of investigations of fires and explosions that occur to oxygen systems in service, are seldom conclusive, and simulated experiments in the laboratory cannot always re-produce the actual conditions. Also after a fire or an explosion, the original source of the ignition is usually either destroyed or damaged to the extent that its former condition cannot be determined, and so the probable cause of the accident can only be surmised.

The principal lesson which has been learned is that scrupulous cleanliness is essential in all oxygen system components, and before a unit is installed, it should be flushed out with nitrogen or oil free filtered air. The aircraft maintenance manual procedures must be closely followed at all times, particularly with regard to the lubrication of pipe fittings and only special oxygen system thread lubricants should be used.

The likelihood of a fire or an explosion can be reduced if, when opening shut-off valves, care is taken firstly to open them only slightly for a short period, and then open them slowly to the maximum. Most modern airline aircraft are fitted with "slow-opening" valves, but even with these fittings it is wise to adopt the same precautions.

High pressure oxygen systems are less liable to spontaneous ignition due to adiabatic compression if the high pressure shut-off valves are left open at all times. However, this is normally only possible with a demand system or with a continuous flow system having a low pressure shut-off valve. If this practice is adopted, flight crews should monitor the oxygen pressure gauge to ensure that any leakage which occurs in the system is detected.

Aircrew and maintenance personnel should make themselves thoroughly familiar with Air Navigation Orders covering the installation and use of oxygen systems in aircraft. Design requirements for the installation of oxygen systems are set out in A.N.O. Part 101.1.5.7, and operational requirements for the provision and use of oxygen are described in A.N.O. Part 20.4.

AIR AGE JETSAM

Periodically airport ground-staff find objects on runways and taxiways that have fallen from aircraft while taxying or taking off. The list of such articles includes spanners, screw-drivers, torches, refuelling equipment, jacking pads and other hand tools used in aircraft maintenance.

Aside from the hazards arising from mechanical trouble and structural damage which these loose articles can cause in an aircraft, it is obvious that any one of them could become a lethal weapon if dropped from an aircraft over a built up area.

That this has in fact happened on at least two occasions in the last twelve months underlines the seriousness of these incidents. It is remarkable that although in both cases the objects fell into closely settled residential suburbs, no injuries or damage were caused. Figure 1 shows one of these pieces of aerial jetsam, which is obviously a riveting dolly. It is not difficult to imagine the consequences of it falling into a crowded street.

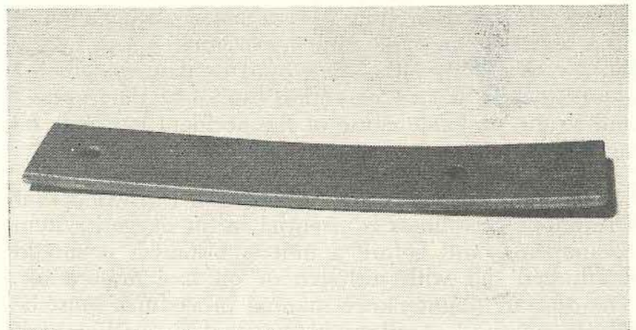


FIGURE 1

Quite apart from the potential danger to life posed by loose articles left in engine bays or wheel-wells or aircraft, costly damage can be inflicted on the aircraft itself. On one occasion when an engineer was making an in-transit check of the engines of a Boeing 707, a plastic handled screw-driver fell from his pocket after he had climbed into the air intake of one engine. It evidently lodged somewhere adjacent to the guide vanes where it was hidden from the view of other engineers who made a final brief check before the engines of the aircraft were started for departure. While the particular engine was being started, there was a sudden metallic clang at about 60% r.p.m. and the mangled screw-driver handle and shaft were ejected from the fan outlet. The engine was shut down, and it was found that two first stage blades and one second stage blade had been damaged. Figure 2 shows the remains of the screw-driver.

It is not only the aircraft in which the articles are left that can be affected. Aircraft have sometimes been damaged by picking up objects dropped on the runway from other aircraft. Figures 3 and 4 show damage caused to a Viscount during a landing run when a main-wheel tyre picked up a pair of pliers lying on the runway and flung them into the arc of the No. 2 propeller, damaging two blades. The rotating propeller blades then threw the pliers up into the belly of the aircraft, piercing the metal skin in two places. The runway had been inspected early that morning and was believed to be clear. It seems probable that the pliers had been left on some section of another aircraft and fell to the runway while it was manoeuvring on the ground at some stage prior to the arrival of the Viscount.

Over the years, Australian aircraft maintenance engineers have built up an enviable standard of workmanship. It would be a great pity if this reputation were marred because we omit to make a thorough check for all our tools and equipment after completing a service on an aircraft.

FIGURE 2

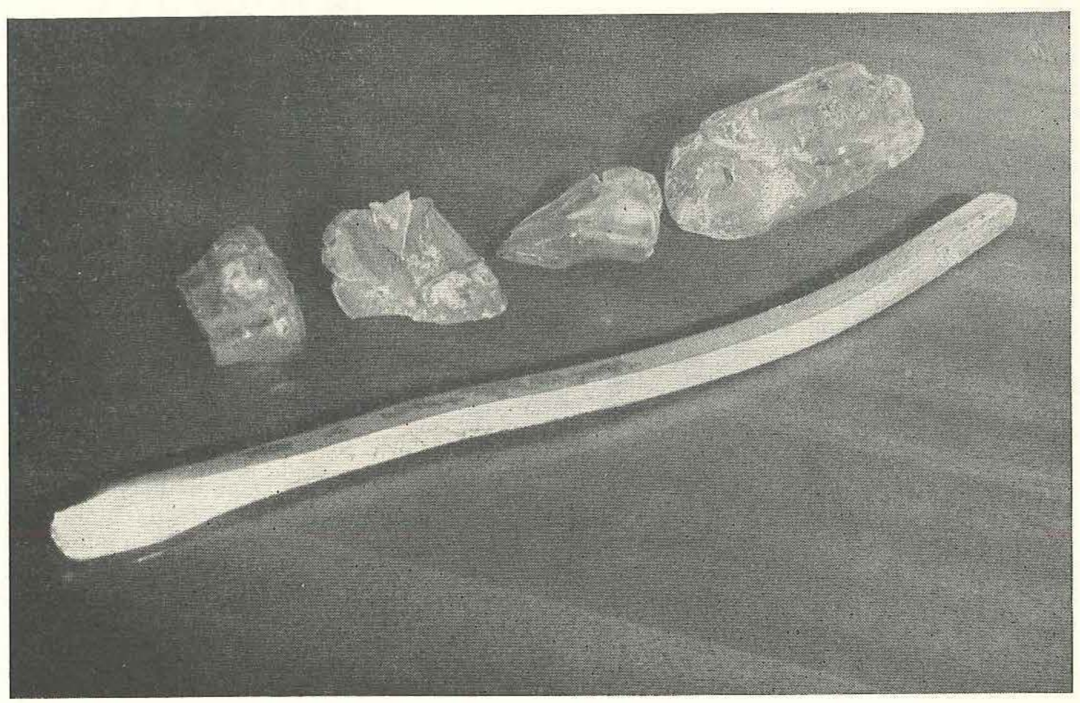


FIGURE 3

Damaged propeller blade with pair of pliers repositioned in gashes.

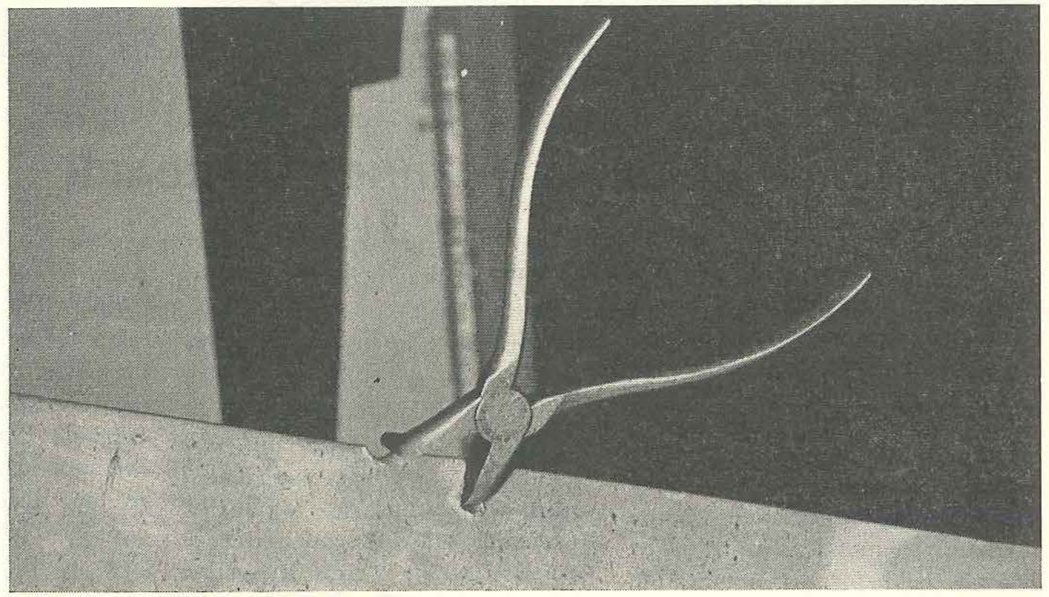
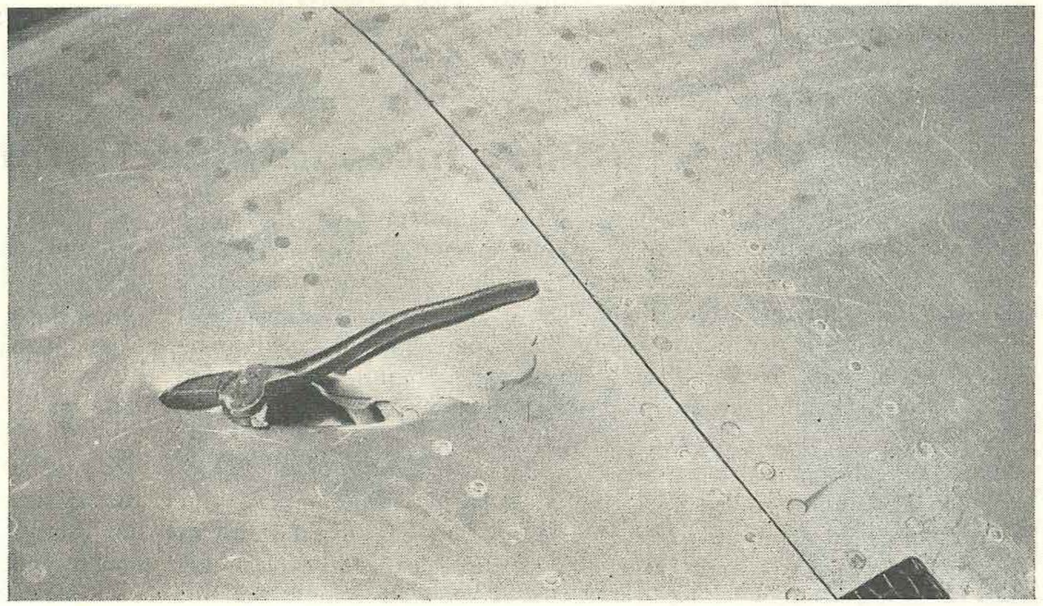
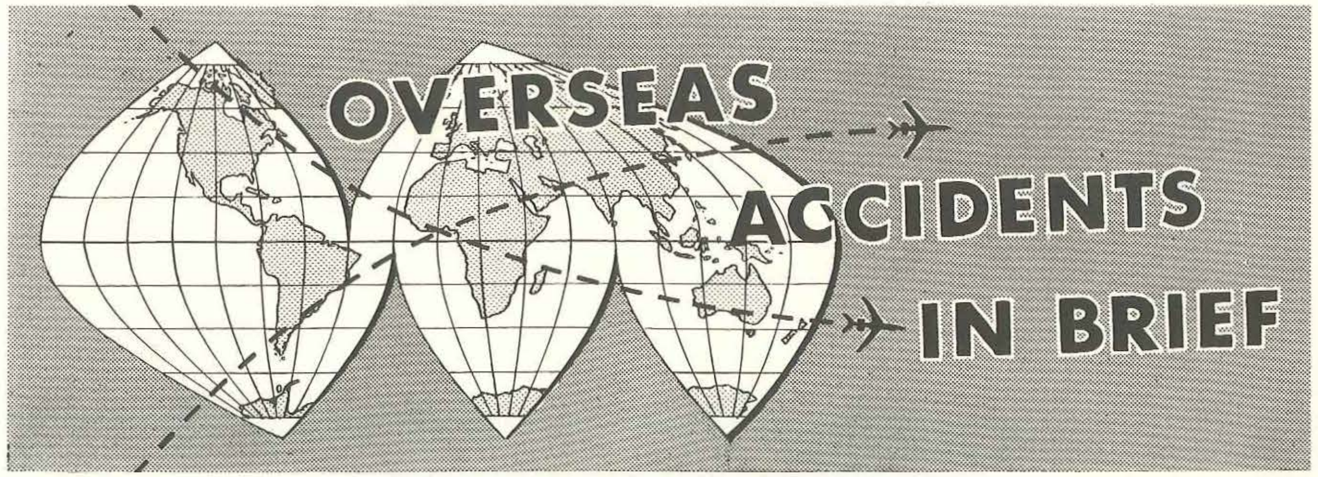


FIGURE 4

Skin damage to underside of aircraft.





CONVAIR CRASHES DURING APPROACH

While making a visual approach to land at night in the course of a scheduled airline flight, a Convair 340 crashed and burned. Both pilots and three of the 40 passengers were injured but there were no fatalities.

Earlier on the same night another aircraft had abandoned a landing at this airport and proceeded to an alternate, because of weather. The Convair held for 10 minutes on arrival in the circuit area, then advised that it would make a visual approach. This was the last transmission from the flight.

There were no ground witnesses to the approach or the crash which occurred in a large level field. The point of first impact was almost on the extended centre line of the runway and approximately 4000 feet short of the threshold. Marks indicated that the aircraft struck the ground while nearly level longitudinally and in a shallow left bank. The port main landing gear, both propellers with their respective engines, and the port wing were torn off. The aircraft rolled on to its back and slid more than 400 yards before coming to rest. Fire broke out in the separated wing but not in the fuselage and all 43 occupants were able to evacuate the aircraft quickly.

An examination of the wreckage found nothing to indicate any malfunctioning of the aircraft or its systems and both pilots stated that no difficulty had been experienced with the aircraft. It was found that the captain's scroll type check list was set at the "cruise" position while the first officer's was at the "descent" position. The operating company's policy requires the check list challenge to be called by the pilot not flying, who then performs the actions which can only be accomplished from his position. The results of the investigation also suggested that the pilots did not properly monitor either their altimeters or their vertical speed indicators during the descent. It was apparent that the decision to start the approach had been made quickly on receiving the permissive weather while the aircraft was very close to the airport. The ensuing rapid descent, together with the failure of the crew to monitor the instruments resulted in the aircraft flying into the ground during the approach in restricted visibility.

C.A.B. United States.

Pilot Incapacitated During Flight

Three minutes after making a normal take-off, an Auster engaged in joy-riding operations was seen to make a steep turn and then enter a dive from which it failed to recover. The aircraft was destroyed and all four occupants killed when it struck the ground.

A detailed inspection of the wreckage showed that the aircraft was serviceable before the crash. The investigation found that the flight was the pilot's 58th for the day and that for the preceding ten days he had been flying from 0800 to 1800 each day. A post-mortem examination found that at the time of the crash he had taken no food for several hours but had consumed alcohol. The cause of the accident was attributed to incapacitation of the pilot under the combined effect of fatigue, blood sugar deficiency and alcohol.

Ministry of Transport, India.

INADEQUATE PRE-FLIGHT CHECKS . . .

Lockheed unable to climb after take-off

Preparatory to beginning a charter flight shortly before sunrise, the pilot of a Lockheed 12 started the engines and taxied to a run-up position at the end of the runway. An apparently normal run-up lasting about three minutes was carried out and the take-off run commenced. The aircraft became airborne but failed to climb normally, continuing beyond the runway at a low level until it struck a tree 29 ft. above the ground. It then descended through other trees, finally coming to rest a quarter of a mile beyond the end of the runway. The aircraft was destroyed in the impact and the ensuing fire and the pilot and all four passengers were killed.

During the investigation, the external gust lock used for securing the rudder and elevator controls when the aircraft is parked was found along the wreckage path. The starboard rudder and the starboard outboard section of the elevator to which the external gust lock is attached when in place were recovered nearby. When the gust lock was fitted to these pieces of wreckage, it was found that deformation damage, scratches and punctures matched the shape and size of the lock, clearly showing that it was installed when the aircraft crashed. No evidence was found to indicate that any condition other than the immobilized controls had contributed to the cause of the accident. Although no check list for the aircraft was found in the aircraft wreckage, one was found in the pilot's office which listed a check for freedom of the controls as a pre-take-off action. A check that all external control locks had been removed should also have been part of the pilot's pre-flight inspection. It was found that the pilot had flown only four hours on this type of aircraft.

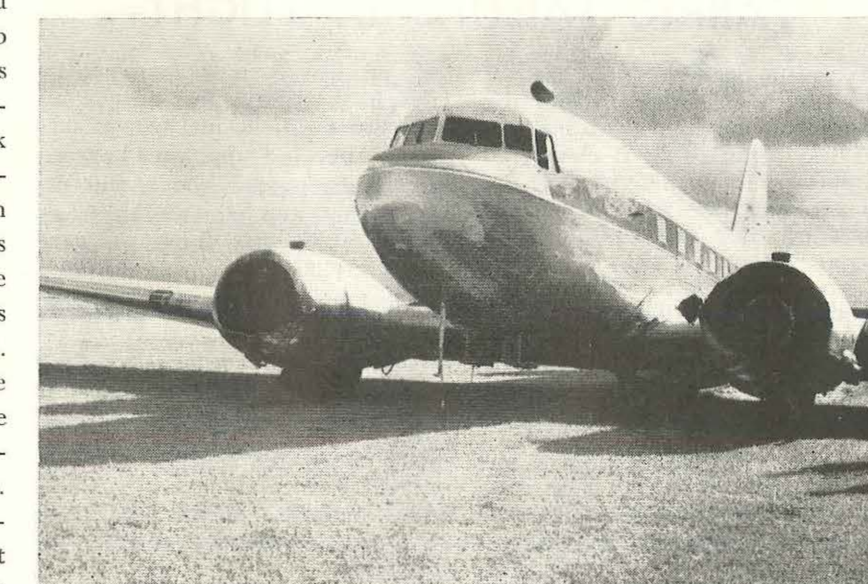
C.A.B. United States

DC3 forced to make Wheels Up Landing

As a DC3 accelerated through V2 speed during a night take-off, the captain found that the elevator control was almost immobile. However, with both pilots straining on the control columns, take-off was achieved. During the next 15 minutes, two attempts to land were made. Each resulted in an extremely hard touch-down and the landing gear was damaged and the starboard tyre blown out. The aircraft was then flown to another airport where, after finding that the landing gear could not be extended again, the pilots made a wheels up emergency landing.

Examination of the aircraft revealed the external gust lock for the port elevator had not been removed. The reason why the lock had been overlooked during the pre-flight inspection, which included the removal of the aileron and starboard elevator gust locks, could not be explained. It was also obvious that the cockpit checks by the crew had been grossly inadequate as the operator's check lists required a check for freedom of the controls before starting the engines, before commencing to taxy, and before take-off.

C.A.B. United States



Faulty Instrument approach in Aero Commander

At the conclusion on an IFR flight an Aero Commander crashed during an ADF instrument approach to land. The airport weather observation at the time was "indefinite ceiling 800 feet, sky obscured, visibility two miles, fog, wind 190 degrees 8 knots". The authorized minima for the approach required a cloud base of 800 feet and a visibility of two miles.

Approaching in a shallow descent, the aircraft first struck the tops of trees about 65 feet high located on terrain approximately 200 feet higher than the approach end of the runway. After the initial impact it descended through trees and crashed in an apple orchard. The site of the crash was about three miles short of the runway threshold and about 1450 feet left of inbound course between the end of the runway and the final approach facility, a non-directional beacon located 4.8 miles from the runway. The crash caused fatal injuries to the pilot and one passenger and serious injuries to three other passengers. The aircraft was virtually destroyed by impact forces but there was no fire.

Normal procedures for this approach require an altitude over the initial impact point of about 1350 feet or nearly 900 feet higher than the actual height of the aircraft when it struck the ground. Descent below 1070 feet on QNH or 800 feet above the ground is not permitted until visual flight reference is established. One of the surviving passengers who had some experience as a pilot, stated that when the undercarriage and flaps were lowered he looked forward from his rearward facing seat to watch the landing but could see nothing but fog. He reported that at this time the altimeter indicated 1100 feet. As he watched he saw it indicate 1000, 900, 800, 700, and finally 600 feet while the aircraft was still in fog. Two or three seconds later the aircraft struck the trees and crashed.

It was concluded that an improperly executed instrument approach by the pilot, resulting in a descent below obstructing terrain, had caused the crash.

C.A.B. United States

FABRIC FAILURE IN FLIGHT

Just after a Piper PA 22 had taken off for a private flight, the attention of bystanders at the airport was attracted by a change in the sound of its engine. Looking up, the witnesses saw pieces of fabric separating from the aircraft. The aircraft entered a spin, the port wing collapsed and folded back, and the aircraft struck the ground nose down in an almost vertical attitude. The pilot and his three passengers were killed.

Examination of the wreckage showed that a large section of the port wing tip fabric had been torn off in flight together with two smaller fabric patches covering inspection holes just inboard from the wing tip. The fabric failure had induced aerodynamic loads severe enough to deform the wing spars outboard from the lift strut attachment. The wing fabric area between the missing patches was almost devoid of dope and paint and the edges of the fabric were frayed in some places. There were several other patched areas in the wing panels, and some patches could be pulled off by hand. The wing fabric itself was in a satisfactory condition.

It could not be positively determined when the patches were installed but the accident was attributed to an inferior fabric repair and subsequent inadequate periodic inspections.

C.A.B. United States.

Light Aircraft collide during approach

While a Luscombe 8A flown by a student pilot was on final approach at an uncontrolled airport, it was struck by a Globe Swift flown by a private pilot. The collision occurred about 30 feet above the approach end of the runway and both aircraft crashed to the runway with the Swift on top of the Luscombe. Neither pilot was injured.

Each of the pilots stated that they made a normal entry to the aerodrome circuit area, and while they observed other traffic in the circuit, they did not see each other's aircraft at any time prior to the collision. From the ground the two aircraft had been observed in the traffic circuit and when the Luscombe turned on to final approach, the Swift was seen still on its base leg. After turning on to final approach the Swift was observed to overtake and descend on top of the Luscombe. The pilot of the Luscombe stated that he had maintained an approach speed of 70 miles per hour and the pilot of the Swift said his approach speed was 80 miles an hour. These are the normal approach speeds for the respective aircraft. Traffic around the airport at the time of the accident was congested and the accident was attributed to the pilot of the Swift failing to see and avoid the Luscombe during the landing approach.

C.A.B., United States

Carbon-Monoxide leads to Structural Failure

Some 10 minutes after taking off and while climbing to cruising level at 8000 feet, an Aero Commander disintegrated in flight. Although the accident occurred in IMC weather no thunderstorm activity was reported at the time.

Wreckage was scattered over a distance of about 3500 feet, and the main portion including the cabin was almost totally destroyed by a fire which followed the crash. The separated sections of the wreckage revealed no evidence of fire and no evidence of malfunctioning could be found in the engines, aircraft, or controls. The cabin heater-air conditioning - pressurizing unit was examined and X-ray tests revealed a crack in a weld joint of the air inlet fitting which would have permitted leakage between the heater combustion chamber and the cabin air source.

A post mortem examination of the pilot's body showed a carbon-monoxide saturation of 34 per cent. caused by exposure to products of combustion prior to the crash. This saturation level is sufficient to cause unconsciousness and it was concluded that the aircraft had exceeded its design limitations when the pilot became incapacitated.

C.A.B. United States.

Ground Fine Pitch selected while Airborne

Approaching for a night landing with the undercarriage and 40° of flap extended, the captain of a Fokker Friendship realized that he was too high and would overshoot the runway at the normal angle of approach.

Instead of carrying out a missed approach, the captain for an unknown reason selected ground fine pitch while still at 1000 feet. The aircraft descended steeply to the runway and landed very heavily on the main undercarriage in a nose-up attitude. The centre section of the wing failed completely in upward bending on either side of the fuselage and the aircraft slid for 400 yards on the nosewheel and the underside of the fuselage before coming to rest. A fire broke out in the port engine nacelle but was quickly extinguished by the airport fire crew. The fuselage remained intact and the passengers and crew were uninjured but the aircraft was damaged beyond repair.

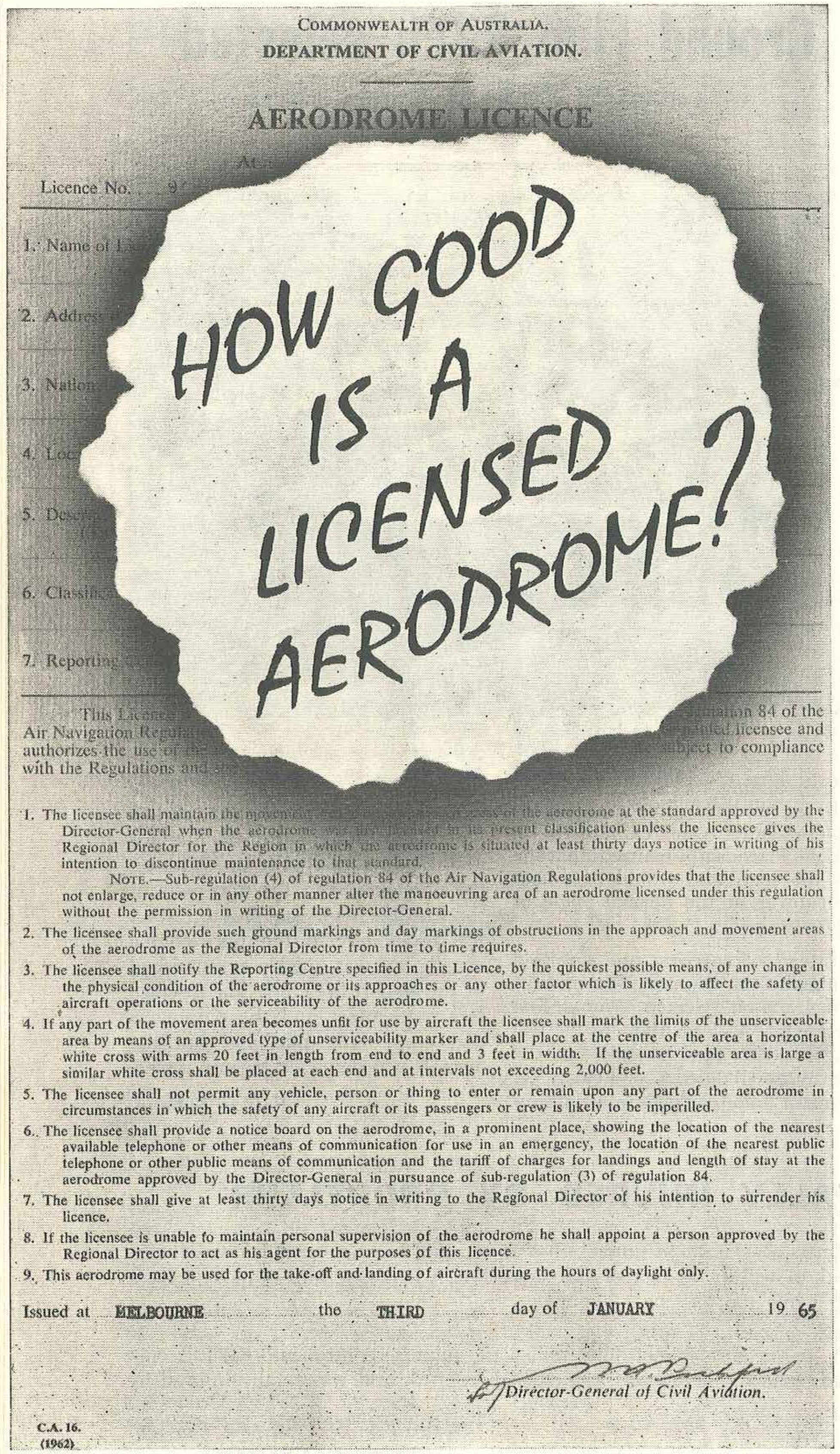
Fokker Bulletin.

SPECTATOR FATALLY INJURED BY PROPELLER

A ski-equipped Cessna 180 engaged on a charter flight landed on a frozen and snow-covered lake to disembark a passenger. The aircraft was taxied to within 30 feet of the shore line, where a group of people were waiting, and the engine was kept running while the passenger alighted.

Noticing one of the men coming out to the aircraft, the pilot pulled the mixture control into the idle cut-off position, but the man walked into the propeller before the engine had stopped, and was fatally injured by the propeller blades.

Department of Transport, Canada.



COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF CIVIL AVIATION.

AERODROME LICENCE

At

Licence No.

1. Name of

2. Addr

3. Nation

4. Lo

5. Desc

6. Classi

7. Reporting

This Licen ... lation 84 of the Air Navigation Regula ... licensee and authorizes the use of ... subject to compliance with the Regulations and

1. The licensee shall maintain the ... of the aerodrome at the standard approved by the Director-General when the aerodrome ... present classification unless the licensee gives the Regional Director for the Region in which the aerodrome is situated at least thirty days notice in writing of his intention to discontinue maintenance to that standard.

NOTE.—Sub-regulation (4) of regulation 84 of the Air Navigation Regulations provides that the licensee shall not enlarge, reduce or in any other manner alter the manoeuvring area of an aerodrome licensed under this regulation without the permission in writing of the Director-General.

2. The licensee shall provide such ground markings and day markings of obstructions in the approach and movement areas of the aerodrome as the Regional Director from time to time requires.

3. The licensee shall notify the Reporting Centre specified in this Licence, by the quickest possible means, of any change in the physical condition of the aerodrome or its approaches or any other factor which is likely to affect the safety of aircraft operations or the serviceability of the aerodrome.

4. If any part of the movement area becomes unfit for use by aircraft the licensee shall mark the limits of the unserviceable area by means of an approved type of unserviceability marker and shall place at the centre of the area a horizontal white cross with arms 20 feet in length from end to end and 3 feet in width. If the unserviceable area is large a similar white cross shall be placed at each end and at intervals not exceeding 2,000 feet.

5. The licensee shall not permit any vehicle, person or thing to enter or remain upon any part of the aerodrome in circumstances in which the safety of any aircraft or its passengers or crew is likely to be imperilled.

6. The licensee shall provide a notice board on the aerodrome, in a prominent place, showing the location of the nearest available telephone or other means of communication for use in an emergency, the location of the nearest public telephone or other public means of communication and the tariff of charges for landings and length of stay at the aerodrome approved by the Director-General in pursuance of sub-regulation (3) of regulation 84.

7. The licensee shall give at least thirty days notice in writing to the Regional Director of his intention to surrender his licence.

8. If the licensee is unable to maintain personal supervision of the aerodrome he shall appoint a person approved by the Regional Director to act as his agent for the purposes of this licence.

9. This aerodrome may be used for the take-off and landing of aircraft during the hours of daylight only.

Issued at MELBOURNE the THIRD day of JANUARY 19 65

for Director-General of Civil Aviation.

C.A. 16.
(1962)

It is not uncommon to hear pilots expressng dissatisfaction about conditions which allegedly exist at licensed aerodromes; conditions which, if accurately described would render an aerodrome unsafe. Yet how often do pilots exercise their prerogative to report these deficiencies so that others may benefit from their experience?

An aerodrome licence is issued by the Director-General of Civil Aviation under the provisions of Air Navigation Regulation 84, and authorizes the use of a particular area of land, as an aerodrome, subject to the licensee's compliance with Air Navigation Regulations and the conditions specified on the licence.

After a licence has been issued, the aerodrome is inspected periodically by the Department to ensure that the original standard is being maintained. Even so, these inspections cannot guarantee that the aerodrome will be serviceable at all times, and it is the responsibility of the licensee to notify the Department of any unsafe condition, so that appropriate *NOTAMs* may be issued. It is also of course the licensee's responsibility to rectify the condition as soon as practicable.

Pilots can assist in maintaining standards at licensed aerodromes by promptly reporting any sub-standard features, such as —

- Poor surface conditions
- Inadequate aerodrome markings.
- Tattered windsocks
- Obstructions in the approach path
- Difficulty of location because of surroundings.

The Air Safety Incident system provides a channel for swift action where operational safety is involved; by using it responsibly, pilots can help make the title "Licensed Aerodrome" a guarantee of safe operating conditions.

The Birds Know Better —

OVERSHOOTING?

Not the gannet. If he comes in too fast or misjudges his glide, he can pull up and still get in. A pilot is not so well-equipped and must make up his mind early to go round again when there is the faintest chance of over-shooting.