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COVER: Seen through the windows of the Flight Service Unit at Dubbo, N.S.W. an Airlines of N.S.W. Fokker Fellowship, operating the early morning service to Sydney, taxis for departure. In terms of passengers carried, Dubbo is one of Australia's busiest inland airports.

—DCA PHOTOGRAPH BY T. MARTIN

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TRAGEDY IN THE DARK

IN Western Australia, a pastoralist who also held a commercial pilot licence planned to make a private flight from Jandakot to Adelaide to attend the Royal Agricultural Show, and then to continue for a tour of the eastern states. He was to be accompanied by three passengers.

The pilot at first intended to make the flight in a Piper Comanche, for which his licence was endorsed but, as this type was not available at the time he agreed to take a Piper Cherokee Arrow instead. Because his licence was not endorsed for the Cherokee Arrow, he underwent conversion training on this aircraft during the two days preceding his planned date of departure. The aircraft was not available until early afternoon on the day of departure, so the pilot decided that he would make his first overnight stop at Norseman and continue through to Adelaide the next day.



About 1500 hours Western Standard Time, the pilot called at the Briefing Office at Jandakot Airport and lodged a flight plan for the route Jandakot to Norseman. When the Briefing Officer on duty pointed out that it was doubtful if he could complete the proposed flight in daylight, the pilot replied that he was rated for night VMC, and if there was insufficient time to reach Norseman before last light, he would divert to Kalgoorlie on a night VMC basis. The pilot's flight plan was then accepted on this understanding.

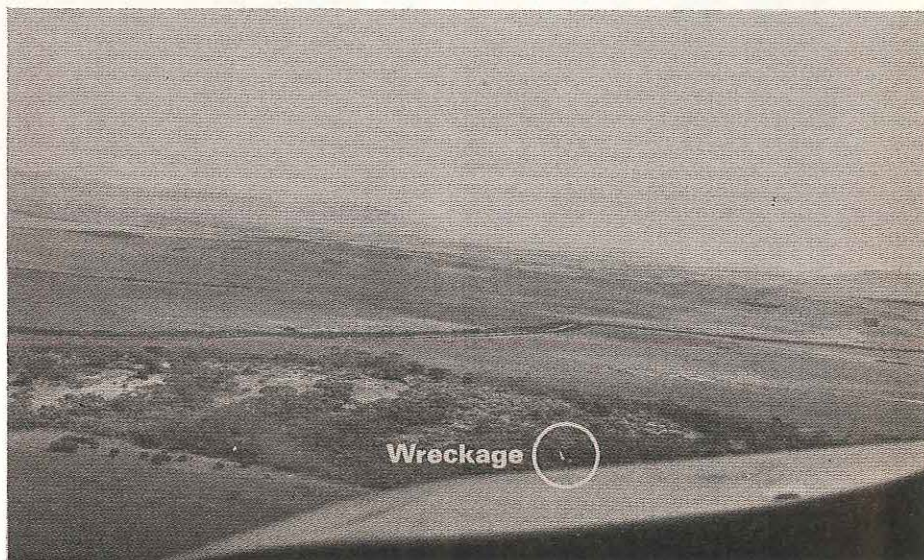
The aircraft subsequently departed Jandakot at 1600 hours and reached Kalgoorlie at 1904 hours, almost on hour after last light. After remaining overnight at Kalgoorlie, the party rose early and arrived at the airport at about 0800 hours. At the Briefing Office, the pilot lodged a flight plan to Parafield with re-fuelling stops at Forrest and Ceduna, and was handed copies of the current Forrest terminal forecast and the area forecast applicable to the Kalgoorlie — Forrest leg of the flight. On the basis of the winds shown on this forecast, the pilot computed his flight plan for the whole flight to Parafield. The pilot then told the Briefing Officer that he would proceed night VMC over the latter portion of the Ceduna — Parafield leg if he was unable to reach Parafield by last light. He nominated 2030 Central Standard Time* as a Sartime to Parafield.

The aircraft departed Kalgoorlie at 0855 hours WST. The weather was fine, with scattered patches of cloud at about 4000 feet, and after cruising for a period below the cloud level, the pilot climbed to 5000 feet to avoid turbulence and maintained this cruising level to Forrest.

At Forrest where the aircraft landed at 1153 hours WST, the pilot was given the area and terminal forecasts for Ceduna, the terminal forecasts for Parafield and Adelaide, and was reminded to check Notams for Whyalla, Parafield and Adelaide on arrival at Ceduna. The party boarded the aircraft again and departed Forrest at 1306 hours.

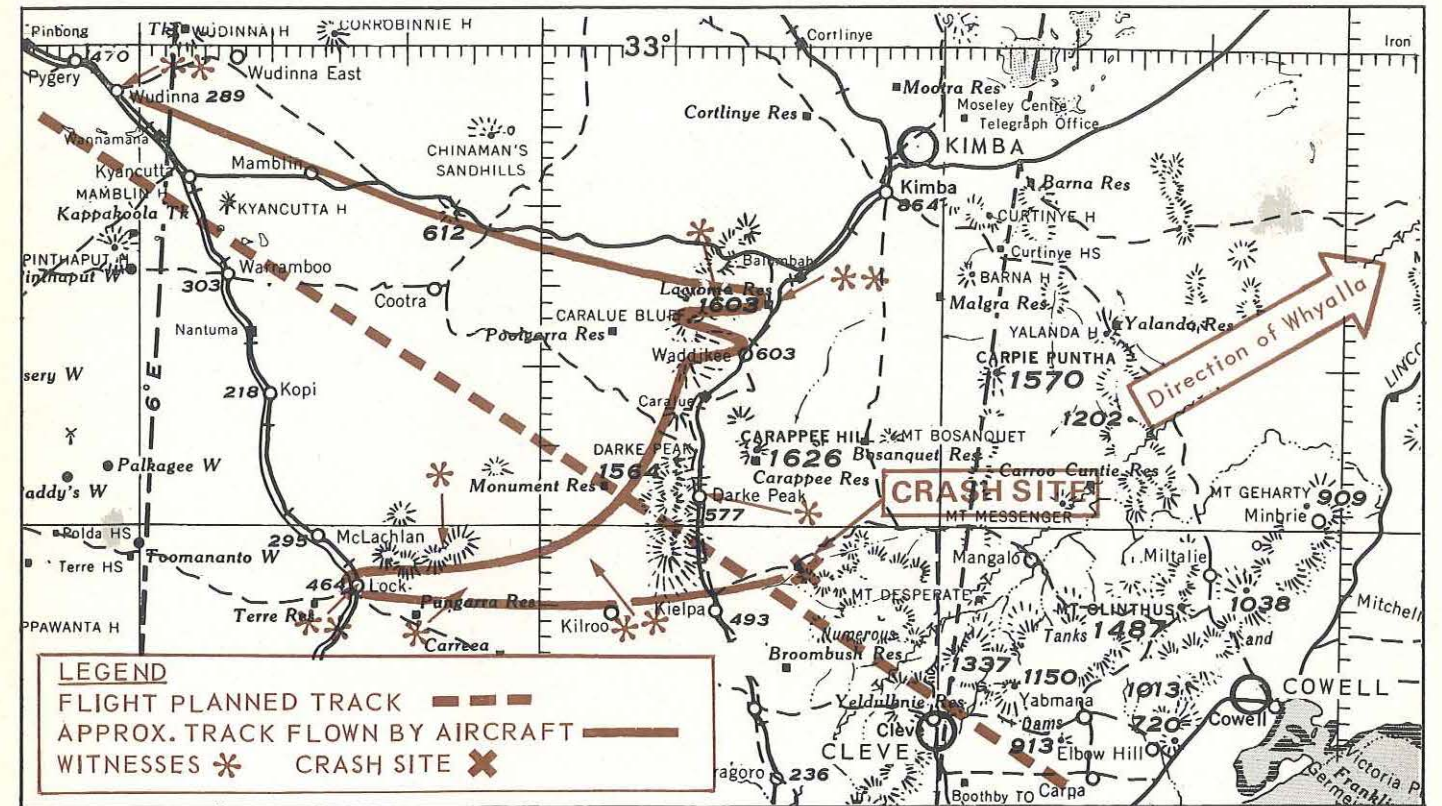
Broken scattered cumulus and strato-cumulus cloud in a light west to south-westerly stream was forecast over the aircraft's route. To the south of Ceduna, 2/8ths of stratus cloud was expected at 1,200 feet in showers and drizzle with

* Central Standard Time is 1½ hours ahead of Western Australian Time.



Opposite page, top: The accident site seen from the air. The wreckage trail, extending 400 feet across the slope of the ridge away from the camera, is visible in the centre of the picture.

Bottom: General view of the accident site looking in a north-westerly direction towards the ranges of Darke Peak and Caralue Bluff. Some thirty minutes before the accident, the aircraft passed close to these ranges at a very low height in conditions of almost total darkness.



Map showing flight planned route between Ceduna and Ardrossan, approximate track flown by aircraft, and the location of witnesses and the accident site.

visibility down to 8 miles. In the latter stages of this leg of the flight, which had been conducted in smooth conditions at 2,500 feet, the pilot told his passengers it might be necessary to remain at Ceduna because of the weather. One passenger then expressed a desire to go on to Adelaide that night if possible, and the pilot said he would decide after checking the forecasts at Ceduna.

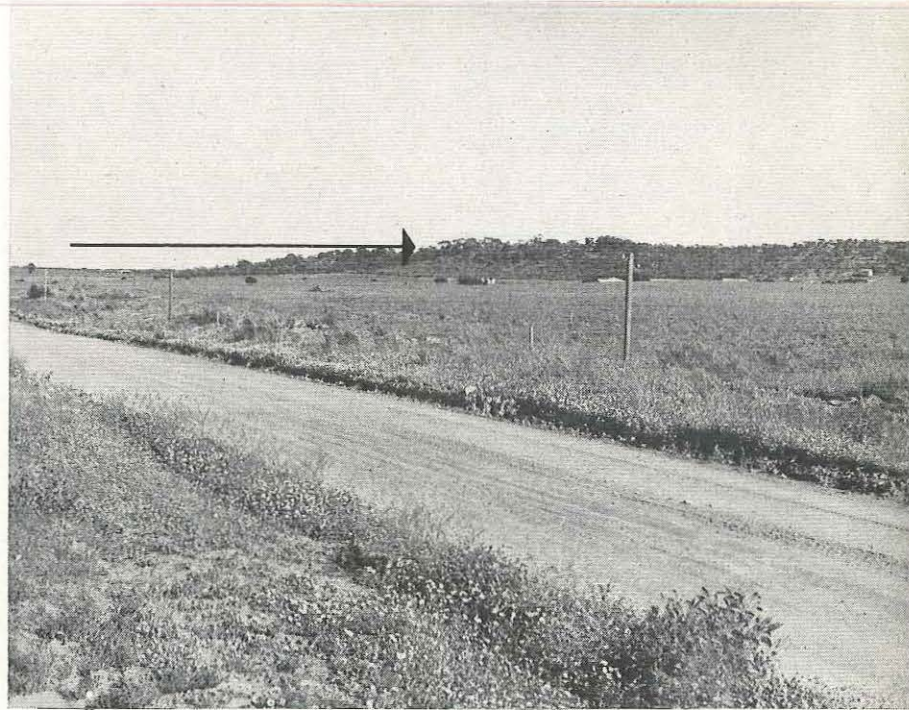
At 1645 hours Central Standard Time the aircraft called Ceduna to advise that it was abeam Lake MacDonald, 40 miles

west of Ceduna. When the aircraft landed shortly before 1700 hours, a slight south-westerly wind was blowing, there were showers in the area with broken cumulus and strato-cumulus cloud at 2000 feet and the visibility was 20 miles.

The aircraft was refuelled again at Ceduna, and the pilot went to the Briefing Room where he was given copies of the current Ceduna and Adelaide area forecasts, together with the terminal forecasts for Parafield and Adelaide. The weather forecast for the Ceduna—

Cowell section of the route showed that considerable cloud and rain was expected over the area. Three eighths of cumulus cloud, base 2,000 feet with tops 7,000 feet, four eighths of strato-cumulus cloud, base 3,000 feet with tops 6,000 feet, and two eighths of stratus at 1,200 feet in drizzle and rain showers was expected south of Ceduna, with visibility reducing from 15 to 8 miles. The freezing level was 4,500 feet. The forecast for the subsequent route section to Adelaide quoted similar conditions with even lower patches of stratus. The terminal fore-

View of the scrub-covered hill on which the accident occurred showing approximate final flight path. The low elevation of the hill above the surrounding terrain is clearly evident in this picture.



casts for Parafield and Adelaide indicated that there would be three eighths of cumulus cloud at 2,500 feet, three eighths of strato-cumulus at 3,500 feet, and occasional rain showers.

After studying the forecasts for several minutes, the pilot remarked to the Briefing Officer that they were "not so good". However, after he had spent several minutes studying a map of the Ceduna-Adelaide route displayed in the Briefing Room, the pilot said he would continue to Parafield via Cowell.

The aircraft reported taxi-ing at 1800 hours and the pilot requested information concerning the aerodrome lighting at Port Lincoln. He was told that the lights at Port Lincoln and Whyalla were on all the time. The pilot then advised that he would be flying over Cowell and would have a look at the weather over the Gulf. If it was unfavourable he would divert to Port Lincoln and continue the flight the following day.

At 1845 hours, Adelaide Flight Service Centre made contact with the aircraft on H/F and asked for further details of the route, time intervals and altitude. After a number of communication exchanges in poor propagation conditions, it was established that the pilot intended flying via Ardrossan thence direct to Parafield, descending to 6000 feet and

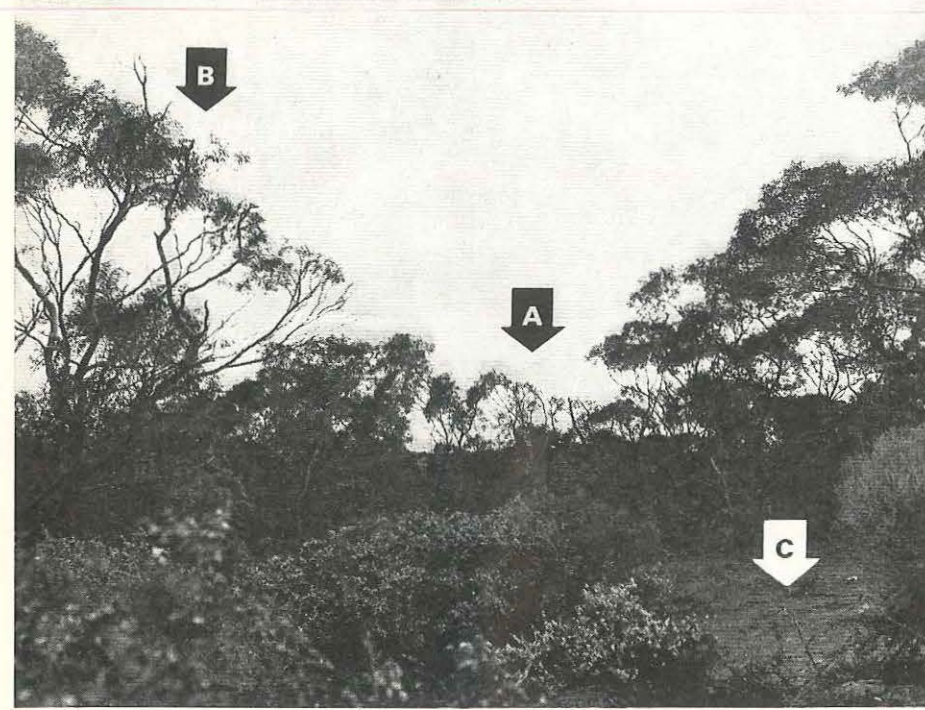
then to 4000 feet to remain below the control area steps.

Twenty-five minutes later at 1905 hours, the Parafield Aerodrome controller reported to Adelaide that the cloud base had lowered to 800 feet and expressed doubt that the aircraft would be able to land at Parafield. At 1917 hours, Adelaide Flight Service heard the aircraft calling and endeavoured to make contact with it in order to pass the amended terminal forecast but despite a number of calls this was unsuccessful. Calls were continued on all applicable frequencies but the only response from the aircraft was an unreadable transmission at 1925 hours. Ten minutes later a clearer transmission than any previously heard was received from the aircraft, asking Adelaide if they were reading his transmission. The Adelaide Flight Service operator replied "Reading you OK. I have an amended forecast for Parafield. Will I go ahead?" There was no reply or further transmission from the aircraft.

In the meantime, in the central district of Eyre Peninsula a light aircraft, flying low in the misty darkness with its navigation lights on and its anti-collision beacon flashing, had aroused the concern of a number of people in the Wudinna, Caralue Bluff, Darke Peak and Lock districts. To the south of Caralue Bluff,

which rises to a height of 1603 feet AMSL and is about 1000 feet above the surrounding terrain, a farmer and his son saw the lights of the aircraft pass over their property at comparatively low level travelling from west to east. When they saw the lights of the aircraft turn back on to a westerly heading, towards Caralue Bluff, they became concerned, especially as the aircraft's height appeared to be less than that of the mountain, whose top was obscured in cloud and drizzle. Thinking the aircraft might be in trouble, the men took spotlights to a nearby agricultural airstrip to render what assistance they could should the aircraft make an attempt to land. While they did so, the farmer's daughter telephoned the local police station at Darke Peak to report that the aircraft appeared to be in difficulty.

As the aircraft continued west towards Caralue Bluff, its lights suddenly disappeared from view, apparently behind the mountain, then about five minutes later reappeared a little further to the south. At this stage the aircraft again seemed to be heading east but then turned back again to the west where its lights once more disappeared suddenly. A few minutes later the men heard the aircraft further to the south but were not able to see it. The farmer's daughter then telephoned the police station at Darke Peak again, saying that the aircraft now



View looking back along the approach path, showing (A) first tree-strike by port wing, (B) other trees struck by starboard wing and (C) point at which port wing tip struck the ground.

seemed to be heading towards Cleve which would take it close to Darke Peak. Taking a pair of binoculars with him, the police constable-in-charge at Darke Peak went outside to watch for the aircraft.

A few minutes later the lights of the aircraft were sighted by a number of people, including a private pilot, in and around the township of Lock, twenty-seven miles south-west of Caralue Bluff. At the time it was completely dark and the sky was overcast with broken cloud, but though there were patches of drizzle further to the east it was not raining in the Lock area. Flying at about 300 feet above the ground, the aircraft approached Lock from a little north of east and, over the town itself, turned left almost through 180 degrees and flew off again on an easterly heading.

Meanwhile at Darke Peak, the police constable had been watching for the aircraft in misty rain for almost half an hour. Finally concluding it must have by-passed his position, he went to telephone the police station at Cleve to have preparations made for an emergency landing at the Cleve aerodrome. Just as he was doing so, the lights of the aircraft came into view at very low level from behind the southern end of the Darke Peak range, moving in an easterly direction. Conditions were still misty with

drizzling rain falling, but the policeman was able to follow the lights of the aircraft with his binoculars and watched it make a gradual left turn on to a north-easterly heading which was maintained until its lights suddenly disappeared in the vicinity of a low range of hills about ten miles away. Fearing the aircraft might have struck the ground, the policeman went inside intending to telephone a farmer whose property adjoins the range of hills. He found his wife already speaking to the farmer who had just telephoned the police station to report he had heard an aircraft crash on his property. The police constable immediately made arrangements for an ambulance and doctor to go to the accident from Cleve, then set out for the site himself.

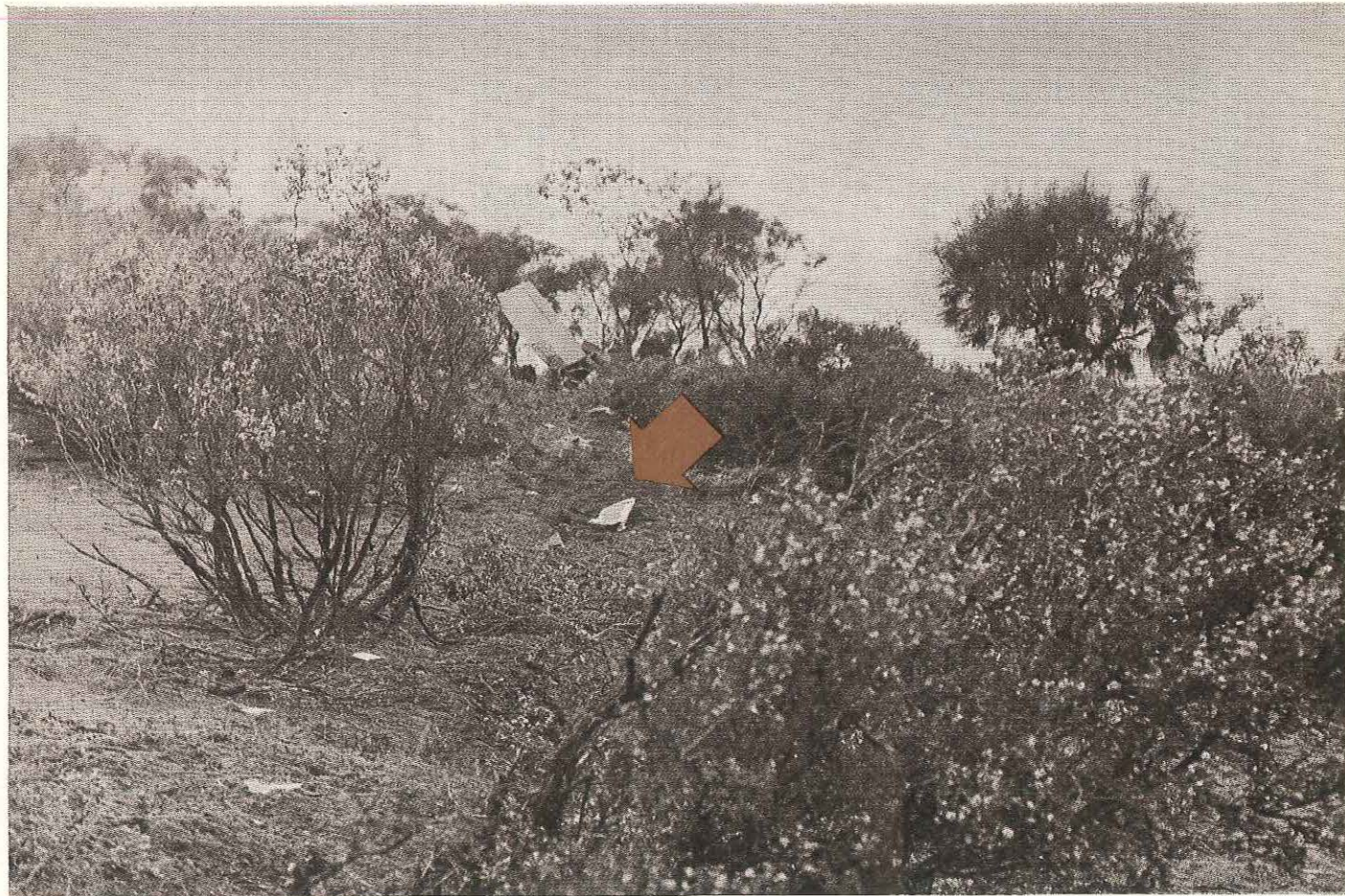
In the area of the crash, two neighbouring farming families had heard or seen the aircraft flying very low in darkness and drizzling rain towards the low range of hills which rise to about 200 feet above the surrounding terrain. The lights on the aircraft then disappeared from sight and two loud thuds followed. After telephoning for an ambulance, the two men and their wives hastily set out in a Landrover fitted with spotlights to begin a search of the scrub covered hillside. Aided by cries coming from the direction of the crash, they quickly located the wreckage. On reaching the

site they found only one passenger had survived and that the pilot and the other two passengers had been killed. The women of the search party, one of whom was a trained nursing sister, then attended to the needs of the injured passenger until the ambulance arrived from Cleve.

* * *

Inspection of the accident site showed that the aircraft, flying a north-easterly heading, had flown into a scrub covered hill 950 feet AMSL and about 150 feet above the surrounding cleared farming country. The initial point of impact was with the tops of gum trees about 20 feet above the ground, on the south-western slope of the ridge and 50 feet below its crest. From this point, a trail of wreckage extended across the scrub-covered slope of the ridge for 400 feet to the position where the main wreckage came to rest.

Examination of the wreckage itself indicated that the aircraft was operating normally in level flight when it first struck the trees. Damage sustained by trees and branches indicated that the propeller had been under considerable power at the time, while the flaps and undercarriage were fully retracted. Apart from a possible defect in the aircraft's altimeter, no evidence was found of any pre-impact damage or malfunction of the aircraft. The correct QNH was



View looking along the narrow wreckage trail in the direction of impact. The arrow indicates the point at which the engine and fuselage first struck the ground.

found set on the altimeter, but examination of the instrument itself showed that the nuts which held the aneroid chamber in position had slackened off. It was established however, that though erroneous readings of the order of 1000 feet or more could have resulted from this, the altimeter errors would have all been under-readings and not over-readings. The height indicated on the altimeter would thus have been less than the actual height of the aircraft. A WAC chart for the area was found spread out in the cockpit and the cockpit light switch was on and turned well up. Although the ADF indicator was damaged in the impact, there was evidence that it had been tuned to the Adelaide NDB at the time of the accident.

The surviving passenger, who had been sitting in one of the rear seats in the aircraft, could recall no details of the accident itself and knew little or nothing about the operation of an aircraft. She remembered the pilot having difficulty in communicating with Adelaide because of poor radio reception and, in the latter

stages of the flight when it was dark, she had formed the impression that they were lost. After they had circled the lights of a town however, one of the other passengers had told her that they were now going to Whyalla. Her next recollection was regaining consciousness after the accident.

The route apparently followed by the aircraft from Wudinna to the accident site, as assessed from evidence obtained from ground witnesses and the surviving passenger, indicates that the aircraft passed Wudinna in light drizzle flying in the dark at about 1,000 feet above the terrain. Some 40 miles further to the south-east in the vicinity of Waddikee and Caralue Bluff, the aircraft ran into deteriorating weather and despite several attempts to continue, further flight eastward was blocked by areas of rain and low cloud. The aircraft then diverted to the south, passing to the west of the Darke Range and the rain and drizzle areas towards the lights of the town of Lock which were seen ahead and a little to the west. After reaching the

town, flying at a height of only a few hundred feet, the aircraft turned back and set off again on an easterly heading, flying lower, if anything, than previously.

The police constable at Darke Peak who saw the lights of the aircraft come around the southern end of the Darke Range, said that at the time, it was misty with drizzling rain and that when he first sighted the aircraft, it was about "one third the height below the top of the range". The southern end of the Darke Range rises to about 1,000 feet AMSL and is some 450 feet above the surrounding terrain. The height of the aircraft at this point would thus have been about 300 feet above the terrain, or about 850 feet AMSL. From statements of witnesses located 10 miles further east near the accident site, and those who went to the scene of the crash, it was evident that there were areas of low cloud and drizzle over the accident site, extending well to the south-east at the time the accident occurred. In the weather conditions forecast for the route, there was every possibility that

the high peaks along the track would have been obscured at times by low cloud, and drizzle could have caused an apparent lowering of the cloud base in these areas. The existence of these conditions was confirmed by weather observations made by two other pilots who flew the route in the afternoon preceding the accident.

The requirements for night VMC flight are similar to those for VFR flight except that provision must be made for at least 1,000 feet of clearance above any obstacle within ten miles either side of track, and within five miles longitudinally of the aircraft in flight. In this case, the pilot had originally planned to fly direct from Ceduna to Ardrossan and this track had been drawn on the WAC chart found in the aircraft. The highest terrain within 10 miles of either side of this track is Carrapee Hill, 1,626 feet AMSL, eight miles to port of track. A few miles to the west of this point, the Darke Range, rising to 1,564 feet AMSL straddles the track, while further to the east, rolling hills in the Cleve-Cowell areas rise to almost 1,500 feet.

The normal VFR cloud clearance minima are also applicable to night VMC operations. Thus, the minimum cloud base for night VMC flight over part of this route would be 3,126 feet, i.e. 1,626 feet plus 1,000 plus 500 feet. As there was more than four eighths of cloud below this height, the night VMC requirements for this particular flight could not be met. As well as this, there was no moon and in the almost totally overcast conditions, it would have been almost impossible to detect the areas of lower cloud in sufficient time to avoid entering them, particularly when flying in rain or drizzle.

Although the pilot's intentions after finally heading south from the bad weather in the Waddikee-Caralue Bluff area, and his reasons for flying at such a low altitude will never be known, it seems probable that these actions may have been the result of navigational shortcomings. No entries had been made in the flight log section of the flight plan found in the aircraft after the accident and although several notations, evidently the times of visual fixes, had been made in pencil on the pilot's WAC chart along the route, even these had been discontinued after the aircraft passed abeam Minnipa.

In the conditions the aircraft subsequently encountered, this lack of navigational information would have placed the pilot at a great disadvantage in

attempting to pin-point his position, particularly after several changes of heading. The passenger who survived the accident said that she had sensed they were lost during the latter stages of the flight, and in the circumstances, this could well have been so. Certainly the evidence that the pilot had been flying at extremely low altitude for some time before impact, and the fact that the cockpit lighting was turned well up with the WAC chart spread out in front of the pilot when the crash occurred, does nothing to dispel this belief. It is also difficult to understand why the aircraft's ADF receiver should have been tuned to the Adelaide NDB at this stage of the flight, particularly as the pilot had indicated he would divert to Port Lincoln, or possibly to Whyalla, if he encountered difficult conditions in the vicinity of Cowell. The surviving passenger had in fact been told they were "now going to Whyalla", shortly before the accident occurred. If the pilot had decided to try and divert to Whyalla at this stage of the flight and was "on top" of his navigation, it is only reasonable to expect that he would have tuned the ADF receiver to the Whyalla NDB. It is also apparent that during the half hour or so preceding the accident, the aircraft avoided what might have been an even more catastrophic collision with the high escarpments of Caralue Bluff and the Darke Range, only by pure chance. It is surely inconceivable that any pilot, aware of the true position of the aircraft, would have knowingly flown so low and in such close proximity to these ranges in almost total darkness.

The pilot's fourth class instrument rating, endorsed for the ADF, had been re-validated for the second time a little over a month before the accident. According to the pilot's log book however, the only night flying he had carried out since the rating was issued to him 19 months previously was three months before the accident, when he made a night flight of 15 minutes while returning from Rottnest Island to Jandakot. It was also learned that during the 13 months that had elapsed since the pilot was issued with a commercial pilot licence, he had made only 19 flights, most of them between Jandakot and Rottnest Island, totalling only 11 hours 35 minutes. Another finding of significance to the investigation, was that the pilot while training for his commercial licence, had experienced a good deal of difficulty in reaching an acceptable standard of navigation, particularly in regard to map reading.

There was another factor which could be indicative of the pilot's lack of overall experience and poor standard of flight planning. Had the flight been completed as planned, the pilot's flight time would have been well in excess of the statutory eight hours allowed in any 24. As it was, by the time the aircraft was approaching the area in which the accident occurred, the pilot would undoubtedly have been tired from his long flight throughout the day. This tiredness could only have made matters worse for him when the flight encountered the difficult conditions already discussed.

In view of the pilot's training history, his lack of recent, overall and aircraft type experience, the circumstances in which the flight was attempted, the poor radio propagation conditions, and the movements of the aircraft observed by witnesses in the latter stages of the flight, it seems probable that the navigational difficulties encountered by the flight developed gradually to the point where they were quite beyond the capacity of the pilot. Why he did not have the presence of mind to turn back into clearer weather and maintain a safe altitude while deciding what action to take, will never be known, but even after eluding the perils of the higher terrain along the route it seems that he was so pre-occupied with attempts to pin point his position, that he had little notion of the danger in which the aircraft was placed by flying so low. Apparently without realizing it, he then allowed the aircraft to go on descending to a height where it simply flew into the comparatively insignificant rising terrain which then lay across its path.

* * *

In retrospect it can hardly be a matter for surprise that a pilot of such limited night VMC experience and bare commercial standard should have come to grief while attempting to "press on" in such adverse conditions, and there is not the slightest doubt that he would have been wise to have stood by his earlier expressed misgivings about the unsuitability of the weather for the Ceduna-Paradise leg of the flight. Whether or not the pilot allowed his judgement to be swayed by his passenger's desire to reach Adelaide that night must remain a matter for conjecture, but the accident provides a sobering reminder that pilots must be resolute in their operational decisions and must never allow pressures imposed by unqualified persons or other interests to influence these decisions.

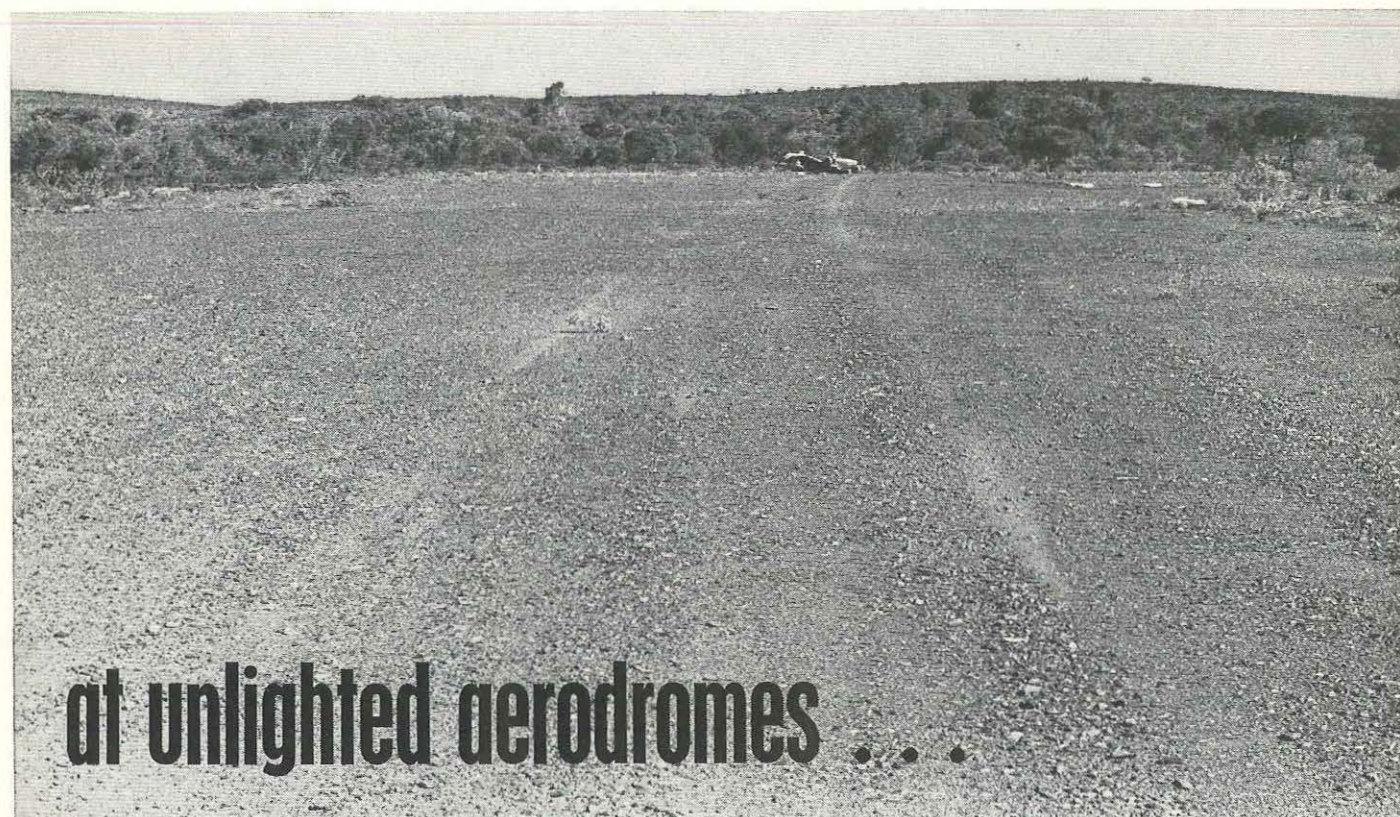


The main wreckage lying in the group of trees which finally brought it to rest. In this picture, the starboard wing has been pulled clear to gain access to the cabin area.

Above all, this tragedy emphasises the degree of caution pilots need to exercise when planning night VMC flights, particularly when the forecast weather is in anyway marginal. Like the other night VMC accident reported on page 10, it also stresses the importance that must be accorded lowest safe altitudes both in the planning and subsequent conduct of the flight. For the night VMC flights that appear at all marginal, a good rule might be "If in doubt don't go". But whenever a decision is made to go, the dictates of sound airmanship require a pilot to have a clear alternative plan of action so that he will be able to divert safely and without delay if unsuitable meteorological conditions are encountered.



The probable cause of the accident was that the pilot, who was inexperienced in night VMC operations, exceeded the limits of his capability by continuing a flight at night in adverse conditions. ➡



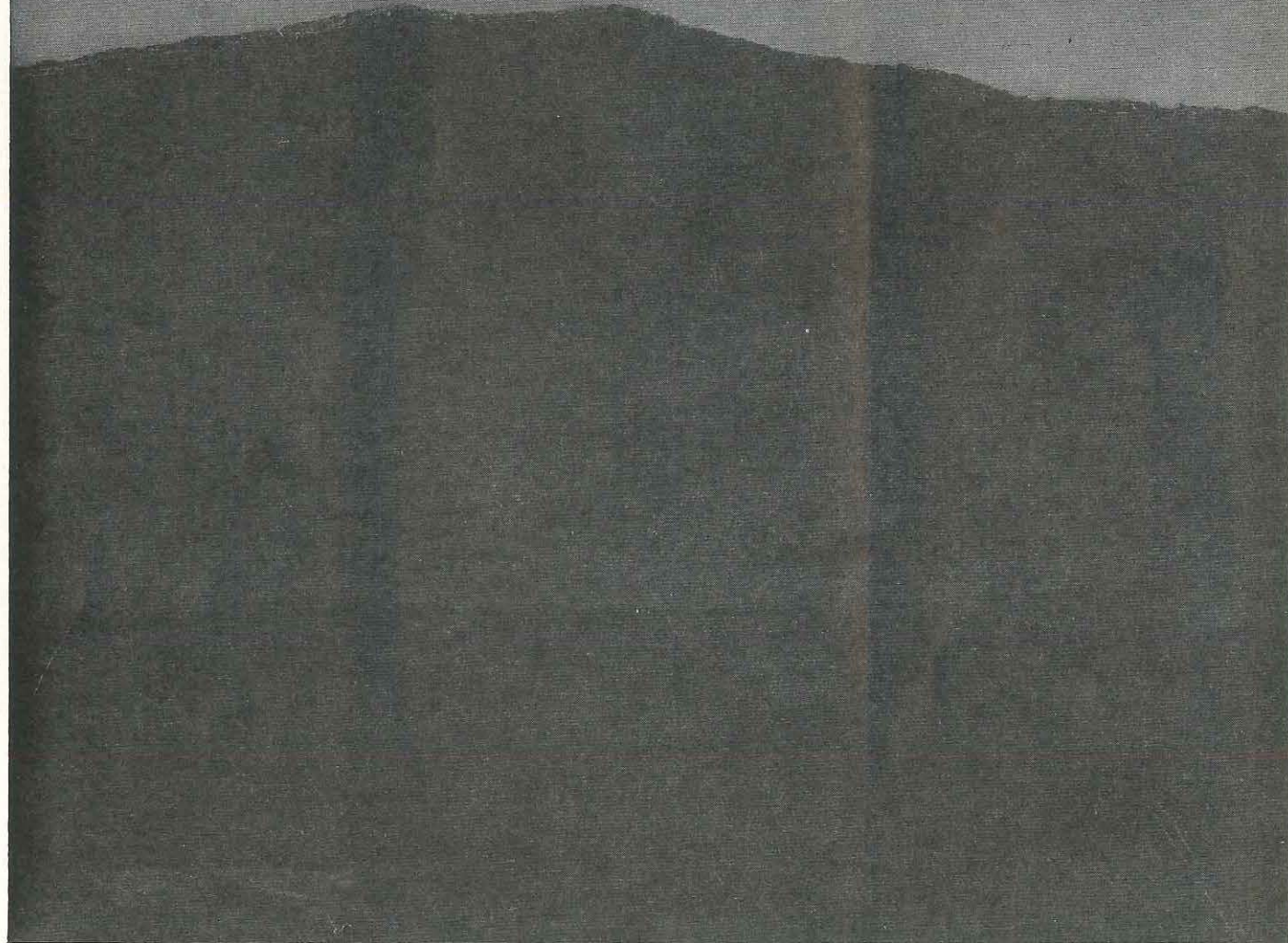
at unlighted aerodromes



ARRIVE
IN
DAYLIGHT!

ONLY CATS CAN SEE IN THE DARK!

descent to DESTRUCTION



Towards the end of a private flight from Jandakot, W.A., to Moorabbin, Victoria, the final stage of which was being conducted night VMC, a Cessna 205 descended into the tree-covered slopes of Mt. Buangor, 11 miles east of Ararat, Victoria. The aircraft was completely demolished and its five occupants were killed.

THE aircraft was owned by one of the passengers on board, and the flight was being made to enable him, and two of the other members of the party to attend a conference at Moorabbin. The aircraft owner held a private pilot licence endorsed for the aircraft type, but because at least one of the flight's three stages was to be flown during the hours of darkness, another private pilot who had previously qualified for a night VMC rating, was invited to command the flight. It was also arranged that this pilot's wife would accompany him on the trip.

The aircraft departed Jandakot in darkness very early on the day of the accident, and landed at Rawlinna W.A. soon after first light to refuel. About mid-afternoon, it landed again for fuel at Whyalla, S.A. Here the pilot-in-command discussed the weather forecasts with the Briefing Officer on duty, and submitted a flight plan for the Whyalla-Moorabbin leg of the flight. The plan showed that the aircraft would be remaining outside controlled airspace, and would be proceeding via Parafield, Tailem Bend, Horsham, Ballarat, Bacchus Marsh and on to Moorabbin via the western light aircraft lane of entry. The plan also indicated that the flight from Horsham onwards would be conducted night VMC.

The aircraft departed Whyalla at 1712 hours CST, but three quarters of an hour later when it called Parafield Tower from abeam Dublin, 35 miles to the north west, the pilot was advised that because of terrain clearance requirements, his planned route segment from Bacchus Marsh to Moorabbin would have to be flown at 3000 feet instead of the 1500 feet altitude nominated on the flight plan and, as this altitude would take the aircraft into controlled airspace on the route being flown, the aircraft would require the appropriate radio frequencies.

At 1805 hours the aircraft called Adelaide Tower with an estimate for Parafield of 1811 hours, and requested a clearance to Tailem Bend at 1500 feet. The tower replied that this altitude would not provide the required terrain clearance and requested the aircraft to climb to 4000 feet by the time it reached Parafield. At 1813 hours the pilot requested Parafield Tower to turn on the airport's runway lights to assist him in obtaining a visual fix. The Tower replied that the lights were already on, and asked the pilot if he would like them to be flashed

on and off. The pilot replied "Affirmative", but shortly afterwards said that he was still not able to see them. The aircraft, which had now reached 4000 feet, was then asked to call Adelaide Tower. This it did, and after being identified by radar was informed that its position was four miles north-east of Parafield. Shortly afterwards the aircraft was vectored on to a heading for Tailem Bend.

A little over two hours later, at 2059 hours EST*, the aircraft called Melbourne Control on the frequency for arriving aircraft, reporting that it was over Ballarat at 4000 feet, estimating Bacchus Marsh at 2127, and requested a clearance to Moorabbin at 4000 feet. The aircraft was cleared to proceed at 4000 feet and to call Melbourne Approach Control on 124.7MHz at Bacchus Marsh. When the pilot stated that the aircraft was not equipped with 124.7 he was instructed to call Melbourne Departures Control at Bacchus Marsh on 118.9. When the pilot replied that he did not have this frequency either, Melbourne Arrivals Control apologised and said they would be unable to accept the aircraft and requested it to proceed OCTA to Moorabbin. Shortly afterwards the aircraft was asked to call Melbourne Flight Service on 120.7 MHz.

The aircraft established contact with Melbourne Flight Service and reported that it was estimating Bacchus Marsh at 2127, proceeding "BCTA". Melbourne Flight Service passed the area QNH to the aircraft and the pilot acknowledged the call. No further transmissions were received from the aircraft.

When the aircraft's SARWATCH had not been cancelled by the nominated time of 2230 hours, communication checks were commenced. These failed to reveal any further news of the aircraft and an Uncertainty Phase was declared at 2300 hours. This was upgraded to an Alert Phase at 2330 hours and, when nothing more had been heard of the aircraft by its calculated fuel expiry time of 0024 hours EST the Distress Phase was introduced. Search and Rescue planning was begun, and at first light in the morning an air search for the missing aircraft was commenced. At 1030 hours wreckage was sighted from the air on the densely timbered north-western slopes of

* Eastern Standard Time is half an hour ahead of Central Standard Time and two hours ahead of Western Standard Time.

Mount Buangor. A ground party, organised from a nearby television transmitting station, reached the scene later in the morning and found that all five occupants of the aircraft had been killed.

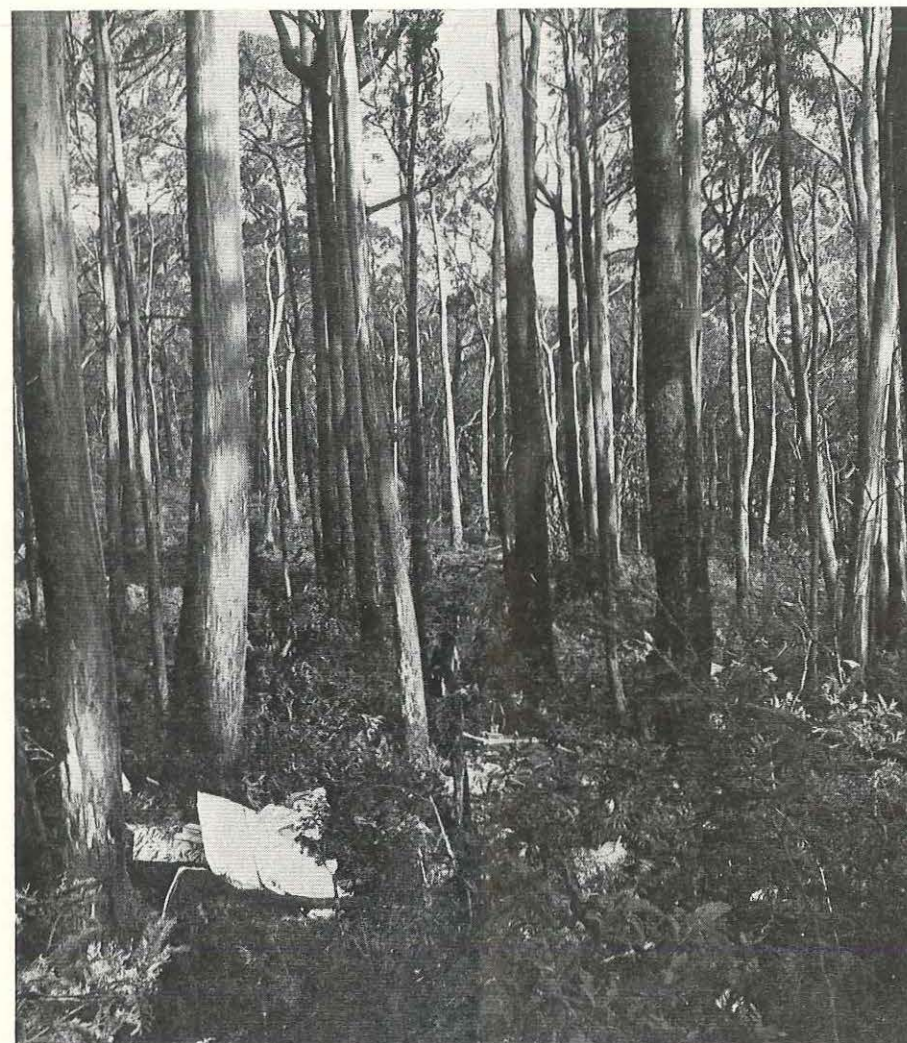
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The site of the accident was three and a half miles south-west of the direct Horsham-Ballarat track, about 100 feet below the summit of Mount Buangor, and 3,150 feet AMSL. The first point of impact was with the top of a tall tree on the mountain side. The aircraft then descended into the heavily timbered forest leaving a trail of wreckage for nearly 400 feet. Damage to the separated propeller blades and to the propeller flange on the engine crankshaft indicated that the engine was operating at substantial power when the crash occurred. Examination of what remained of the aircraft's control surfaces and a section of the control cables showed no evidence of any pre-impact damage or malfunction, and indicated that the aircraft was operating in a cruising configuration when it flew into the mountain.

The weather on the night of the accident was fine, with only a small amount of cloud forecast above the mountains and along the coast. The evidence of witnesses in Ararat who saw what were probably the lights of the aircraft a few minutes before it crashed, and of technicians who were on duty at the television transmitter on the mountain at the time, indicated that the night was fine and clear. This was supported by records of the Bureau of Meteorology, which showed that the sky was clear in the Ararat area on the night of the accident.

The pilot-in-command of the aircraft had been issued with a restricted private pilot licence two and a half years before. Four months after gaining this licence and after experiencing considerable difficulty with his navigational studies his licence was upgraded to unrestricted status. Six months later again, or nearly two years before the accident, the pilot gained a night VMC rating but there was no record that he had carried out any further night flying after this date. The pilot's total aeronautical experience was 368 hours, of which only about 13 hours were on the aircraft type.

The other private pilot, who was travelling as a passenger at the time of



This page: View looking back in the direction from which the aircraft approached. A section of the wreckage lies in the foreground. The heavily timbered nature of the terrain and the dense undergrowth at the accident site are particularly evident in this picture.

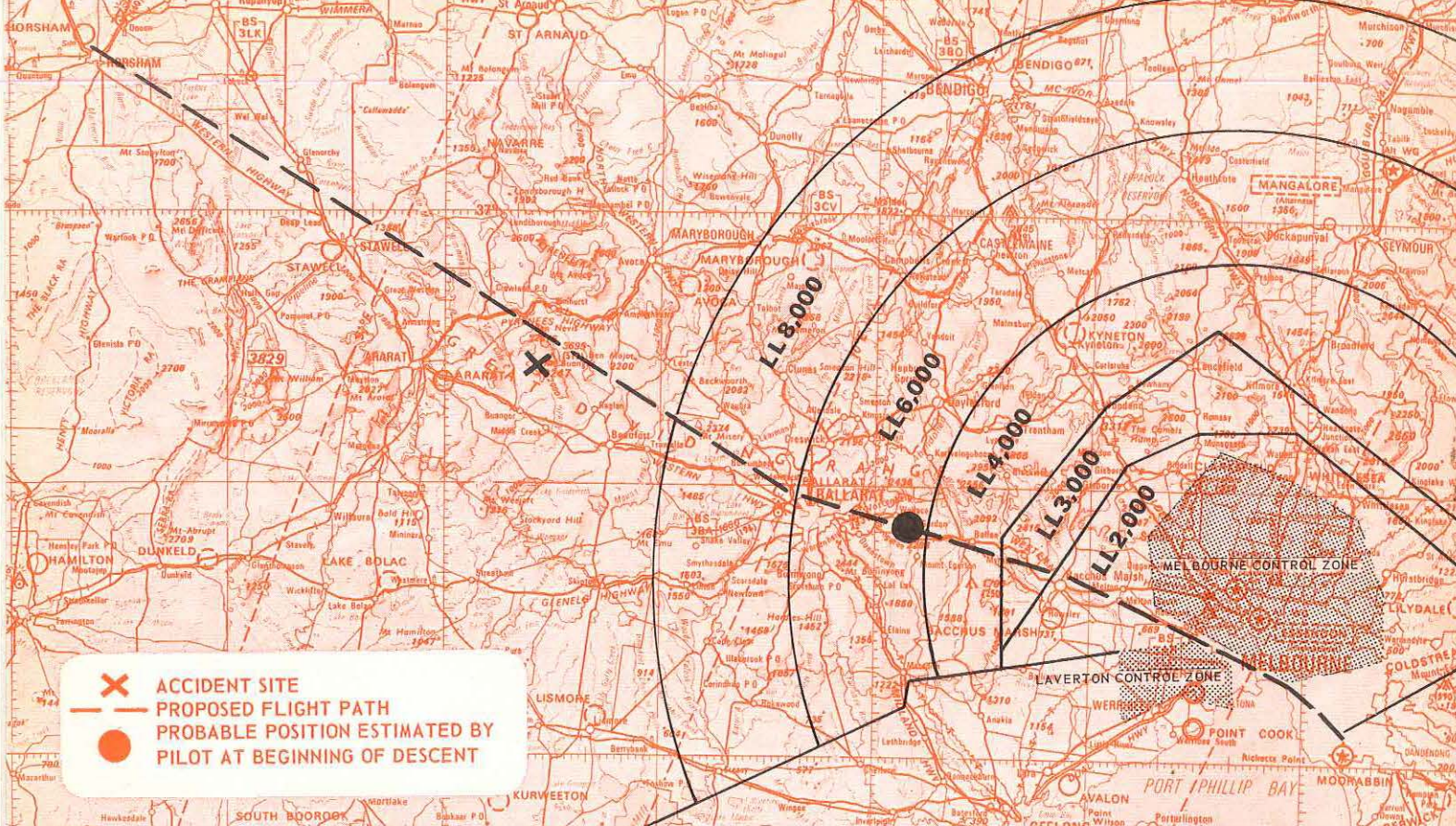
Opposite page, top: Aerial view of accident site on the slopes of Mt. Buangor showing the wreckage trail, nearly 400 feet long, and the almost total disintegration of the aircraft structure. The photograph was taken looking approximately in the direction of impact.

Bottom: First point of impact was the top of the tree in the centre of the picture. From here the aircraft descended steeply into the heavily timbered mountain side.

the accident, had no night flying experience or qualifications. He had held an unrestricted private pilot licence for nearly two years and was endorsed on the aircraft type, with approximately 230 hours total flying experience.

From flight plans and other documents found in the wreckage, Departmental records and witness evidence, it was possible to review the planning and progress of the flight in some detail. It was evident that the flight had originally been planned in three route sectors; Jandakot to Forrest, Forrest to Port Pirie, and Port Pirie to Moorabbin. After departing Jandakot at 0122 hours WST, the aircraft next reported at 0350 hours over Kalgoorlie, 15 minutes ahead of the flight planned ETA. Eight minutes later, the aircraft reported that it was estimating Forrest at 0717 hours WST. This was an hour and four minutes later than the ETA obtained by adding the estimated time interval for the Kalgoorlie—Forrest leg to the aircraft's actual time over Kalgoorlie. Forty-six minutes later, at 0444 hours, the aircraft reported that it was experiencing trouble with the Forrest NDB and requested the Kalgoorlie runway lights to be switched on to enable it to obtain a visual fix. As this was 54 minutes after the aircraft's initial "overhead Kalgoorlie" report, and the aircraft would have had to be within 10 miles of Kalgoorlie for the runway lights to be useful as an aid to navigation, the aircraft must have turned back apparently because of navigational difficulties, and reached the vicinity of Kalgoorlie again at about the time the request for lights was made. This was confirmed by the fact that the aircraft landed at Rawlinna at 0630 hours local time, or 1 hour and 46 minutes after the pilot's request for lights at Kalgoorlie, a time consistent with that required for the aircraft to fly from Kalgoorlie to Rawlinna. After its second departure from Kalgoorlie the flight apparently progressed without incident to Rawlinna, where it landed after an elapsed time of 5 hours 8 minutes from Jandakot. The aircraft was evidently forced to re-fuel at Rawlinna instead of Forrest as originally planned, in order to maintain the statutory fuel reserves.

From the flight plan found in the wreckage it was evident that the second sector of the flight, flown during daylight hours, was under the command of the other private pilot on board the aircraft. Although the time of departure from Rawlinna was not shown, calculations based on the time of the aircraft's Head



Map showing proposed track in relation to Controlled Airspace

of the Bight position indicate that it would have departed at about 0748 hours WST time. Towards the end of this flight sector there was apparently some doubt in the minds of the pilots about the advisability of overflying Whyalla to re-fuel at Port Pirie. Their uncertainty about refuelling facilities at Port Pirie, indicated by an inquiry by radio to Whyalla, together with the fact that the aircraft could have barely reached Port Pirie with its statutory reserves intact, apparently led to a decision to re-fuel at Whyalla instead.

At Whyalla, the two pilots changed roles once more and the flight plan for the sector from Whyalla to Moorabbin was prepared by the pilot with the night VMC experience. Although the section of the flight from Horsham onwards was marked "night VMC" on his flight plan, last light at Whyalla that day was 1758 hours CST, and the aircraft departed Whyalla only 36 minutes before this. The pilot could thus have expected to be in night VMC conditions long before reaching Horsham and in fact, some 10 minutes before the aircraft was due to reach Parafield. There were another two more serious discrepancies in the flight plan. The Parafield-Tailem Bend sector

of the flight, which would take the aircraft over portions of the Mount Lofty Ranges, was planned at only 1500 feet; and the sectors from Horsham to Ballarat and Ballarat-Bacchus Marsh, thence Moorabbin were planned at 3500 feet and 1500 feet respectively. Night VMC procedures require an aircraft to be flown not lower than an altitude which provides 1,000 feet of clearance above any obstacle 10 miles either side of track and within five miles longitudinally, of the aircraft's position.

On this basis, a height of not less than 3,384 feet would have been required for some of the flight between Parafield and Tailem Bend; 4,695 feet between Horsham and Ballarat; 3,950 feet between Ballarat and Bacchus Marsh, and not less than 2,700 feet for part of the flight from Bacchus Marsh to Moorabbin.

After the pilot's flight plan had been passed to Moorabbin Airport, the Moorabbin Briefing Office established contact with Adelaide, pointing out that the sector from Bacchus Marsh to Moorabbin would have to be flown at 3000 feet which, on the route being followed, would place the aircraft in the Melbourne Control Area. When this

information was passed to the aircraft and it was advised that the radio frequencies applicable to Melbourne Controlled airspace would be required, the pilot would probably have consulted his VEC-2 Chart and noted that the Melbourne Area Control frequency for arriving aircraft was 123.9, and that the Melbourne Flight Service Frequency was 120.7. The aircraft was fitted with both these frequencies and the pilot probably assumed that they were all he would require.

A few minutes later, when the aircraft called Adelaide Tower to request a clearance to Tailem Bend at 1500 feet, terrain clearance requirements were again drawn to the pilot's attention; this time in relation to the flight sector he was about to begin and the aircraft was instructed to climb and reach 4000 feet by Parafield. After it had been subsequently vectored on to the heading for Tailem Bend by Adelaide Radar at 1821 hours CST the aircraft did not report again until just over two hours later when, at 2059 hours EST, it called Melbourne Control on the arrivals frequency, reporting that it was over Ballarat at 2058, cruising at 4000 feet and estimating Bacchus Marsh at 2127.



The aircraft's altimeter as recovered from the wreckage showing the reading at time of impact. The area QNH altimeter setting current at the night of the accident was correctly set on the instrument's pressure sub-scale.

At the flight planned airspeed of 130 knots and allowing for the wind from 050 degrees at 5 knots, observed at 5,000 feet that night by the meteorological station at Nhill, the aircraft's ground speed would have been about 126 knots. The distance from where the aircraft terminated its communication with Adelaide radar to Ballarat is 304 nautical miles, so the time interval for this sector of the flight should have been approximately 2 hours 25 minutes, giving an ETA Ballarat of about 2115 hours EST. By comparison, the time interval to abeam Ararat, which is 48 miles less than the distance to Ballarat would have been about 2 hours 2 minutes. The aircraft's ETA abeam Ararat would thus have been 2052 hours. It would have needed only a small variation in ground speed over the distance involved for the aircraft to have actually been abeam Ararat at 2058 hours.

In view of the pilot's past problems with navigation in general and the navigational difficulties he experienced earlier in the flight, it seems quite possible that he could have mistaken Ararat for Ballarat in this way at 2058 hours. Although the aircraft had been vectored by radar on to a heading for Tailem Bend

shortly after leaving Parafield, there can be no certainty that the pilot knew the aircraft's exact position from this point on. Also, by the time the aircraft was approaching the slopes and ranges in the western district of Victoria, the lights of towns and settlements would be becoming more numerous, and after an hour or so of flight over the extensive but sparsely populated areas on either side of the South Australian/Victorian border, the pilot would probably have been very tired. Furthermore, the pilot was totally unfamiliar with the area, never having flown over it before even in daylight. In these circumstances, a misidentification of the lights of a large town would be quite conceivable.

Although the pilot, no doubt unfamiliar with the complexities of the air traffic control system in use at primary airports, probably noted from the information in his VEC-2 chart, that the frequencies fitted to the aircraft were adequate to approach Melbourne in controlled airspace, this was not so. In actual fact, the division of air traffic control responsibilities at Melbourne is such that the Approach Control Unit is normally responsible for all aircraft in controlled airspace within a 30

mile radius of Melbourne, so that the Melbourne Arrivals and Melbourne Departures frequencies are required for operations within this area. The provision of an effective approach control service would not be possible if such a service had to be confined to the Control Zone itself.

Unfortunately, at the time of the accident, the documents available to the pilot did not indicate this, the mandatory carriage of approach and departure control frequencies being related only to operations in Control Zones. The flight procedures section of the AIP and the VFG specified the approach and landing procedures for operations into primary Control Zones, but the situation as in this case of an aircraft approaching a primary airport Control Zone and not intending either to land at that airport or to transit the Control Zone, was not provided for in these procedures. Action has since been taken to clarify this situation.

Since the aircraft had been instructed to maintain 4,000 feet instead of the flight planned altitude of 1,500 feet between Parafield and Tailem Bend, it

seems probable that the pilot would have continued in flight at this height until after he reported his position at Ballarat. From his request to Melbourne for a clearance at 2059 hours, it is evident that the pilot intended to continue to Moorabbin at this height.

By the time it was established that the aircraft was not equipped with the necessary frequencies and the pilot was informed that he could not be accepted in the Control Area, the aircraft would have travelled a further nine miles from the position of the pilot's "Ballarat" report. At this stage, the pilot probably believed he had almost reached the boundary of the 4,000 foot Control Area step. There is nothing to prevent an aircraft cruising at the base level of a Control Area step while still remaining outside controlled airspace and, technically, there would have been no immediate need for the pilot to descend. But the base of the 4,000 foot control area step at this point is only 10 miles wide, and to continue the flight eastward without infringing controlled airspace, it would be necessary for the aircraft to descend to

3,000 feet by the time it reached the inner boundary of the step. At the speed at which the aircraft was flying, the time available for this descent would be slightly less than five minutes.

The unexpected change in the aircraft's flight plan would thus have come at a critical time for the pilot. Undoubtedly tired after his long flight, he would now have felt under some pressure to make a decision with little or no time to formulate a carefully considered alternative plan of action. In this situation, it is very probable that the pilot's first thought would have been to revert to his original plan to proceed to Moorabbin via the light aircraft lane. That he actually made this decision is evident from his second last transmission, in which he informed Melbourne Flight Service that he would be proceeding to Moorabbin "BCTA". Compliance with this plan of action, from the position in which the pilot believed the aircraft to be, would have necessitated an early descent to 3,000 feet or below. The last transmission from the aircraft which was an acknowledgment of the Melbourne Area

View of the wreckage trail as it was found, looking back in the direction of impact. The badly damaged engine and instrument panel are in the centre foreground of the picture partly hidden by the thick undergrowth.



QNH passed to the aircraft by Melbourne Flight Service, was made at 2103 hours, shortly after the pilot advised that he was proceeding "BCTA" and five minutes after his "Ballarat" position report. At this stage the actual position of the aircraft was approximately 11 miles south east of Ararat, and a descent at this point placed the aircraft directly on a collision course with the Mt. Buangor range.

* * *

The accident was thus the culmination of a number of factors and discrepancies in the planning and conduct of the flight. Navigation had obviously presented the pilot with some problems in the past and, as well, he had only once before flown outside Western Australia and this was seventeen months previously. It is clear, however, that neither these considerations, nor the fact that he was no longer qualified to undertake a night VMC flight had deterred the pilot from accepting command of the intended flight. Not only did he fail to meet the recent experience requirements for night VMC flight, but his Class 4 Instrument Rating had actually expired 10 months before the accident occurred. His only actual experience in night navigation was in fact what he had carried out prior to the initial issue of his Class 4 Instrument Rating 20 months previously. The pilot's lack of knowledge and experience was only too evident from his obvious failure to understand the terrain clearance philosophy applicable to night VMC flight. The reason why he did not make proper provision for terrain clearance in his flight planning will never be known, but it seems quite possible that he simply did not know what was required of him, and that the altitudes nominated on the flight plan were selected solely because they would enable the aircraft to remain below the base of controlled airspace.

As well as the inexperience of the pilot-in-command, his lack of qualifications for the flight, and the fact that he was completely unfamiliar with the terrain over which he was to fly in the dark, there was another important factor which undoubtedly played its part in contributing to the flight's untimely and tragic end. This was the length of the flight itself, and the crew fatigue which would have inevitably resulted.

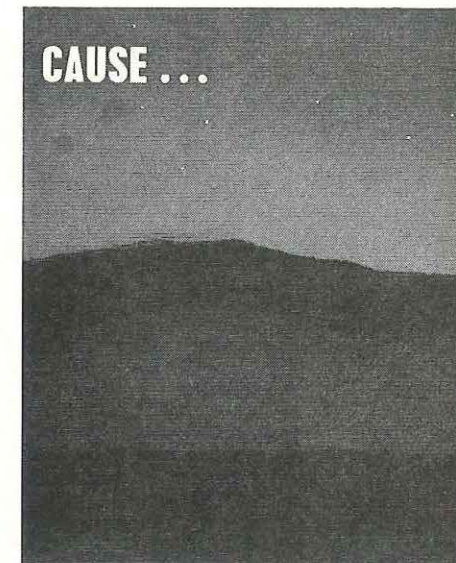
Had the aircraft reached Moorabbin as planned, the total time spent by the

pilot-in-command at the controls would in any case have been in excess of the statutory eight hours allowed in any twenty-four. But as well as this, the total airborne time from Jandakot to the occurrence of the accident was nearly eighteen hours, and in addition there was the time spent on the ground refuelling at Rawlinna and Whyalla. Although the pilot was not "on duty" in the strict sense of the term for the whole of this time, his "off duty" period during the Forrest-Whyalla leg of the flight could hardly be regarded as adequate rest. It is also likely that, as the aircraft left Jandakot at 0122 hours, the pilot would have had little sleep in the night hours before departure.

In these circumstances, there can be no doubt that the pilot would have been extremely fatigued by the time the aircraft reached the area in which the accident occurred. His resulting lack of alertness, in combination with the other factors already discussed, could have easily produced a situation where the flight was virtually an "accident going somewhere to happen". In fact, had the terrain clearance requirements not been brought to the pilot's attention when he requested a clearance via Parafield to Tailem Bend, it seems very probable that the accident would have occurred two and a half hours earlier on the western slopes of the Mt. Lofty Ranges. In retrospect it is of course most regrettable that when it was established that aircraft did not have the necessary frequencies to operate in the controlled airspace within 30 miles of Melbourne, no one on duty at Melbourne had any reason to believe that the pilot's navigation might have been in error, nor any way of knowing that the aircraft had experienced navigational difficulties on at least two other occasions during the flight from Jandakot. Had this information been available, or had the pilot given any indication that he required assistance, such assistance would have been promptly forthcoming.

Apart from the more obvious operational lessons of this accident therefore, it serves as a further demonstration that pilots should not hesitate to call for assistance, by declaring an Emergency, if they should ever find themselves in a situation which appears to be getting beyond their experience or capacity. It is for this purpose that the Department's Search and Rescue organisation exists, and in such an emergency situation every possible facility is extended to a pilot.

There is clearly a reluctance on the part of many general aviation pilots to do this, no doubt prompted by a desire "to keep out of trouble". But a few minutes dispassionate thought should be enough to see the folly of taking this attitude too far. Having to do a little "explaining" afterwards is unquestionably better than being permanently silent.



The cause of the accident was that the pilot, who was inexperienced in night VMC operations operated the aircraft at an unsafe altitude at night.

HOW IS YOUR NAVIGATION?



Disastrous End to Holiday Flight



INADEQUATE FLIGHT PLANNING

Journey into Nowhere

MISUNDERSTANDI

A PRIVATE pilot was killed in a crash landing on a wooded hillside near his home in the mountains of Colorado. The pilot, who was on a solo flight, was flying at a low altitude when he lost control of the aircraft. The crash occurred on a steep, wooded slope, and the pilot was killed on impact. The investigation is still ongoing.

A 1945 Cessna 441 was on a solo flight from Denver to Aspen, Colorado. The pilot was flying at a low altitude when he lost control of the aircraft. The crash occurred on a steep, wooded slope, and the pilot was killed on impact. The investigation is still ongoing.

The pilot had also reported a complete loss of directional control in the vicinity of the crash site. The pilot was flying at a low altitude when he lost control of the aircraft. The crash occurred on a steep, wooded slope, and the pilot was killed on impact. The investigation is still ongoing.

FLIGHT PLANNING

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the accidents reported in the Digest in the past.

In the discussion which accompanied the descriptions of these accidents, and in its Editorials from time to time, the Digest has frequently pointed out that the development of an accident is nearly always an evolutionary process. In other words, an accident does not "just happen", but is usually the culmination of an insidious chain of events or incidents. With hindsight, it is frequently possible to see that if the formation of the chain could have been interrupted, the accident could have, or would have, been averted.

There is one almost certain way of interrupting such a chain of events, provided that it is done in time to alter the course of the accident evolutionary process. As a reader has so competently advocated in this issue's "Pilot Contribution", by far the most effective answer to a pilot's navigational problems, when the situation seems to be getting out of hand, is to declare an emergency and call for assistance.

Clearly, many general aviation pilots feel a great reluctance to do this, perhaps for fear that they will "lose their licence". It is possible that the apprehensions of some pilots in this regard may be considerably exaggerated. Certainly, any declaration of an emergency by a pilot may generate an Incident Report, but it by no means follows that this will lead to disciplinary action against the pilot himself.

It should be obvious that, in the interests of air safety generally, any situation serious enough to warrant the declaration of an emergency should be the subject of an investigation. The purpose of such an investigation is not that blame may be apportioned to some person, but so that the circumstances of the incident can be properly analysed to the ultimate advantage and safety of all concerned. The pilot will benefit in knowledge and experience, the Department will benefit and, in due course, other airspace users are also likely to benefit. There is also the possibility that the occurrence, taken with others of a similar or associated nature, may lead to the establishment of a particular "trend" that will eventually contribute to a better system by providing the Department with an opportunity to examine its standards and procedures in regard to this type of occurrence. The whole purpose of the investigation of Air Safety Incident Reports is clearly reflected in the well-known indemnity provisions which the Director-General

extended some years ago to the originator of incident reports in certain circumstances.

But all these considerations aside, the eventual outcome of not calling for assistance in a critical navigational situation should, as pointed out in the article on page 10, be a matter for much greater disquiet than the possible administrative consequences of declaring an emergency in flight.

As to the two fatal accidents themselves in this issue of the Digest, readers will undoubtedly be struck by the similarity of the circumstances that led to each, and by the number of contributing factors they have in common.

In both cases the pilot planned a flight that would exceed the statutory flight time limitations and inevitably resulted in his being fatigued at the very time that his faculties were most needed. In neither case did the pilot have a wide flying background; neither was experienced on the aircraft type, and neither had any worthwhile experience in night VMC operations beyond that which had been originally required of him for the issue of a Class 4 Instrument Rating. On top of this in each case, the pilot's rating had become invalid for lack of recent experience, many months before the flight in question was undertaken.

In each case too, the pilot was unfamiliar with the terrain over which he was to fly, yet was prepared to continue the flight in darkness despite the unfavourable circumstances already mentioned. Lastly, in both instances, the pilot's flight preparation left much to be desired and took no account of the lowest safe altitude requirements for night VMC flight.

Cross country navigation in a light aircraft today is a very different matter from what it was comparatively few years ago. In the era of fabric-covered, tail skid and tail wheel aeroplanes, that cruised at 80 knots and had an endurance of two and a half hours, a pilot's problems were mostly manipulative ones. If he could master these properly, the performance limitations of his aircraft made it unlikely that he would get into a great deal of trouble on a cross-country flight.

Today, the exact reverse is true. From a manipulative point of view, most single engined light aeroplanes, even the high performance ones, are much easier to fly than their predecessors. But their speed and range is often such that even quite minor navigational errors can easily

become compounded into major ones if the pilot is not "on top" of his navigation.

The fact that the aircraft themselves are easier to fly and they have an extensive range, naturally and quite properly encourages their use for long cross-country trips and "tours" of a length and duration that could hardly have been considered in their counterparts of yesterday. As well as this, there are two other factors which have undoubtedly contributed to the overall problem of pilot navigation. Both of them relate to pilot attitudes.

Over the past few years, the promotional advertising for some types of light aircraft has fostered the notion that the skills and judgements necessary to fly an aeroplane are little removed from those required for driving a motor car. Unfortunately, amongst some would-be aviators, this seems to have stimulated an "aerial driver" outlook rather than a proper "pilot-in-command" philosophy and has done nothing to encourage amateur pilots to aim at professional standards in all aspects of their flying.

The same sales promotional campaigns in conjunction with the undoubted virtues of the aircraft themselves also seems to have introduced to the ranks of aircraft owners and pilots, persons who have learnt to fly because it provides them with an efficient means of transport in country areas, but who have no real interest in flying other than this.

Attitudes of this sort are in marked contrast to the emphasis on leadership and enthusiasm, pride in skill and airmanship, and esprit de corps, which so characterised most aero clubs and flying schools a decade or two ago, when private ownership of aircraft was the privilege of the very few. As a result, the overall concept of light aircraft flying today is much less subject to imposed discipline and is far more individualistic in character. It is all the more necessary therefore that individual pilots take care to cultivate in themselves, the right attitudes and self-disciplines so necessary to conduct their flying in a sound and safe manner.

Nearly always when navigational problems develop, the pilot is lacking in overall experience, recent experience or perhaps both. It must of course be accepted that inexperience in either of these areas will inevitably result in some mistakes. After all, this is no more than the price of real experience. But proper

ON GETTING LOST... and other navigational perplexities

flight preparation and a sense of one's own limitations should ensure that such mistakes do not develop into a navigational disaster.

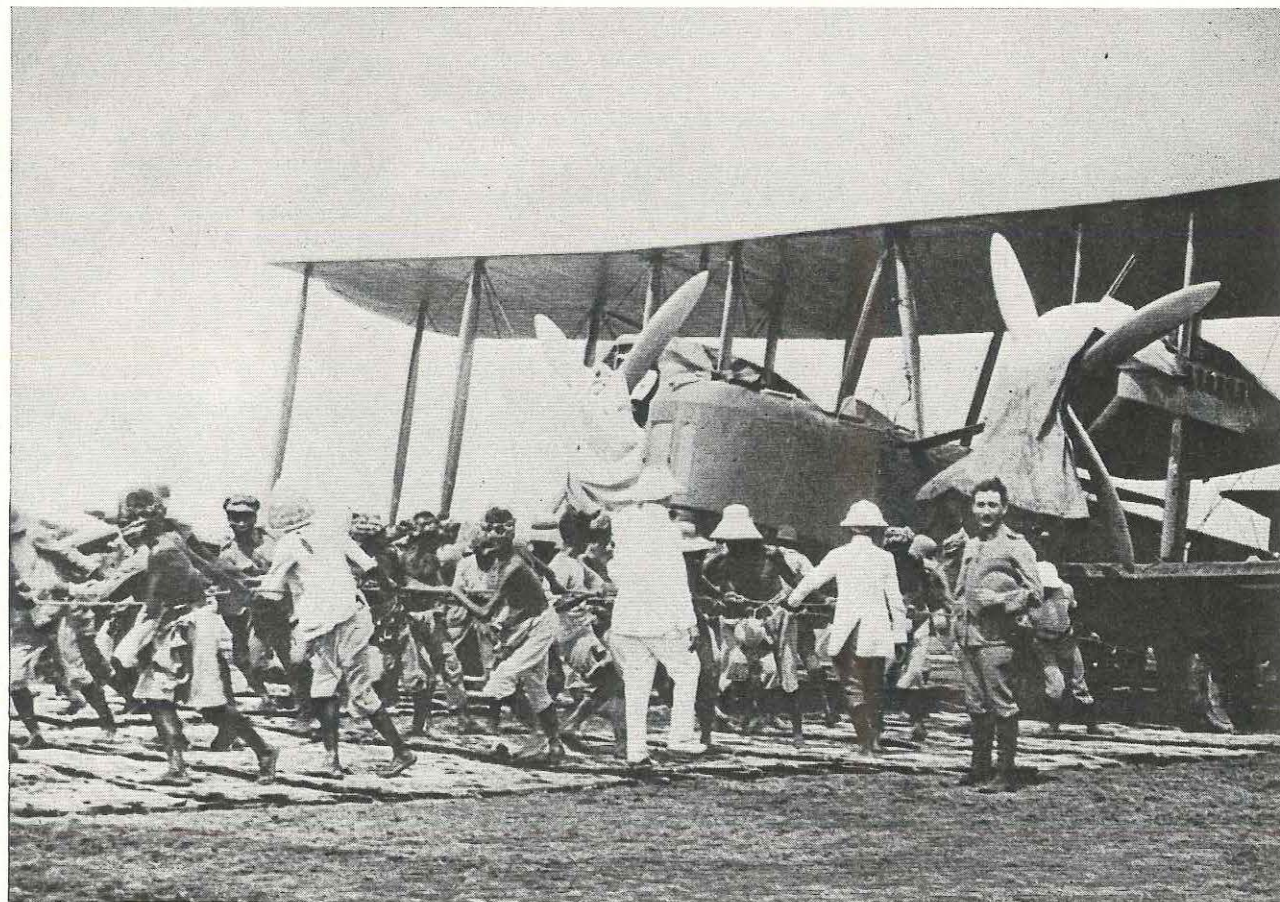
This preparation must always include, as advocated elsewhere in this and previous issues of the Digest, the provision of an "emergency plan" that will enable the aircraft to reach a safe "alternate" if things go unexpectedly wrong. And not only must one's technical competence and knowledge for the flight be

taken into account; it is equally important that one's physical capability for the task be given careful consideration. The review of the navigational incident that follows this article, as well as the discussion of the accidents on the preceding pages, testify all too well to the possible consequences of pushing one's physical resources too far. The flight time limitations laid down in Air Navigation Orders have not been devised merely to be restrictive. There are very sound reasons

for them and pilots must remember that, just as a machine cannot function properly if it is not adequately fuelled and maintained, so the human body cannot function efficiently without proper food and rest at the right intervals.

To disregard any of these factors in the planning and subsequent conduct of a flight, can, as is so clearly evident from pages of this issue of the Digest, lead to results that are not only tragic, but in all probability permanent. —

✿ AIR SAFETY ADVICE = ILLUSTRATED ✿



"CONFINE OPERATIONS TO SEALED SURFACES!"

(Sir Ross and Sir Keith Smith's Vickers Vimy at Batavia, 1919)



THE DARKNESS DEEPENS

TO undertake a charter flight from Ceduna, S.A., the pilot of a Beech 36 based at Whyalla departed from Whyalla Airport at 1000 hours. By arrangement with his employer, he was carrying five acquaintances as passengers on the positioning flight.

Because the pilot had gained the impression, during a flight the previous day, that the aircraft's compass was read-

ing up to 20 degrees in error on certain headings, he carefully cross-checked his headings and tracks during the flight to Ceduna, and found that the compass was in fact reading incorrectly, especially on easterly and westerly headings.

After landing en route at Streaky Bay to off-load one of the passengers, the aircraft duly arrived at Ceduna at 1130 hours. After the rest of his friends had

left the aircraft, the pilot had the aircraft refuelled and completed arrangements for the charter flight, which was to be an inspection of stock grazing areas up to 200 miles west and north-west of Ceduna. With the passengers who had chartered the aircraft on board, he then departed on the inspection flight at 1250 hours.

The flight, which took the aircraft to Coorabie, Colona Station, Ooldea and

Cook on the transcontinental railway lasted almost four hours, and it was not until 1645 hours that the aircraft touched down again at Ceduna.

Because the friends he had left at Ceduna would not be ready to return to Whyalla until late in the day, the pilot intended making the return flight after dark, using night VMC procedures, for which he was properly rated. But he had also to consider the passenger he had left at Streaky Bay, and as the airstrip there had no facilities for night operations, the pilot decided to fly to Streaky Bay before it was dark, pick up the passenger, and return to Ceduna to await the arrival of the others for the return flight to Whyalla.

This he did and in due course, after all his passengers had arrived back at the Ceduna Airport he submitted a flight plan for the final Ceduna-Whyalla leg of the day's flying. The plan showed that the aircraft would follow the direct route between Ceduna and Whyalla, and nominated positions abeam Minnipa and Kimba as check points.

Half an hour after last light at 1843 hours the aircraft took off from Ceduna. After adjusting his calculated flight plan heading to allow for the compass error, the pilot tracked outbound from Ceduna NDB on a compass heading of 085 degrees and climbed to his intended cruising height of 7,500 feet.

Thirty-two minutes later the pilot observed the lights of a town some distance away to starboard and estimating that he was abeam Minnipa, transmitted a position report. Although the lights seemed to be further away to the south than he expected, the pilot assumed that small areas of broken cloud below him were affecting his judgement of distance and he continued the flight on the same heading. However, after another twenty-five minutes flying, by which time he should have been abeam Kimba, the pilot found that the lights of the town were nowhere in sight.

A smaller group of lights then appeared ahead close to the aircraft's track and, assuming they were those of the town-

ship of Buckleboo, 18 miles north-west of Kimba, the pilot concluded he was still close to track and transmitted another position report to the effect that he was abeam his second check point, and gave an estimate for Whyalla of 1955 hours.

A few minutes later, when the lights of a large town came into view in the distance, the pilot assumed that he was approaching Whyalla, but then he saw that neither his ADF nor his DME, both of which were tuned to Whyalla, were indicating direction or distance. Arriving over the town, the pilot found that he could not identify it and he began to circle the area while he attempted to fix his position. Believing now that the town might be Kimba or possibly Cowell, the pilot called Adelaide Flight Service on VHF and extended his ETA Whyalla to 2005 hours. After a further five minutes circling, the pilot finally realised he was not going to be able to identify the town and decided that it was time to call for help while he still had ample fuel remaining in the tanks. He therefore reported to Adelaide that he was uncertain of his position and asked if any assistance could be provided to aid him in identifying the town.

Meanwhile at Woomera, 120 miles north-west of Whyalla and about 40 degrees to port of the direct Ceduna-Whyalla track, the officer-in-charge of the Flight Service Unit had noticed a light aircraft circling the town in the dark. He was off duty at the time, having closed the Unit earlier in the evening and, as he had no knowledge of any flights planned into Woomera, he decided to telephone the Adelaide Flight Service Centre from his home to see if any information was available on this aircraft. On doing so, he was told that a Beech 36 aircraft, en route from Ceduna to Whyalla had encountered navigational difficulties and was now circling an unidentified town. The Flight Service Officer drove immediately to the airport to re-open the Unit and switched on the runway lighting and the airways rotating beacon.

Adelaide Flight Service passed this information to the pilot who sighted the lights of the aerodrome as soon as they were turned on. VHF contact was then established between Woomera and the aircraft, and the pilot was able to confirm beyond doubt that he was in fact over that town. With his position now

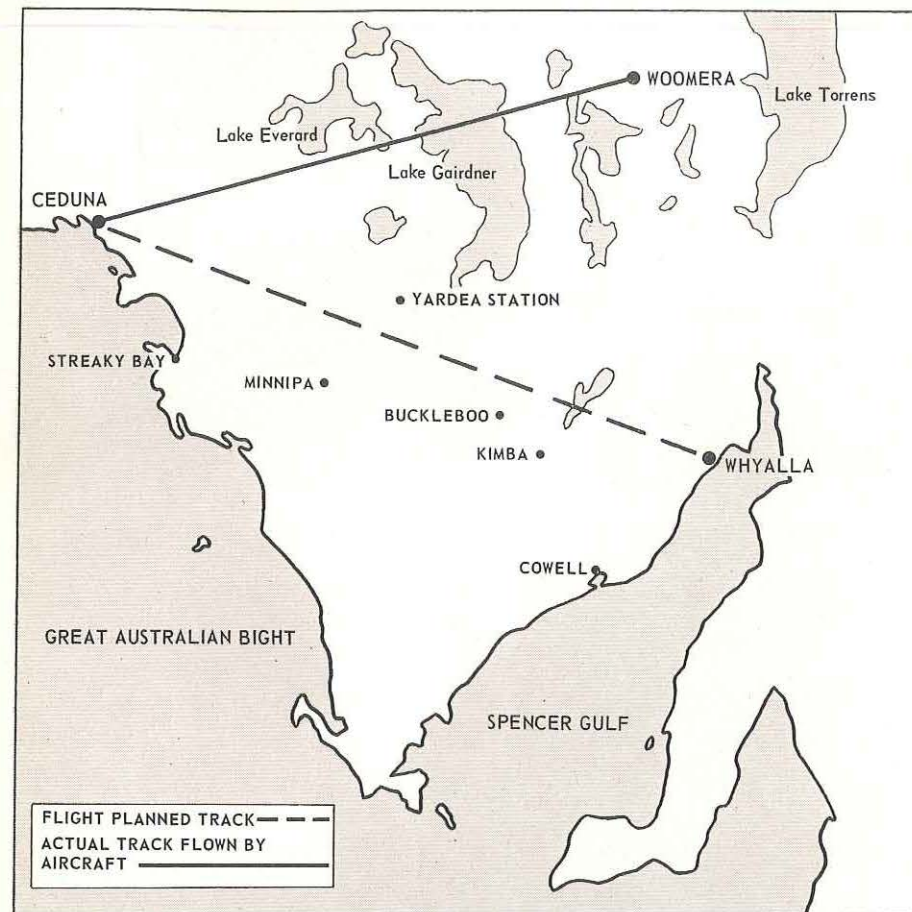
verified, the pilot set heading for Whyalla, but on being instructed not to continue, he turned back and landed the aircraft at Woomera.

The pilot and his passengers stayed overnight at Woomera and in the morning a Departmental dispensation was granted to the pilot to continue the flight to Whyalla with the faulty compass, provided that he used the main road between the towns as a navigational reference. The aircraft subsequently arrived back at Whyalla without further incident.

Investigation of the incident confirmed that there were errors in the readings of the aircraft's compass. A check swing, carried out at Whyalla a short time after the aircraft landed, disclosed that the compass was in fact, over-reading by up to 16 degrees on easterly headings.

A more detailed examination of the aircraft later established that the immediate cause of the compass errors was an unusual magnetic field in the vicinity of the lower firewall, together with a magnetised tachometer generator. The aircraft was subsequently demagnetised and a further compass swing with a new instrument installed then proved satisfactory. No defect could be found in the original compass after it was removed from the aircraft. Although the reason for the formation of the magnetic fields could not be positively established, it was found that the aircraft had been extensively damaged in an accident some months before and it was quite possible that they had been induced at some stage during the repairs subsequently made to the airframe, and the radio and electrical systems.

Despite the misleading compass readings the pilot had successfully identified the error on earlier flights and had determined its magnitude with commendable accuracy. In setting off on the return flight at night from Ceduna to Whyalla, it is clear that he intended to allow for this error and adjust his flight planned heading accordingly. It was evident from the investigation however, that instead of mentally adding the correction to the



Map showing flight planned route between Ceduna and Whyalla, and the actual track flown by the aircraft.

flight planned heading on departure from Ceduna, the pilot had subtracted it, thus compounding the error.

It was further evident that after covering some distance from Ceduna in the dark, the pilot was misled into thinking he was maintaining the flight planned track, by the appearance of lights along the route, which seemed to correspond with his expected check points. The pilot obviously remained under this impression until he actually arrived over Woomera itself.

In view of the length of time the pilot had been on duty when he made his navigational error, the question of whether fatigue or some related effect had been a contributing factor, was considered. It was found that by the time the pilot began his intended return trip to Whyalla, he had flown just over six hours for the day and had been on duty for about nine hours. These times are, of course, within the statutory limits laid down by Air

Navigation Orders Part 48, and in themselves would be unlikely to have an adverse effect on a pilot's judgement and ability. But it was also found that the pilot had breakfasted two hours before leaving Whyalla that morning, and had eaten no other meals throughout the eleven hour period preceding the commencement of the return flight. As well as this, no food or refreshments of any type were carried on the aircraft, so that by the time he called for assistance over Woomera, the pilot would have been without any form of nourishment for about 12 hours.

It is a fact that regular meals combat the effect of tiredness, besides breaking up the monotony of long spells in the cockpit. In this case, the pilot had not eaten since early in the morning and had been on duty for nine hours, including six hours actual flying in an area demanding precise navigation. As well as this, the pilot had to contend with a compass that was giving erroneous readings, and on top of it all at the end of

the day he had the additional work load of making the return flight at night. In these circumstances it is not surprising that the pilot made a mental error when he attempted to apply a correcting factor to his defective compass, an exercise that requires great care even at the best of times.

Pilots who have to conduct long flights in similar situations, where regular meals are difficult or even impossible to obtain, should carry a boxed lunch-type meal with them and a container of a suitable beverage prepared in their home. The food should be packed in an insulated container as this not only keeps it palatable but also affords protection against food poisoning organisms. As a general rule it is unwise for pilots to eat pies, hamburgers, sausage rolls or trifles and other sweet dishes prepared in coffee shops or cafes in remote areas, because of the risk of food poisoning and consequent pilot incapacitation.*

Little imagination is required to see how easily an incident of this sort could have developed into a major accident. Had conditions been only slightly less favourable and had the pilot not requested assistance when he did, the aircraft could have become lost in the dark anywhere within a vast and virtually uninhabited area and beyond the range of navigation aids by which to fix its position. In these circumstances with a dwindling fuel supply, a pilot's chances of carrying out a successful night landing would be very slim indeed.

In attempting a night flight over an extensive sparsely settled area with a faulty compass, the pilot undoubtedly displayed a lack of wisdom. His decision to continue the charter flight with this handicap earlier in the day, must also be regarded as a questionable one, especially in view of the remote area in which it was undertaken.

The one "bright spot" in this navigational incident is of course the fact that the pilot, once he realised he was well and truly lost, had little hesitation in calling for assistance. The rapidity with which the request bore fruit in this instance shows the wisdom of such action and serves as further vindication of the points made in the articles on pages 10, 18 and 28.

* See "Pilots and Food Poisoning," Aviation Safety Digest No. 51. Copies available from the Editor.



**PROPELLER
MAINTENANCE
... for pilots!**

In the north-west of Western Australia, a pilot was flying a Mooney M20E from Marble Bar to Mt. Newman. The flight had been proceeding smoothly when, some 30 miles north of the destination, a sudden violent shuddering developed throughout the aircraft. The pilot immediately closed down the engine and was able to carry out a successful forced landing on a road. Climbing out of the aircraft to investigate the reason for the out-of-balance condition, the pilot found that about nine inches was missing from one blade of the propeller.

THE aviation industry has, for some years, recognised that propeller blades are subject to fatigue cracking which originates from stone bruises on the leading edge and the pitch face of the blades. A large proportion of general aviation aircraft in Australia operate from unsealed areas for much of the time, and it is therefore not possible to avoid damage of this type altogether. But the effects of stone bruises can be considerably lessened by constant, skilled attention to the condition of the blades. Wherever possible, this should be carried out on a daily basis.

The severity of the consequences which can result from either neglect or lack of skill in the inspection and rectification of stone damaged blades can hardly be over emphasised. It is quite possible for instance, for a blade to have a minute crack at the base of a stone bruise which, within a very few hours of operation, could cause the loss of portion of the blade. Such an event will cause heavy vibration, and may seriously damage the engine installation before an emergency landing can be made. In extreme cases, where the major portion of a propeller blade is lost, the entire engine mount will fail almost instantaneously and the engine will fall out. Enough instances of this have occurred in Australia, as well as overseas, to warrant the matter being again drawn to the attention of maintenance staff, and in particular to those pilots who operate their aircraft away from a base, without the day to day support of maintenance staff.

In the incident described at the beginning of this article, the Mooney aircraft, equipped with a Hartzell propeller, had been operating from a mining company's airstrip and the propeller had suffered blade damage of the type described. Some days prior to the occurrence, the pilot had inspected the blades and had dressed the leading edges with a very rough file, but he did not remove all the stone damage. As a result a crack originated and progressed through an estimated 40 per cent of the blade width until it finally failed, and about nine inches of the blade was flung off. The pilot said afterwards that there was no warning of the failure and the first indication of trouble was when the smooth-running engine suddenly began a violent shaking which affected the whole aircraft. Because the pilot's immediate diagnosis was correct, and he was able to carry out a successful forced landing, the only further damage the aircraft sustained was a broken exhaust manifold.

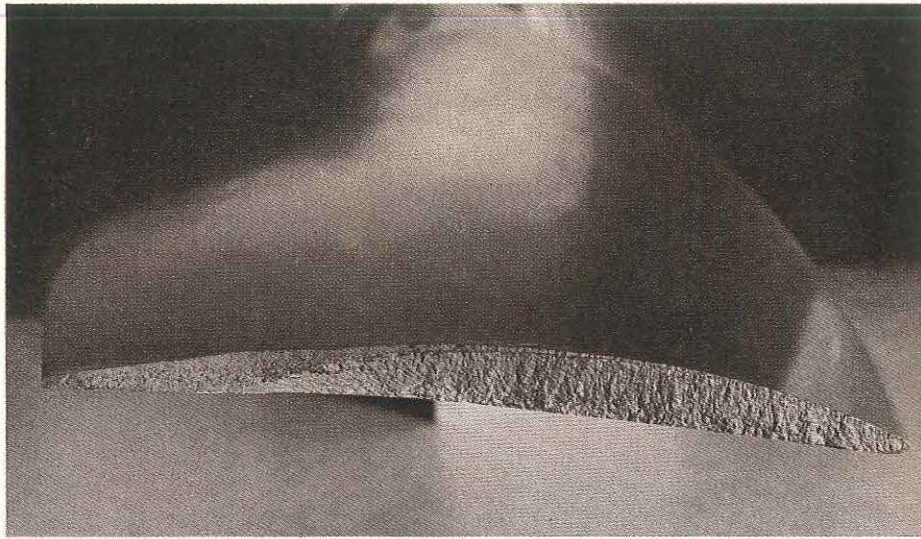
It was found that this propeller had been in service for only 63 flying hours. Examination of the broken blade clearly showed that the crack had originated from the base of a stone bruise on the leading edge and the characteristics of the fracture indicated that very rapid progression of the crack had taken place across the blade until the final failure occurred. These characteristics are clearly visible in the photographs, figure 1. The very dark area at the leading edge is the original stone bruise. In the next area, equal to roughly one quarter of the blade width, the spacing of lines at right angles to the blade surface, show how the crack progressed at an increasingly rapid rate until it was roughly half way across the blade. At this stage the final, almost instantaneous, failure occurred. The examination also revealed that the leading edge of the blade, in-board of the failure, was heavily scarred where the pilot had previously attempted to smooth out stone bruises. In performing this work however, he had done far more harm than good.

Three distinct lessons are evident from this incident:

- Stone damaged blades can fracture within a few hours of operation unless the damage is properly rectified;
- Where aircraft are operating from loose gravel surfaces, propeller blade inspection and rectification is necessary on a daily basis;
- The work must be performed by a person who has been properly instructed in the procedures to be used.

The first point is borne out by the history of propeller blade damage known both to the Department and those operators who have suffered expenses and inconvenience from this cause. The incidence of stone damage can be considerably lessened by avoiding, as far as possible, running engines on the ground on other than paved or grassed surfaces.

The second point is supported by the results of investigations into blade failures. Laboratory inspection of blade fractures indicates that the period of time between the occurrence of a stone bruise and the initiation of a crack in the blade, is short. When first formed, a crack is usually so small that it is hardly perceptible to the naked eye. But once a crack starts, its rate of progression increases quite rapidly so that by the time it is visible to the naked eye, the



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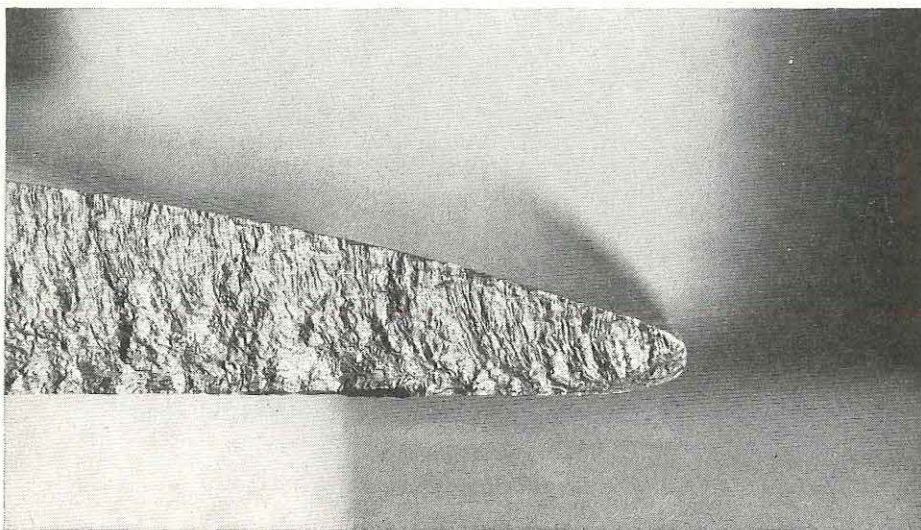
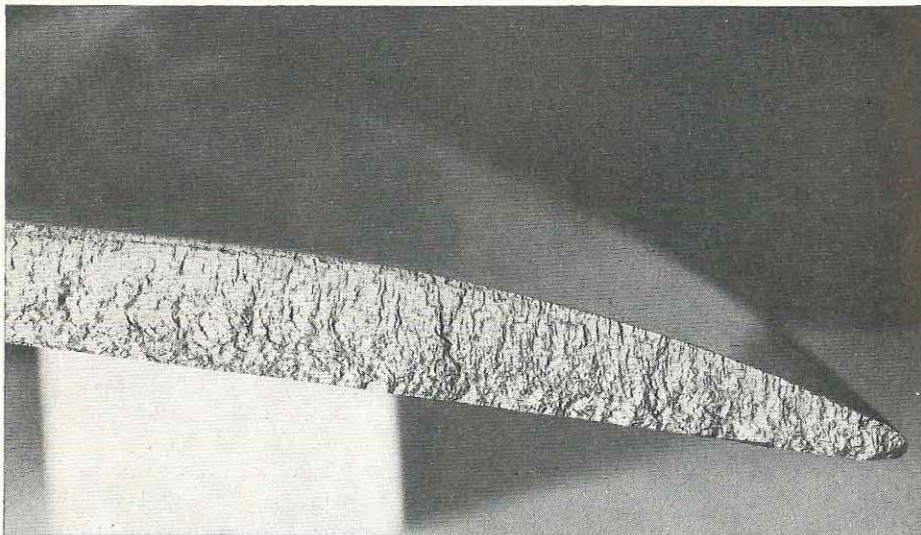
Figure 1: Marks characteristic of fatigue cracking are clearly visible in this series of photographs showing the fracture surface of the failed propeller blade after its removal from the Mooney. The stone bruise from which the crack originated is seen more clearly in the centre picture, as a very dark area at the leading edge of the blade.

Opposite Page, Top.

Figure 2: Diagram showing recommended surface contours for blending-out stone bruises on the leading edge and pitch face of a propeller blade.

Opposite Page.

Bottom: Figure 3: Deep score marks caused by the use of a rasp on the leading edge of the Mooney's propeller blade, immediately inboard of the point of failure.

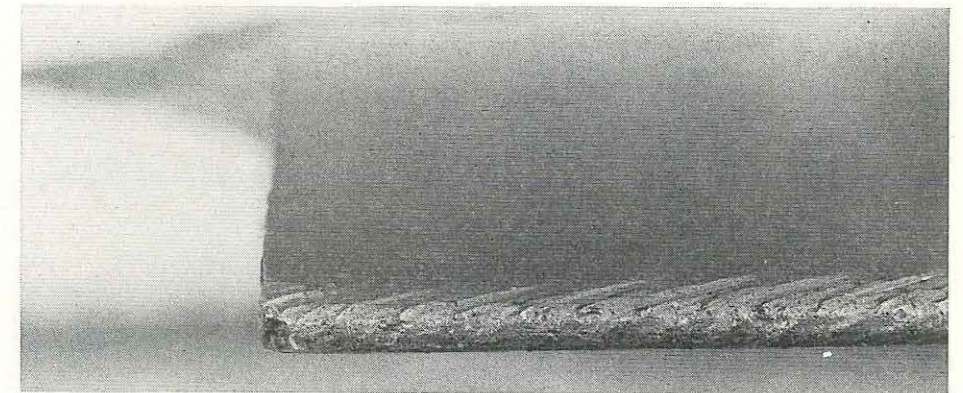
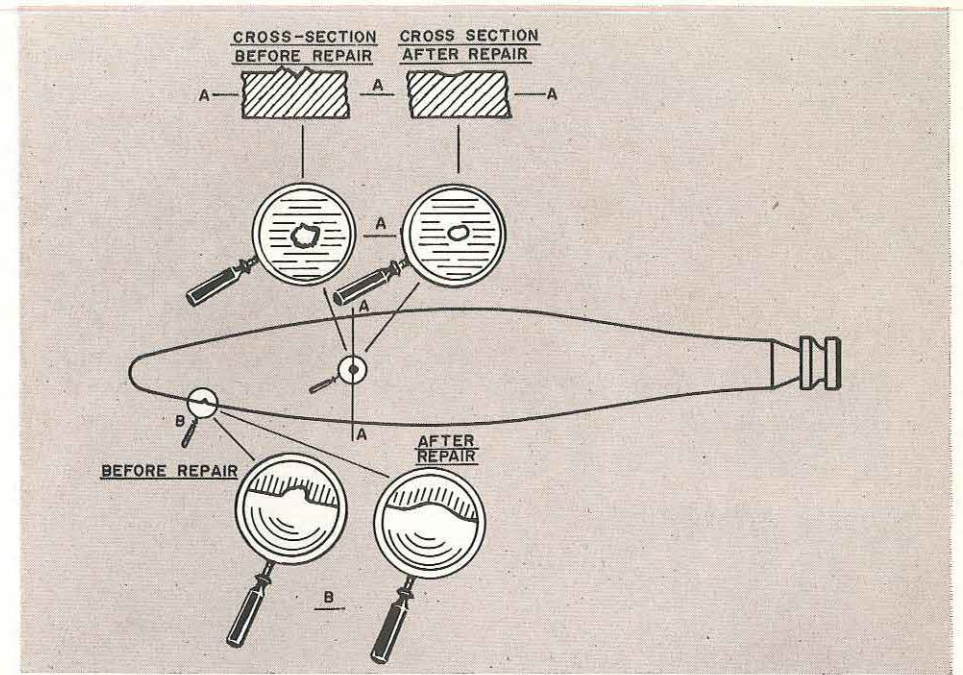


blade is already damaged beyond repair and is unfit for further operation. Careful daily inspections are therefore essential so that severe bruising, either on the leading edge or on the pitch face of the blade, can be blended out before any crack develops. To inspect propeller blades properly, it is of course necessary that they be first cleaned of their usual accumulation of grass gum and insect debris. This is best accomplished by rubbing the blades down with a wet cloth, then wiping them over with a clean, oily cloth.

The removal of stone bruises requires the use of fine files and should be completed with a final polish by a very fine emery cloth. The work should be accomplished in such a way that the indentation is smoothly blended into the blade contour and the area should be repolished as nearly as possible to the original high finish of the blade surface. The area around the stone bruise should then be carefully examined with a 5X or better magnifying glass, to ensure that no cracking has occurred and that all pits at the base of the stone bruise have been removed. The sketches in figure 2 show recommended contours for the removal of stone bruises, and are as specified in propeller repair and maintenance instructions. Obviously however, there is a limit to the amount of material which can be removed from any blade without affecting its performance, balance or strength. The limits to which repairs of this nature can be conducted are generally prescribed in propeller manufacturers' manuals, and in no circumstances must these be exceeded.

The photograph in figure 3 shows the results of unskilled attention to the propeller blade of the Mooney. The deep score marks caused by the use of a rasp are clearly evident. Such damage would be quite capable in itself, of initiating fractures in a propeller blade and, in any case, would ruin a blade which might otherwise have been returned to service after proper treatment. Although in this case the pilot had made some attempt to clean up the blade damage, it is quite clear he had not been instructed in the essential basic procedures or given any understanding of what he was trying to do.

The maintenance requirements set out in Air Navigation Order Section 100.5.2 were designed to allow pilots to perform certain simple maintenance functions. It is only reasonable to expect however, that such pilots will take steps to ensure they are fully conversant with the work



that they propose to undertake. In the case under discussion, an hour's proper instruction and practice, would in all probability, have averted the trouble and expense involved in the incident.

In this incident, the question of propeller maintenance only is involved, but the moral of the story is equally applicable to other preventive maintenance performed by pilots. While the A.N.O. referred to provides authority for a pilot to carry out certain maintenance and minor rectifications on his aircraft, the final responsibility for the condition of the aircraft still remains with the operator. Operators must therefore accept the responsibility of ensuring that their pilots are properly trained and

equipped to carry out whatever maintenance they are permitted to perform within the limits of the authority granted under A.N.O. Section 100.5.2. It is unfortunately quite evident that some operators are deficient in this regard. In their own interests, as well as in those of air safety generally, they would be well advised to give some thought to this aspect of their responsibilities. It might otherwise become necessary for the Department, on the grounds of safety, to withdraw this general maintenance authority and instead require individual pilots to satisfactorily complete a course of practical training, commensurate with the terms of the work they are to perform, before being authorised to do so.

PRIVATE PILOTS— and navigation in the outback

Our pilot Contribution this time is a little different. Instead of the usual "It happened to me" style of article that appears in the Digest under this heading, our contributor has to offer some timely comment and advice that could be taken to heart by any inexperienced pilot contemplating a long cross-country flight over unfamiliar terrain.

I WAS just back from my first holiday tour of Central Australia, when I read Aviation Safety Digest No. 70 and then re-read No. 55 — both with heightened interest.

I have accumulated hours slowly on my private pilot licence, and for me, the 400-500 hour danger period is tempered by the caution of sixteen years spent in and about aero clubs and gliding clubs. With this background, I am not setting out to solve all the Department's problems but I do have a thought about declaration of emergencies.

In the accidents reported in the two Digests mentioned the situation might have been saved if the judgement of a senior operations officer had been brought to bear earlier. Naturally, no pilot wants to be the subject of an incident report and there must be no surer way to gain such a citation than to declare an emergency, unless it is to persist with a situation which has got beyond control. On the other hand, there seems to be a common stage in the development of an accident when the pilot realises he is in serious trouble. It is the judgements made in the stress of this realisation, which in retrospect, so often turn out to be faulty.

For my part, if things ever do go horribly wrong I would like to think there was someone on the ground to help, working out a DR position from my flight log, searching for suitable alternative aerodromes, checking that they are within range, getting the actual weather and computing a new heading. When a flight has to be re-planned in the air, theory breaks down in the face of hard practice. Searching the AGA sheets for an alternate with runway lighting, or for one which has a strip aligned into a 40 knot wind; measuring track and distance to some point on an adjoining WAC chart, checking fuel for a diversion and minutes of daylight remaining; looking up approach, tower and SMC frequencies, the boundaries of restricted areas and controlled airspace and the aerodrome elevation; noting VOR or ADF frequencies, as well as identifying and tuning these aids, is altogether more than a handful, without having to fly the aircraft in deteriorating conditions as well!

Flight preparation is not the whole answer. It is just not possible to memorise even the most important of such data for every alternate that might be

needed on a long trip and to note them all on a knee pad would be to copy out the bulk of the VFG! About the most that can be done is to have a "disaster plan" in the event of failing to find the destination or finding it "clamped" under a great thunderstorm. Danger develops when, for some reason or other, flight planning or perhaps pilot experience, does not provide for the situation that develops.

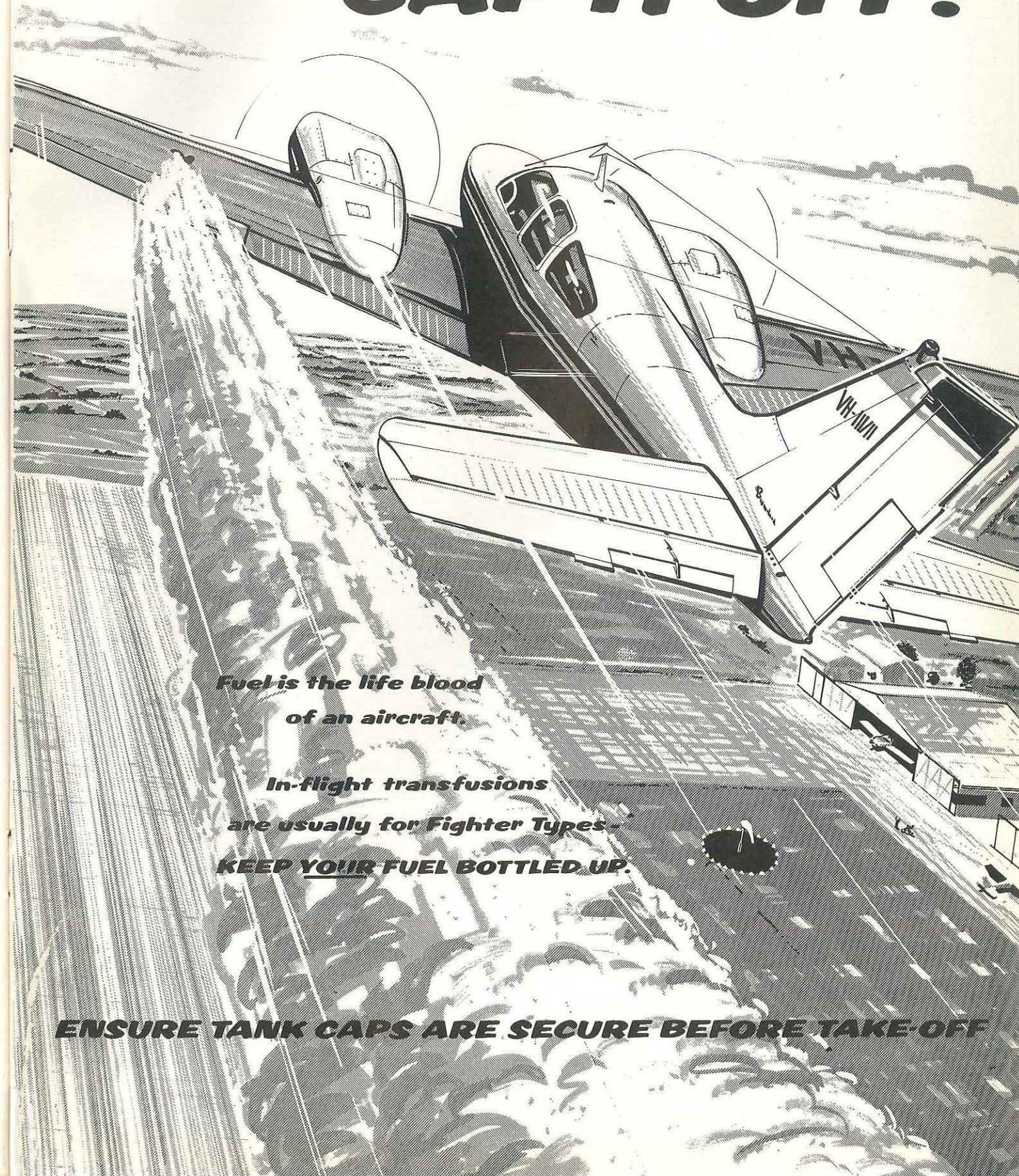
Everyone understands that, when a con rod suddenly becomes visible poking through the engine cowling and all beneath is forest and hills, a Mayday call is only sporting to the people whose job it will be to find the wreckage! I am sure however, that pilots generally do not realise that certain assistance is available in other situations if only they will declare an emergency. I certainly did not appreciate this until I read the article in Digest No. 57 about the unfortunate incident at Moorabbin. This put emergency declarations into perspective for me and developed my resolve that if or when the time comes, I will make no bones about the need for assistance or special procedures.

May I suggest that you stress very strongly in the Digest the advantage of declaring an emergency when life in the air suddenly becomes too exciting for comfort.

Comment

We are grateful to our contributor for pointing out afresh, something that the Digest has been attempting to convey to pilots for a long time. Exhortations to act when necessary on the advice contained in the Emergency Procedures printed in the front pages of the Visual Flight Guide, have appeared in the Digest on a number of occasions in recent years, as well as in the widely circulated pamphlet "Hints on Flight Planning and Navigation in Remote Areas". If results are any indication however, this advice seems to have been received with little enthusiasm. But now that it has come anew and unsolicited from a conscientious fellow pilot who has experienced the problems of outback flying for himself, perhaps more of our readers will be ready to heed it! A study of the accidents and incident reported on pages 1, 10 and 21 should also assist in reaching this conclusion, and the discussion in the article on page 18 offers further food for thought on the subject.

CAP IT OFF!



*Fuel is the life blood
of an aircraft.*

*In-flight transfusions
are usually for Fighter Types.
KEEP YOUR FUEL BOTTLED UP.*

ENSURE TANK CAPS ARE SECURE BEFORE TAKE-OFF