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AVIATION SAFETY DIGEST

DEPARTMENT OF CIVIL AVIATION AUSTRALIA

No. 50 MAY, 1967

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Department of Civil Aviation · · · Australia

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Cover: *TAA's first DC-9 "Edmund Kennedy", as seen from an accompanying aircraft during the final stages of its delivery flight.*

Aviation Safety Digest is prepared in the Air Safety Investigation Branch and published at two monthly intervals. Enquiries and contributions for publication should be addressed to The Editor, Aviation Safety Digest, Department of Civil Aviation, Box 1839Q, P.O., Elizabeth Street, MELBOURNE, C.1.

MEETING THE NEED

With this, its fiftieth issue, Aviation Safety Digest takes a further step forward in serving the interests of air safety in the Australian Aviation Industry.

Beginning with its inaugural issue in July, 1953, the Digest, for a time, appeared at rather irregular intervals, its publication being prompted by reports and other air safety education material becoming available from a somewhat adolescent civil aviation industry. With the appearance of its sixth issue, in June, 1956, the Digest finally settled down to become a quarterly magazine being issued in March, June, September and December of each year. Since that time, although there have been several changes in cover style, type face, weight of paper and latterly, with the introduction of colour, the Digest has retained its fundamental quarterly character.

Until comparatively recently, this quarterly frequency appeared to provide adequate coverage of the various aspects of air safety applicable to Australian operations. During the past two years however, the extremely rapid growth that has taken place in the industry, particularly in the field of general aviation, has engendered substantially more significant air safety education material, and in more recent months, it has become increasingly evident that a quarterly publication is no longer adequate to disseminate the information that the Department believes should be made available to the industry.

To meet this situation, the Digest is in future to appear every two months. This issue, No. 50, which would have normally appeared in June, is being published as a May issue; the following issue is to appear in July and succeeding issues are to be published at two monthly intervals from then on.

In its campaigning through the medium of the Digest, for a greater awareness of air safety on the part of everyone who is involved in the industry, the Department has been constantly encouraged by the very many constructive criticisms, suggestions and expressions of appreciation, that have been received from readers of the Aviation Safety Digest. Thus, in taking this step of increasing the coverage of the Digest, the Department hopes that the publication will be able to more effectively fulfill its function of stimulating air safety consciousness throughout the industry, and that pilots, engineers, operators, and indeed all who have a part to play in the operation of aircraft or in the promotion of the industry, will be further encouraged to strive for operations that are as accident free as it is humanly possible to make them.

DISASTROUS MISSED APPROACH

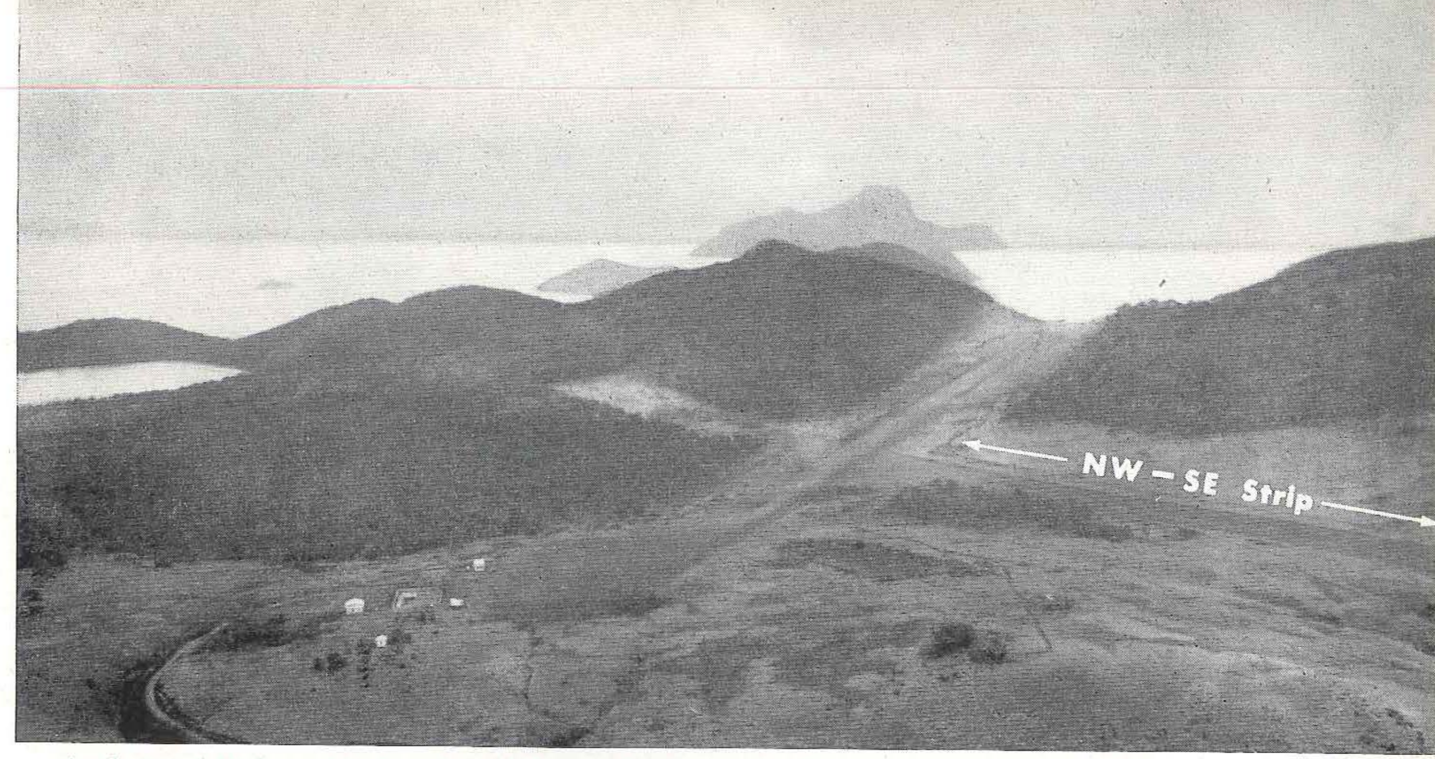
Arriving over Lindeman Island, Queensland, the pilot of a Cessna 182 made an approach to land downwind on a strip with a pronounced, but deceptive downslope. The aircraft did not touch down until half way along the strip and the pilot initiated a missed approach but the aircraft, unable to outclimb the rising ground ahead, crashed and burned. The pilot and two of the passengers escaped but the other two passengers were killed.

The pilot, who held a commercial licence with a "B" grade instructor rating, had hired the aircraft the day before at Toowoomba, to spend a few days holiday visiting some of the island resorts off the Queensland coast. Four members of his family were accompanying him as passengers. The party flew from Toowoomba to Mackay on the day preceding the accident and remained there overnight. On the morning of the day of the accident, the pilot had the aircraft refuelled to full tanks, and after discussing the meteorological forecast with the air traffic controller on duty at Mackay, the pilot flight planned to Lindeman Island, BCTA, with full radio reporting. The weather was mostly fine with a few showers to seaward off the coast and two-eighths of cumulus cloud at 2,000 feet. The wind was from the south-east at 10-15 knots and the visibility, clear of showers, was 25 miles.

The fifty-five mile flight from Mackay was uneventful in generally fine conditions, but by the time the aircraft reached the island, the cloud cover had increased. The pilot noticed there were showers and low cloud immediately to north of the island, with cloud lying around the hills on the northern approaches to the aerodrome. As he flew towards the aerodrome, the pilot saw that the south-easterly wind was blowing straight down the shorter of the island aerodrome's two strips. The other, longer strip, is aligned almost north-south.

Hills lie to the north and north-west of the aerodrome, and the pilot saw that to land into the south or south-east, would involve making a base leg in reduced visibility on the northern side of the island, and a final approach through gaps in the hills below low cloud. In any case, he had not contemplated landing into the south or the south-east for, from a visit to the island as a passenger some five years previously, he had the impression that both strips sloped uphill from the south and south-east and that, for this reason, landings on the aerodrome were always made uphill on whichever of these two strips was the more suitable. On this occasion, the pilot saw that a left hand circuit for a downwind landing on the longer, northerly strip would take him very close, if not into, the rain showers and areas of low cloud. Conscious also of the possibility that the showers might be moving over the aerodrome, and that he might then have difficulty in maintaining VFR flight, the pilot decided he could safely land downwind on the north-westerly strip if he did so without too much delay. He understood this strip to be 2,500 feet long and, as he had landed many times downwind on a strip of similar length at Toowoomba, using a short field landing technique, he did not expect there would be any difficulty in getting in on this occasion.

Because of the tail wind component, the pilot planned for a long final approach to the north-westerly strip and on turning on to base leg, reduced speed and selected two "notches" of flap. As soon as he had turned on to final, the pilot lowered full flap, trimmed the airspeed back to 50 knots and selected the propeller control to full fine. The approach continued normally until the pilot flared for landing, but the aircraft then seemed to encounter a slight updraught and would not settle as the pilot expected. Assisted by



Aerial view of Lindeman Island aerodrome looking north, showing the disposition of the two strips. This is very much the view the pilot of the Cessna would have had as he approached the island from Mackay

the tail wind, the aircraft floated more than half way along the strip before touching down.

In the nose-up attitude in which he had placed the aircraft for a short field type of approach, the pilot did not at first realise how much of the strip the aircraft was using, but shortly after the aircraft settled on to the nosewheel and he began to brake the pilot saw there was insufficient strip length in which to bring the aircraft to a stop. He applied full power, retracted the flaps to 15 degrees, and lifted the aircraft off the ground to make another circuit. At first, the aircraft seemed to be climbing away satisfactorily, but then the pilot saw that it was not outclimbing the slope which lies beyond the north-western end of the strip. The stall warning began to sound when he raised the nose to try and increase the angle of climb, and the pilot saw that the aircraft would not clear the trees ahead. Realising that an accident was now inevitable, the pilot closed the throttle and aimed the aircraft to take the initial impact with a tree on the port wing. After this, the aircraft struck two more trees and came to rest on its side facing back along the flight path. A fierce fire broke out almost immediately, and the aircraft burnt to destruction.

* * *

The aerodrome at Lindeman Island is privately owned and its owners also operate a charter service with a Drover aircraft. The Drover usually flies several times a day between Mackay and the island and for this purpose, the owners maintain a close liaison with Mackay by telephone and radio.

Before departing from Mackay however, the pilot of the Cessna did not request any information on the aerodrome at Lindeman Island, but relied on what he could remember from a visit he had made there as a passenger five years before. As well as believing that both strips of the aerodrome sloped upwards from the southern and south-eastern coast of the island, and that all landings were made uphill and take-offs downhill, the pilot erroneously believed that the shorter of the two strips, the one on which he subsequently attempted to land, was 2,500 feet long.

Aerial view of the strip from which the pilot attempted the missed approach, showing the position of the wreckage at the end of the over-run which lies beyond the north-western end of the strip

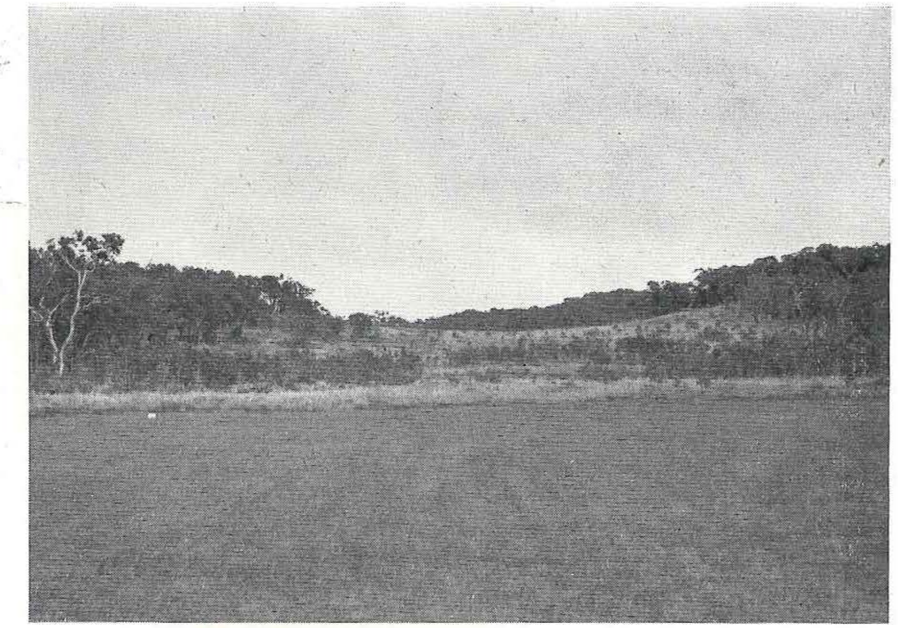
In actual fact, this strip, which is aligned north-west, south-east is 2,150 feet long, and over much of its length it slopes downwards towards the north-west.

The approach to this strip from the south-east, is over an escarpment approximately 200 feet high. The strip itself then slopes upwards two degrees for the first 250 feet, runs level for 200 feet, slopes one degree downwards for the next 600 feet, then very slightly downwards over the remaining 1,100 feet. Beyond the north-western end of the strip, an over-run slopes upwards two degrees almost to the north-western coast of the island. The strip itself reaches it lowest point at about the intersection with the north-south strip.

The weight of the aircraft at the time of the attempted landing was calculated to be 2,646 lbs. According to the relevant Cessna 182 landing chart for mainland operations, at this weight the aircraft was within permissible limits for landing on a strip of 2,150 feet at the pressure height existing at the time, and with a tail wind component of about five knots. For a landing in these conditions with a tailwind component much greater than this however, the length of the strip would have been inadequate. There was ample evidence that at the time of this landing the tail-wind component on the strip was well over five knots.

As can be seen from the aerial photographs of Lindeman Island Aerodrome, the slope of the

View looking north-west from approximately the point at which the missed approach was commenced. Note the rising ground on the over-run beyond the end of the strip.



strips is not easy to appreciate from the air. This is particularly so in the case of the north-west, south-east strip and it would be easy for a pilot to be misled from a hurried observation. Because the partly cleared over-run beyond the north-western end of the strip slopes upwards towards the hills on the north-western coast of the island, it can at first glance, give the impression of an overall upward slope on the strip, towards the north-west. This could be especially so in the case of a person with a preconceived idea that the strip sloped upwards in this direction. Nevertheless, a detailed examination of the strip from circuit altitude could have assisted in assessing the slope more accurately. In this case however, the pilot did not complete a circuit of the aerodrome before landing, and approaching the island as he did from the south-west, before turning on to final approach for a landing into the north-west, his view of the aerodrome would have been very much as shown in the picture on Page 3.

In carrying out only a partial circuit of the aerodrome on his arrival over Lindeman Island, the pilot was obviously anxious to make a landing as soon as possible, to avoid having to make a diversion, or being delayed, because of deteriorating weather in the vicinity of the island. During an interview with the pilot after the accident, it was evident that he had believed a deterioration in the weather was imminent and was anxious to make a landing before its onset.

Showers and low cloud were lying in the vicinity of the island at the time of the aircraft's approach and there was no doubt that temporary deteriorations were occurring from time to time. Similar south-easterly stream weather, in fact, persisted for two days after the accident, and during this time, it was noticed that cloud quite frequently, covered the peaks of the hills on Lindeman Island and a neighbouring island. With the deterioration in visibility in showers that occurred during these periods, light aircraft operations to and from the aerodrome became more critical and some missed approaches were made, but at no time did the weather conditions preclude operations altogether.

Notwithstanding these considerations, the Cessna, at the time of its arrival at Lindeman Island, was carrying very ample fuel reserves—enough to have held at Lindeman Island for a considerable time and then, if necessary, to have returned to Mackay. It is very unlikely that weather conditions en route to Mackay would have deteriorated to the point of making this return difficult. There is no doubt that the pilot's decision to make an immediate landing was hasty and ill-considered, but even so, this decision in itself, did not produce a situation where an accident or an incident was inevitable. Similarly, his selection of a landing strip with a downward slope and a tailwind component, although making the landing critical, did not render an accident inevitable.

The pilot made a normal approach to land, intending to touch down on or before the crest of the rise 200 feet in from the approach end of the strip. Had the pilot achieved a touch-down at this point and immediately applied full braking, it is probable that the aircraft could have been brought safely to a stop in the length of the strip. But, probably because of the wind over the escarpment, the aircraft did not touch down as the pilot intended, and floated at relatively high ground speed down the strip for some 1,200 feet before the main wheels contacted the ground.

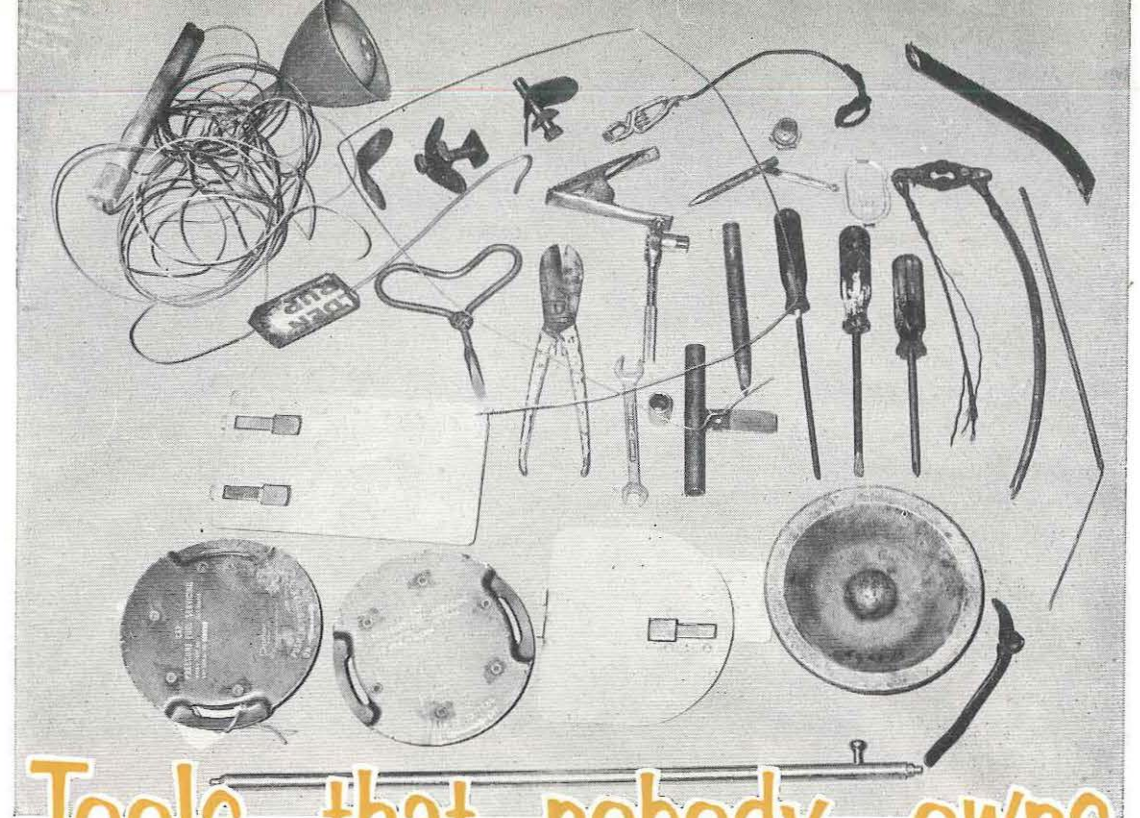
On touching down, the pilot said that he braked lightly, and only then realised that he did not have sufficient strip left in which to safely bring the aircraft to a stop. With the aircraft in a pronounced nose-up attitude during the hold-off before touching down, the pilot had not appreciated the amount of strip the aircraft was using and the hazardous situation in which it was being placed. An accident or an incident of some sort was now inevitable, for even if the pilot had braked harshly, immediately on touching down, the aircraft could not have been brought to a stop in the distance remaining and would have over-run the end of the strip. The over-run area is covered with long grass two to three feet high, and scattered small bushes and saplings up to six feet in height. There is a gully eight feet deep across the over-run, 230 feet beyond the end of the strip, and the aircraft would almost certainly have overturned if it had run this far.

The pilot said he had made the decision to execute a missed approach, as soon as the nosewheel was on the ground. Despite this, during an examination of the strip, wheel marks indicative of braking were found just north-west of the intersection of the two strips, considerably further down the strip from the point where the nosewheel made contact with the ground, and it was probable that they had been made by the Cessna. It was apparent that the missed approach was not initiated from the point of touch down, and that the aircraft lost some further speed before the pilot began the overshoot manoeuvre. Normal reaction time would probably account for 200-300 feet of the distance the aircraft travelled before it began to accelerate again.

There is no doubt that when the aircraft would not settle after it was flared for landing, the pilot should have initiated a missed approach almost immediately. Instead, the pilot's determination to complete the landing, combined with his lack of appreciation of the conditions of strip length, slope and wind, induced him to persist with the landing until he finally realized the aircraft could not be stopped within the confines of the strip and he was forced to make a split-second decision. In deciding to go around, the pilot again failed to fully appreciate the influence of the tailwind—in this instance the effect that it had in reducing the climb gradient of the aircraft. At the time of the pilot's decision, the aircraft had already been placed in the position where some sort of an accident was inevitable but there is little doubt that an over-run accident would probably not have been so costly in lives or equipment.

Cause:-

The cause of the accident was that, subsequent to an attempted landing on a strip which was unsuitable under the existing conditions, the pilot initiated a "go-round" too late for the aircraft to achieve a flight path above the rising terrain.



Tools that nobody owns . .

A Digest article "Lost and Found" early last year (see Aviation Safety Digest No. 45, March 1966) listed a number of tools and other items of equipment that had been found on the movement areas of major airports, over several preceding months. Maintenance staff had obviously left the equipment at various times in the engine bays and wheel wells of aircraft they were working on, and the items had subsequently fallen from the aircraft while manoeuvring on the airport concerned. The article went on to discuss the potential dangers that forgotten equipment of this sort can pose, particularly if a piece drops from an aircraft after it has taken off.

The accompanying photograph of tools and other equipment collected over a period at *one* major airport in Australia, shows that the problem is still far from beaten, and that maintenance personnel need to exercise a good deal more care in "cleaning up" when they finish working on an aircraft. Although some of the articles shown in the photograph are quite costly, it is remarkable that, with the exception of the trailing aerial and drogue in the upper left hand corner, no amount of enquiry has been able to establish their ownership!

When this type of incident first became prominent, the type of equipment found was, in the main, of the kind usually employed in major repair workshops. But more recently, the trend has been towards the sort of tools used in day-to-day maintenance, as the brief article at the foot of page 13 will confirm. We are concerned at this, since such work should be performed by either Licenced Aircraft Maintenance Engineers or by persons working directly under their supervision. To judge by results, it would seem that, in some cases, standards of supervision and final inspection before certification are simply not as good as might be expected.

The Department acknowledges the continuing contribution of equipment by donors who obviously wish to remain anonymous, but we would much prefer to have the tools delivered directly to our airport stores!

BEWARE OF JET BLAST

AT Adelaide Airport, a Boeing 727 was preparing to taxi from the apron for take-off. With engines running at idle thrust, the Boeing was standing at the outer edge of the apron, facing west directly away from the terminal building. The forward loading steps were still in position and the cabin door had not been closed.

At the same time a DC-3, which had just landed from Kangaroo Island, taxied on to the apron from a southerly direction, to disembark passengers in front of the terminal building. Approaching the rear of the Boeing, the DC-3 pilot slowed his aircraft, and turned slightly towards the terminal building, with the intention of keeping well clear of the tail of the Boeing while he taxied behind it before making a 180 degree turn into the DC-3 parking position immediately in front of the building *(see Fig. 1)*.

As the DC-3 turned half right and passed slowly behind the Boeing, the control surfaces and tail section of the DC-3 were suddenly subjected to severe buffeting as they entered the efflux from the Boeing's engines. Despite the efforts of the DC-3's crew to restrict the movement of the controls, the rudder was flung heavily against its stops, the elevators flapped up and down violently and the aircraft itself was swung rapidly to the right. The captain of the DC-3 opened the starboard throttle to stop the swing and succeeded in regaining control, but before he could taxi his aircraft clear, the port elevator drooped, tore away from its attachments, and was blown high in the air behind the DC-3. Afterwards, when the damaged aircraft was inspected, it was found that the starboard elevator and rudder assemblies had also been damaged substantially. *(see Figures 2, 3, and 4)*.

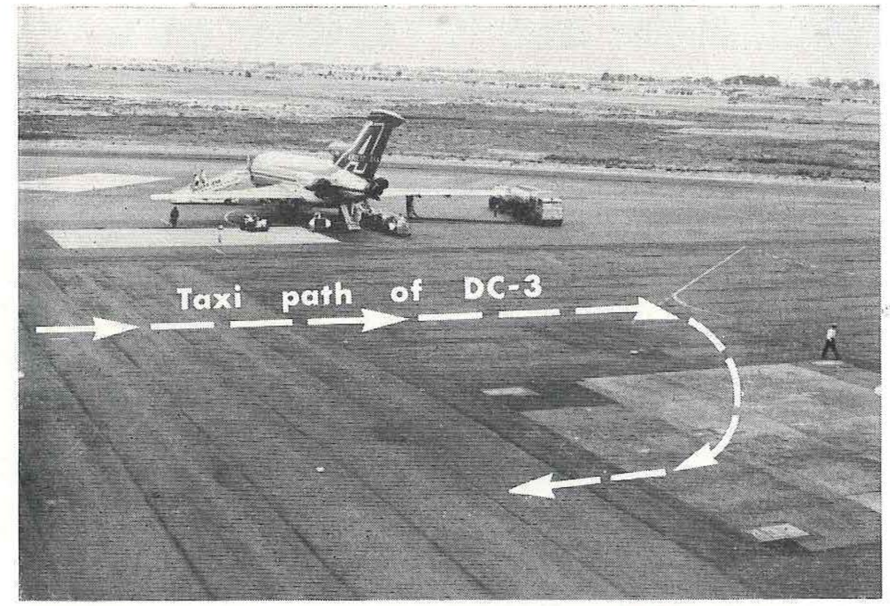


Fig. 1 Approximate taxi path followed by the DC-3 as seen from upper floor of terminal building. The Boeing 727 depicted, is in the position which a similar aircraft occupied at the time of the accident.

This is by no means the first time in Australia that an aircraft has been damaged by blast from a jet aircraft standing nearby. On another occasion, while a Boeing 727 was manoeuvring at Melbourne Airport, the blast from its jet engines damaged the elevator system of a Viscount. The two aircraft were parked tail to tail on the apron but separated by a distance of about 80 feet. As the Boeing commenced to taxi, it immediately began a small radius turn to the left away from the terminal building, initially using more than idle thrust.

Although the gust locks of the Viscount were engaged, the Viscount's elevators were forced violently to the full up position. The gust locks of the Viscount are designed to withstand tail winds of up to 80 knots so it is probable that the velocity of the jet efflux 80 feet astern of the Boeing was in excess of this figure.

There are at least two other incidents on record where Viscounts have sustained minor damage from the jet blasts of Boeing 707 aircraft. And in yet another case, the efflux behind a 727 taxi-ing on an airport apron, hurled a set of aircraft steps into a nearby fence. The force of the impact was sufficient to flatten three complete panels of chain wire fence, including uprights fabricated from two inch pipe.

What is the answer to this problem now that large jet aircraft are becoming more numerous on the apron of our airports, and must share apron space in front of passenger terminals with other types of aircraft?

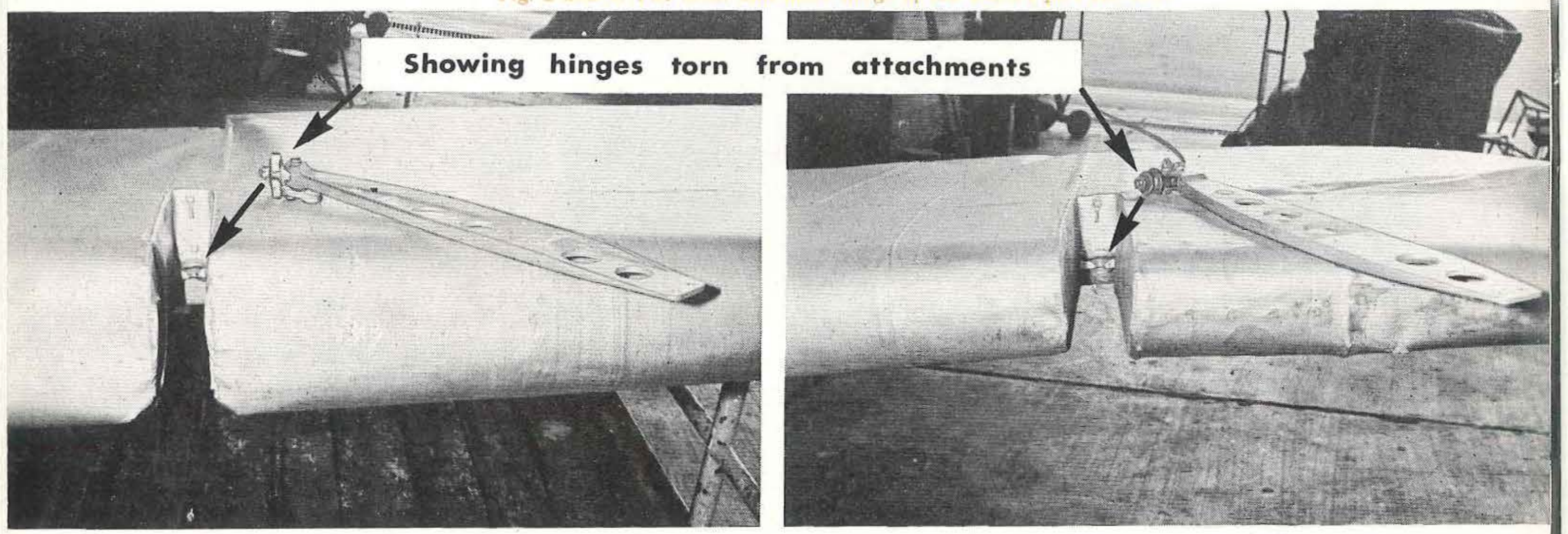
The diagram at Fig 5 shows jet efflux velocities that may be expected in the wake of a large jet aircraft on the ground. In the light of the accidents already described, however, it is clear that these values cannot be accepted as absolute, but as a guide only. It is estimated that in the case at Adelaide Airport, the tail of the DC-3 was at no time closer to the Boeing's jet pipes than 90 feet. If the Boeing's engines were at the idle thrust, as would seem to be the case since the aircraft's forward stairs were still in position, an efflux velocity of less than 30 knots is all that might have been expected. This figure is certainly much less than the velocity that would have been required to inflict the damage sustained by the DC-3. Why then the large discrepancy between the "theoretical" and actual velocities? The answer appears to lie, at least partly, in the wind that was blowing at the time. The Boeing was facing almost directly into a 12 knot westerly wind, gusting to 16 knots, and it is apparent that this had a marked effect in carrying the blast from the jet downwind towards the DC-3, producing the same effect as if the jet engines had been moved closer to the DC-3.

Tests have in fact shown that wind direction and strength can have a very considerable effect on jet efflux velocities. For example, with a Boeing 727 slowly moving directly downwind in an 18 knot breeze with its engine producing enough thrust for taxi-ing, quite small efflux velocities were felt 100 feet astern of the aircraft's jet pipes. This is in marked contrast to the velocities that must have existed not many feet closer to the jet engines involved in the cases of aircraft damage already cited.

The graph on Page 12 *(Fig. 6)* was developed from results obtained in tests conducted by one jet aircraft manufacturer and shows jet efflux velocities at varying distances behind a large airline jet at different power settings. Here again, the values given must be regarded as a guide only as no allowance has been made for the effect of wind.

All things considered, it is quite clear that a great deal of caution must be exercised on airport aprons if further jet damage incidents are to be avoided. Much wider separation of airline aircraft on aprons would be impractical, and in normal circumstances the existing spacing provided by taxi guide lines is sufficient for safe operation. Obviously, however, if proper precautions are not taken, damage from jet blast can and will occur. For this reason, it is most important that jet aircraft always follow nose wheel guide lines as

Fig. 2 and 3. The inner and outer hinge of the DC-3's port elevator.



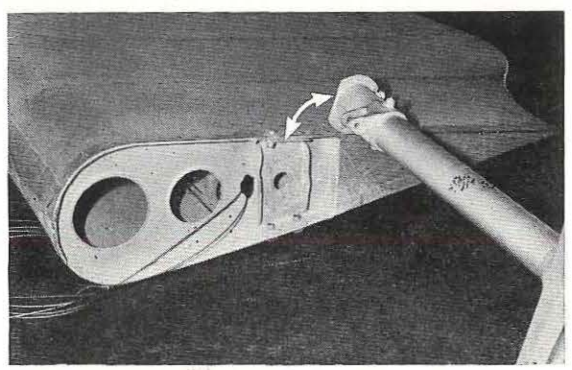


Fig. 4. Portion of the DC-3's elevator torque tube assembly, showing how the rivets which secure the tube to the starboard elevator were sheared off by the violence of the elevator's movement.

JET BLAST. . . . DANGER AREAS

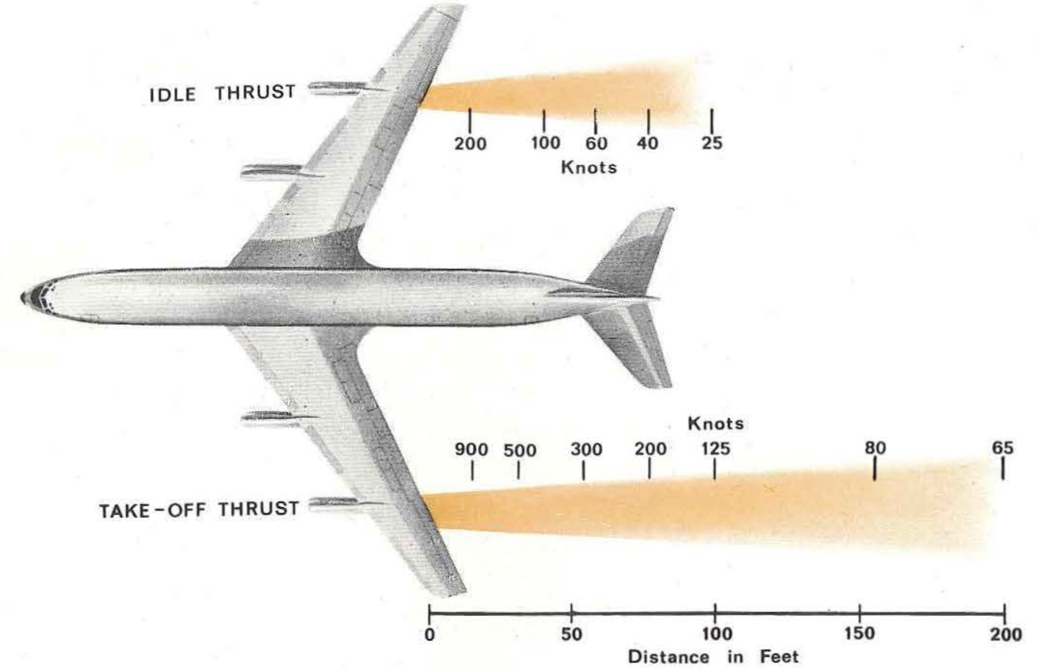


Fig. 5. Diagram showing efflux velocities that may be expected behind large jet aircraft at idle and take-off power settings.

WARNING: Wind conditions can have a marked effect on jet effluxes. These figures for still air conditions, should not be regarded as absolute, but as a guide only.

closely as possible to ensure that designed blast clearances are maintained. Airline despatching engineers should also ensure that the blast area behind a jet is clear of other aircraft, personnel, and equipment, before giving the jet aircraft captain a clearance to start his engines. Pilots of jet aircraft, for their part, should use the least possible thrust when taxi-ing on aprons, especially in close proximity to other aircraft, refuelling equipment, and buildings. Probably the most critical taxi-ing phase is when the throttles are opened to "break away" thrust to get the aircraft moving, especially if, at the same time, the aircraft has to to turn sharply or if its path is slightly uphill. In these circumstances, quite large amounts of thrust are required for a short period. For example, efflux velocities of over 70 knots have been measured 150 feet behind the jet pipe of a typical large jet at its minimum break away thrust. The intensity of such a blast, and the area it affects, is sometimes very difficult for a pilot to appreciate from the cockpit.

It is not only the aircrews and ground staff responsible for the operation of jet aircraft that need to be concerned with the problem of jet blast. Pilots of non-jet aircraft, too, must play their part. From the data that is available, it is obvious that a large number of variables can be involved, but pilots should nevertheless know what may be expected in the wake of a large jet at the thrust settings likely to be encountered on the airport apron. Light aircraft are of course the most vulnerable of all, and should never be positioned or manoeuvred behind a jet aircraft that has its engines running. Whenever possible, the same principle should apply to large aircraft, but when this is not practicable, the maximum available separation from the operating jet engines should be utilised. Pilots should also remember that the effect of jet blast will be less severe if it is directed against the nose of an aircraft, rather than the tail. Control surfaces, even with gust locks engaged, are not designed to withstand strong tail winds.

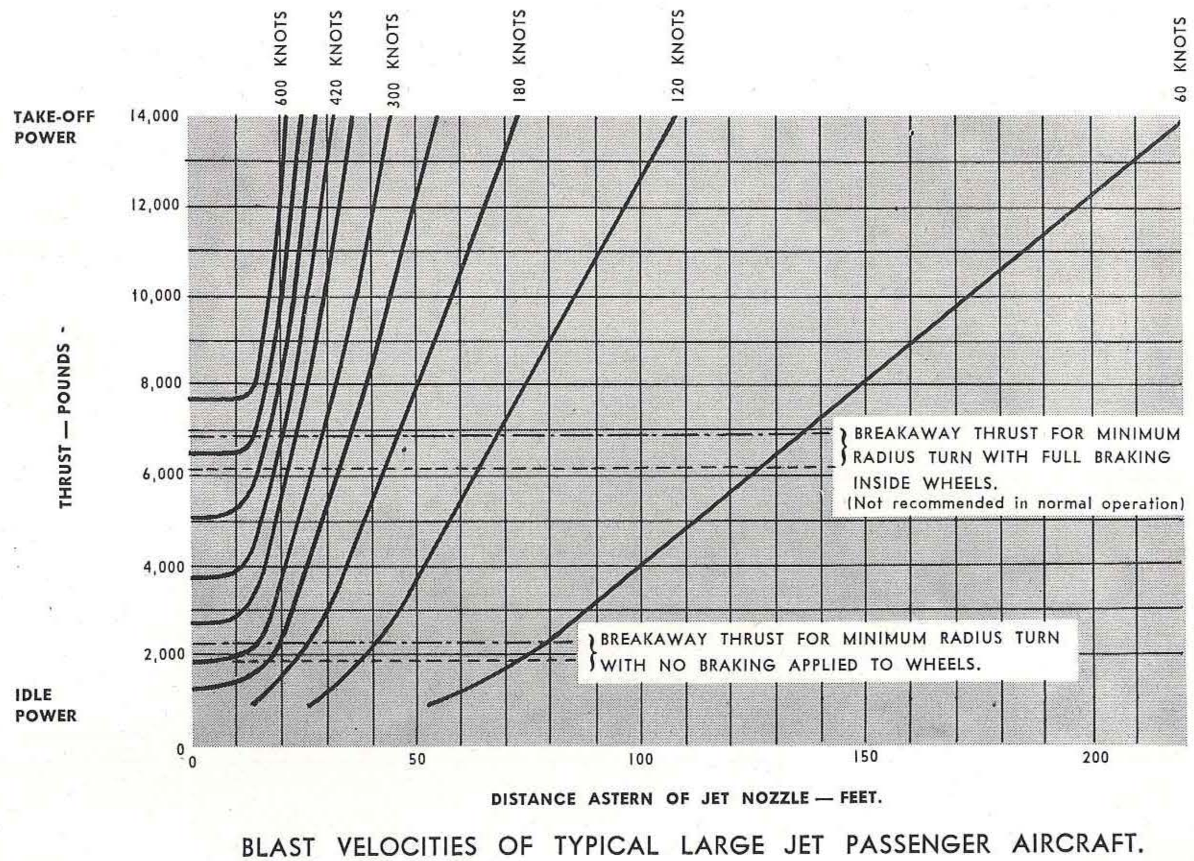


Fig. 6 Graph showing efflux velocities to be expected at varying power settings and distances from jet pipes. Note how rapidly the efflux velocity increases as distance from the jet pipe decreases, particularly at high power settings.

Perhaps the most significant point to emerge from the DC-3 accident at Adelaide Airport is that pilots need to be able to see that a jet aircraft has its engines running. Because the operation of jets on airport aprons can pose such a serious yet almost invisible hazard, it is most important that pilots of other aircraft have some means of clearly recognizing whether or not a jet aircraft's engines are operating. At present, the only way the pilot of another aircraft can know that a jet's engines are running is by the heat haze behind the aircraft, emanating from the jet pipes.

One Australian airline has adopted the practise of its jet aircraft using their anti-collision beacons to signify that the pilot is ready to start the engines, and of leaving the beacons switched on the whole time the engines are running. This is a procedure that is used widely by jet aircraft in other parts of the world and it has a great deal of merit. It gives a positive indication to other pilots that a jet aircraft's engines are either running or about to be started.

As a result of the accident at Adelaide Airport, the Department has decided to adopt this practice as standard for all civil jet aircraft in Australia. This new requirement, together with an admonition to pilots to "keep their distance" whenever an anti-collision beacon is displayed on a jet aircraft, is now being incorporated in Aeronautical Information Publications, and in the Visual Flight Guide.

The introduction of this new procedure, together with the co-operation of pilots and ground crews in becoming more "blast conscious" of jets manoeuvring in close proximity to other aircraft and equipment, should go a long way towards eliminating the type of incidents described in this article.

More Thoughts on — SARTIME

To all of us who use SARTIME as a basis for obtaining a Search and Rescue Service if the worst should happen, the thought of someday forgetting to "Cancel SAR" hangs over our heads like the Sword of Damocles.

Indeed, much time and thought has been devoted to attempts to develop a foolproof method of remembering to cancel one's Sartime at the end of a flight, and so banish this anxiety neurosis that seems to plague us whenever we fly. Aero clubs have erected "Cancel SAR" signs over Club Room doors, notices have been hung in briefing rooms, and plaques have been installed on aircraft instrumental panels. The Department has lent its weight to this Cause by such measures as printing a warning in bold letters at the foot of Flight Plan "B"!

But seemingly for the absent minded, even all these efforts can sometimes be in vain. One otherwise most worthy pilot who offended recently and wrote to express his regret, told us of his latest development in this war of nerves. "I am truly sorry for the occurrence," he wrote. "To avoid its repetition, I have placed above the switches on the dashboard, and on the door where I lock the aircraft, separate notices 'Cancel Sartime'. In addition, I hang around my neck a medallion inscribed 'Cancel Sartime'. These things I have done because I deeply appreciate the search and rescue service conducted by the Department."

The pilot's sentiments, together with the strenuous efforts he has made to come to grips with his problem are much appreciated. But one point seems still to be resolved. Where is he to put the notice to remind him to look at his medallion?

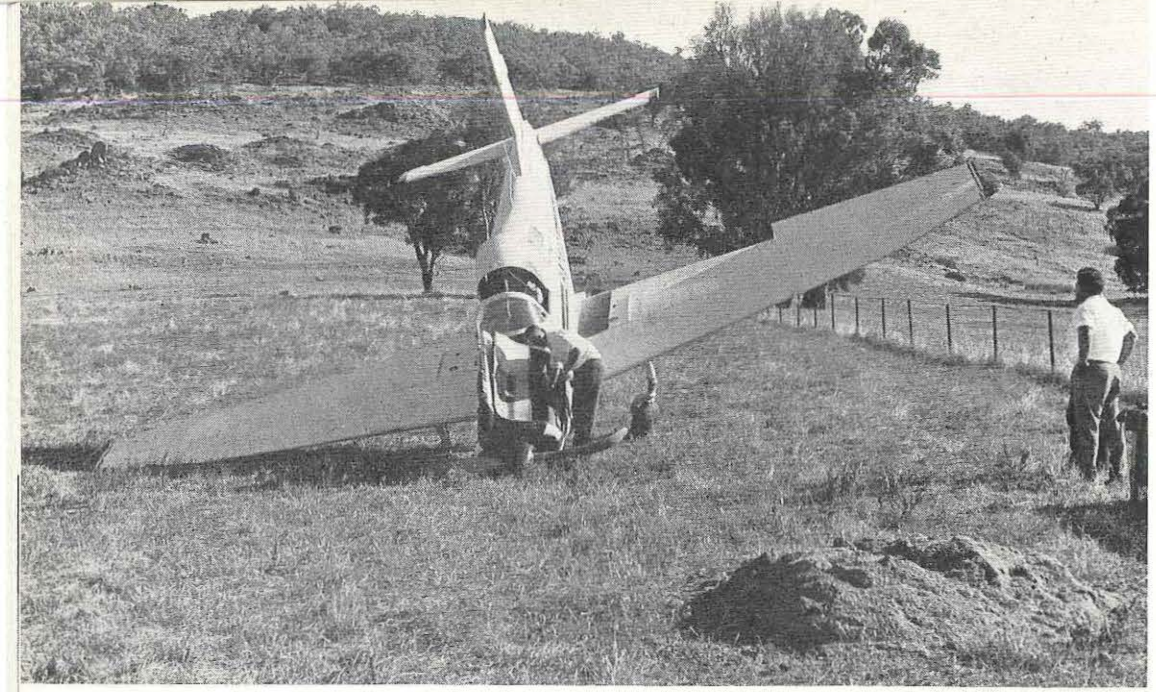
Forgotten Tools Again

Departing on a regular public transport flight from Goroka to Lae, New Guinea, the crew of a DC-3 heard a bang during take-off. They continued the flight but had the aircraft inspected on arrival at Lae. It was found that the starboard propeller had been struck by a small, hard object, which had then been flung against the wing root, puncturing the fairing.

A search was made at Goroka and a spanner found on the runway. The L.A.M.E. who owned the spanner, admitted that he had forgotten it after repairing a windscreen wiper, and had left it on the nose of the aircraft. Because of a shortage of maintenance staff, he had been exceptionally busy, and had finished work on the aircraft after dark by torchlight.

The incident is another exemplification of the old adage "more haste—less speed". Regardless of operational urgencies, it is dangerous for L.A.M.E.'s to undertake more work than they can thoroughly check. (See also "Tools that No One Owns", page 7).

CONFUSION -- BY DESIGN



The pilot of the Cropmaster in this picture was carrying out a superphosphate top dressing operation in hilly country south-west of Albury, N.S.W. Before taking off from Albury to begin the day's work, he had refuelled his aircraft, filling both tanks to capacity. The pilot then flew to the agricultural airstrip from which he was to work and began spreading.

After completing several loads, the pilot found that the early morning sun, rising above a ridge beyond the take-off end of the strip, was making visibility very difficult, so he ceased work until conditions improved.

The pilot resumed spreading operations an hour and a half later, and carried out some further runs. When he landed after completing about his tenth load, the pilot checked his fuel gauges, noted he had used most of the contents of the port tank, and changed the fuel selector, as he thought, from the port to the starboard tank. His subsequent take-off was normal until the aircraft reached a height of about 50 feet, but then the engine failed without warning. The pilot dumped his load immediately and returned the fuel selector to the port tank, but the engine showed no sign of recovering power, and the pilot had no alternative but to make the best forced landing he could in the circumstances.

The paddock immediately below the aircraft at the point of engine failure was a short one, bounded on its far side by a stout post and wire fence. Too high to attempt to put the aircraft down here, the pilot was forced to try and reach the paddock beyond, in the direction in which he was flying. The aircraft, however, failed to clear the fence, and struck the ground heavily. The starboard undercarriage was sheared off, and the aircraft slewed to the right, cartwheeled and came to rest on its nose. The pilot was not hurt.

* * *

An examination of the aircraft established that the engine had failed only from lack of fuel. The starboard tank was almost full but the port tank was virtually empty.

During the investigation, it was found that the pilot had taken over the operation of this aircraft only a short time before the accident occurred. Before this, he had been flying another Cropmaster belonging to the same operator for a considerable period. The fuel tank selectors of each of these two aircraft, though at first glance identical, differ from each other in one important respect as illustrated by the photographs and diagrams on the opposite page.

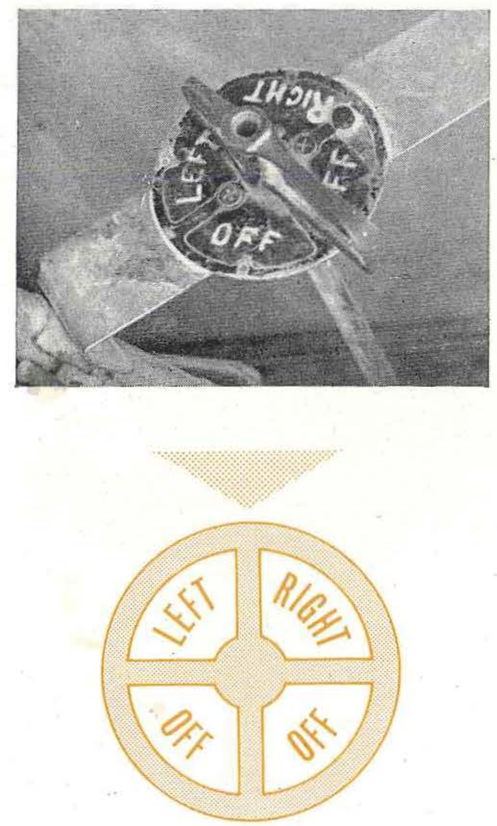
It will be noticed in the second aircraft, the selector position which corresponds with the starboard tank position in the aircraft the pilot was flying originally, is in fact the off position!

The pilot said that just before he changed tanks, preparatory to beginning the take off on which the accident occurred, he had checked the fuel gauges and saw that the port fuel tank was reading almost empty and the starboard tank full. At this same time, the pilot said, the loader vehicle was manoeuvring up to the aircraft, and while keeping his eye on the loader, he had changed tanks without actually looking at the selector.

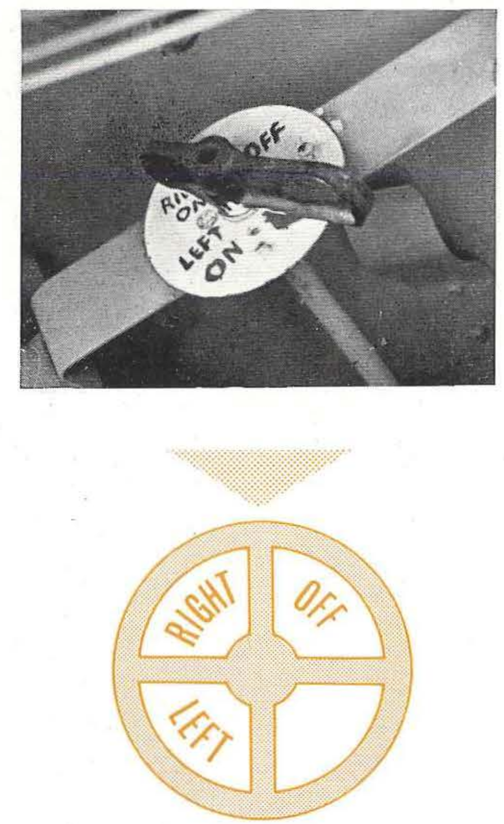
In the absence of any other reason for the failure of the engine, it is possible that from force of habit, the pilot positioned the fuel selector in the way he had been accustomed to in the aircraft he had been flying previously, but this in effect had turned the fuel off. The fuel remaining in the lines and carburettor had been sufficient for the aircraft to take off and climb to 50 feet but at this point the engine failed from fuel starvation.

Confusion over fuel selector positions has been responsible for other forced landings (see "Fuel Mismanagement — Forced Landing", Aviation Safety Digest No. 43, September, 1965). Previously, these misunderstandings have occurred when pilots have changed from one type of aircraft to another. Variations in fuel selector layout in aircraft of different types are certainly enough of a problem, yet it is one that can be met adequately if pilots properly familiarize themselves with the fuel system of the particular type of aircraft before they fly. But when fundamental though not obvious, differences exist in controls as vital as fuel selectors, in aircraft of the same type and in the same fleet, an accident sooner or later is surely almost inevitable.

The moral for operators should be clear.



Left: Fuel selector in aircraft pilot was flying previously.



Right: Fuel selector in aircraft involved in accident.

TREES SNARE CESSNA

ABOUT mid-afternoon at Lae, New Guinea, Flight Service Unit officers received a call from a Cessna 210, advising that it was taxi-ing at Dona preparatory to departing for Lae. Dona is a mission station 70 miles south-east of Lae, and the strip there is classified as a Private Landing Area.

Six minutes later, when the aircraft had not passed a departure report and failed to answer calls directed to it, Lae declared the Alert Phase and a DC-3, which had just departed Lae for Girua, 145 miles to the south-east, was briefed to watch for the aircraft en route. Almost immediately afterwards, the Cessna called again to transmit a Mayday call and the pilot reported he had crashed on take-off. The pilot had suffered a broken wrist and the front passenger had sustained minor injuries, but the two rear seat occupants had escaped unscathed. Although the radio was still serviceable, the aircraft was badly damaged.

Lae then requested the DC-3 to overfly Dona and transmit advice to the Cessna that aid would arrive at Dona within the hour. Twenty minutes later, the DC-3 reported it was over Dona and had sighted the crashed aircraft and the occupants.

In the meantime, a Cessna 180 was requisitioned at Lae to take a doctor and medical supplies to the scene of the accident. The relief aircraft arrived at Dona an hour and a half after the accident occurred, and when the doctor had treated the two injured, they were flown back to Lae. The other two occupants of the wrecked aircraft remained overnight at Dona, and were flown out the next day.

* * *

The pilot of the crashed aircraft, had landed at Dona on the day preceding the accident. With three passengers, he had been making a private flight from Port Moresby to Lae. When the aircraft was abeam Lasanga Island, 40 miles south of its destination, deteriorating weather had closed Lae, and the pilot had diverted to the east, intending to proceed to Popondetta and remain there overnight. En route to Popondetta however, he sighted the strip at Dona, and after obtaining its dimensions by radio from Lae, decided to land there instead of continuing the additional 75 miles to Popondetta. After inspecting the strip as closely as possible from the air, the pilot made an uneventful landing and the party remained at Dona overnight.

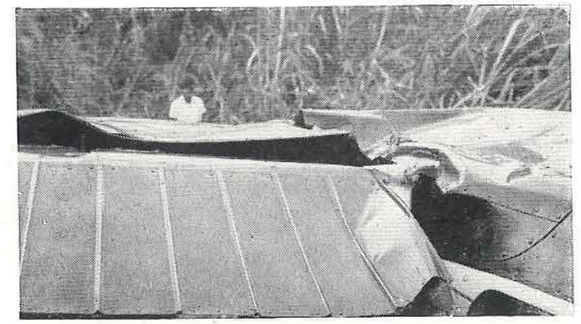
It rained heavily at Dona in the night, and on inspecting the strip in the morning, the pilot decided to delay taking off until the afternoon, to allow time for the strip to dry out. As well as being wet, the grass on the strip was about 18 inches high and during the day the pilot arranged for a tractor belonging to the Mission at Dona, to be driven over the strip a number of times, towing sheets of steel matting, to attempt to flatten the long grass.

By 1500 hours, the pilot considered the strip had dried out sufficiently. He and his passengers boarded the aircraft, and soon afterwards it began a take-off from the strip in a northerly direction. The take-off seemed normal at first, but about midway down the strip, the aircraft ran through a boggy patch of ground and its acceleration was retarded. The pilot nevertheless continued the take-off and the aircraft left the ground 150 feet from the southern end of the strip. The aircraft subsequently failed to climb away normally and it struck the top of banana palms growing at the end of the strip. The starboard wing dropped, and the aircraft plunged into the undergrowth and fell heavily to the ground. It came to rest in a level attitude, but very extensively damaged, 250 feet beyond the end of the strip.

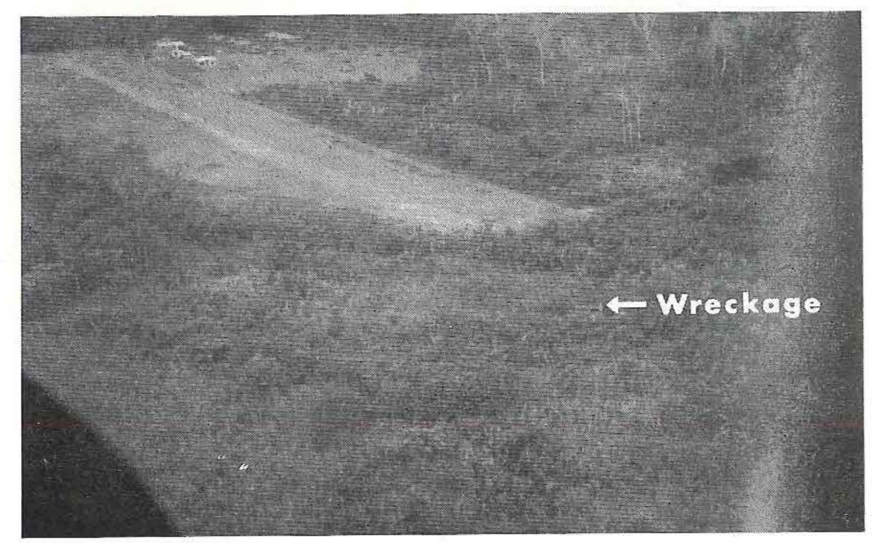
In an interview later, the pilot said that, for the take off, he had selected 15 degrees of flap then held the aircraft on the brakes until he had opened the throttle fully. The aircraft accelerated rapidly once he released the brakes, and quickly attained a little over 40 knots. At this stage, the pilot said, the aircraft encountered a muddy patch on the strip and it stopped accelerating. On regaining firmer ground, however, the air speed indicator was still registering 40 knots so he decided to continue the take-off. He lifted the aircraft off at 55 knots, but instead of climbing away normally, it mushed and struck the top of trees at the end of the strip. When the aircraft had finally come to rest in the undergrowth, he had turned off all the switches and he and his passengers left the aircraft.

A witness who was watching the take-off from the strip, said that the aircraft seemed to accelerate normally, but it did not leave the ground until it had run almost the full length of the strip. From his position, the witness did not see the aircraft hit the trees at the end of the strip; rather the aircraft appeared at first to climb over them but then seemed to enter a diving turn to the

The badly damaged aircraft as it came to rest in the undergrowth beyond the end of the strip.



This view of the port wing root gives some idea of the very extensive damage sustained by the aircraft.



Aerial view of Dona airstrip showing the wreckage of the aircraft lying in the undergrowth beyond the northern end of the strip.

right, after which there was a sound of impact. The witness said that at the time of take-off, the strip had dried out to a degree, but there were still boggy patches in several places.

The strip at Dona, which is 1500 feet long, is privately owned and seldom used. On the occasions it is required for use, arrangements are made beforehand for the grass on the strip to be cut. The strip had not been used for some time before the Cessna 210 landed and as well as there being long grass on the strip, wild banana palms had grown to about 15 feet at its northern end. This had reduced the strip's effective operational length from 1,500 feet, down to only about 1,050 feet.

The pilot of the 210, who had flown the aircraft from Sydney for a holiday trip to Papua/New Guinea, had with him a mainland take-off performance chart for the aircraft type. Although, according to this chart, 1,500 feet of strip would have been sufficient for the aircraft to take-off safely at its loaded weight, with only 1,050 feet of strip, the aircraft's loaded weight would have been about 478 lb. in excess of the safe limit. As well as this, the mainland chart does not take into account surface conditions and the figures from which it is derived, are obtained on a strip surface of short, dry, grass. These conditions are in sharp contrast to those at Dona at the time of the attempted take-off. At the aircraft's loaded weight, the take-off safety speed according to the chart was 66 knots but in this case, the pilot had been forced to lift the aircraft off at 55 knots. This speed was insufficient to enable the aircraft to make the immediate initial climb that would have been essential for it to clear the obstructions at the end of the strip.

Altogether, taking into consideration the state of the strip and the performance of the aircraft at its loaded weight, it is quite evident that the pilot had little chance of successfully completing a take-off in these conditions.

As an airstrip in the Private Landing Area category, operations from Dona are confined to aircraft belonging to owners of the strip, and which are listed for operations in Papua/New Guinea under Category D (These aircraft categories are set out in AIP AGA-2-3). Any such operations are also subject to aircraft performance limitations, as determined from the relevant aircraft performance charts for Papua/New Guinea.

Such restrictions on the use of Private Landing Areas in Papua/New Guinea, exist for the express purpose of preventing the type of accident that occurred at Dona. In this case, the pilot was from the mainland and had no experience, and apparently little knowledge, of Papua/New Guinea operations. Had the pilot briefed himself more thoroughly beforehand on the pitfalls peculiar to operating aircraft in Papua/New Guinea, the situation in which he placed the aircraft by landing at Dona, could easily have been avoided.

Cause:—

The probable cause of this accident was that the pilot elected to take-off at a time when the condition of the strip demanded a level of performance from his aircraft which was beyond its capability at the weight at which it was being operated.

FALSE ALARM

A few minutes after taking off from Archerfield for Coolangatta, Queensland, the pilot of a Victa Airtourer reported that smoke was coming from the engine cowling and that he was returning.

The aircraft made an uneventful landing six minutes later, and it was found that the smoke was generated by cleaning fluid with which the engine compartment had been sprayed a short while before the aircraft departed. Although the engineer responsible had blown out the engine compartment with compressed air after cleaning it down, he had not given it a thorough drying before replacing the engine cowlings.

Residual cleaning fluid in the engine compartments of light aircraft has given pilots some anxious moments on a number of occasions recently. It is good practice to run an engine on the ground for a few minutes after it has been cleaned down, to ensure that any remaining dregs of cleaning fluid are evaporated before the aircraft is flown.

. . . Safe Cargo?

FROM time to time, the safety of an aircraft is jeopardized by goods or materials of a potentially dangerous nature, which have been consigned by, or carried on to, that aircraft by unthinking people. Lest any readers feel that the subject of dangerous goods is one about which rather a lot of fuss is made unnecessarily, it is as well to remember that only six years ago, a freighter DC-3 was destroyed in New Guinea after chemicals in the cargo it was carrying caught fire. On this occasion, the crew made an emergency landing in time to escape safely, but the aircraft was completely burnt out on the ground.

During the last few months there have been several more incidents in which the safety of aircraft was compromised. Three of these are of particular interest and could well have had much more serious consequences.

In one of these incidents, mercury was spilt from a plastic bottle loosely packed in a box being carried as passenger's luggage. The box had been flown from Darwin to Alice Springs in a Fokker Friendship, and at Alice Springs was transferred to a Lockheed Electra bound for Adelaide. The leakage was discovered only when the box was being unloaded from the Electra at Adelaide airport. Both the Friendship and the Electra were immediately taken out of service and action was taken to remove any effects left by mercury on the structure of these aircraft.

The consequences which can result from mercury coming in contact with aircraft structures are extremely serious because the effect of mercury on aluminium alloys can be particularly corrosive. A natural protective oxide film is normally present on the surface of aluminium alloys, but if this film is scratched or damaged in the presence of mercury, amalgamation takes place. This amalgamation prevents the restoration of the oxide film and if any moisture is present, extremely rapid and uncontrollable corrosion occurs immediately. In laboratory tests, it is possible to actually watch this corrosive process taking place. In a matter of minutes, sheet alloy can grow whiskers of the corrosion product, and complete penetration of the sheet can take place. From an airworthiness point of view, mercury contamination of an aircraft structure is most serious in structural joints and overlapping skin surfaces. In these places, it is almost impossible to ensure that the mercury has been removed completely, and any relative movement of these parts can cause damage to the natural oxide film and protective finishes, thus permitting amalgamation to take place and the subsequent corrosion to develop unseen.

The other two incidents of note, involved leakage of motor fuel from cargo being carried in aircraft. In one case, samples of motor spirit being carried for a major oil company leaked in flight while being transported in a Fokker Friendship. The three small wooden boxes containing the fuel samples, had been placed aboard the Friendship at Wyndham, destined for Perth, and at the captain's instruction, were loaded into a locker in the cabin so that they could be kept under the crew's scrutiny. Some time after departure, as the aircraft was approaching flight level 180, the senior hostess reported to the captain that strong petrol fumes were causing the passengers discomfort, and at about the same time the crew began to smell the fumes in the cockpit. The fumes soon affected the crew to the extent of causing nausea and headaches. The first officer left his seat to break open the boxes and examine the contents while the captain put on his oxygen mask to try and counter the effects of the fumes.

The first officer found that the contents of only one of the three boxes was intact. In the other two boxes, the seals on the two-pint tins were defective and in one case, the tin had been loaded upside down inside the box. The sawdust and shavings which had been packed inside the boxes around the tins was saturated and some of the motor spirit had spilled out on to the floor of the cabin locker. While the first officer was cleaning up the spillage, the captain considered whether he should return and land at Wyndham. Instead however, he tried raising and lowering the cabin altitude while still maintaining cruising level, to effect a more rapid change of air in the aircraft's cabin, and after a time the strong fumes began to dissipate.

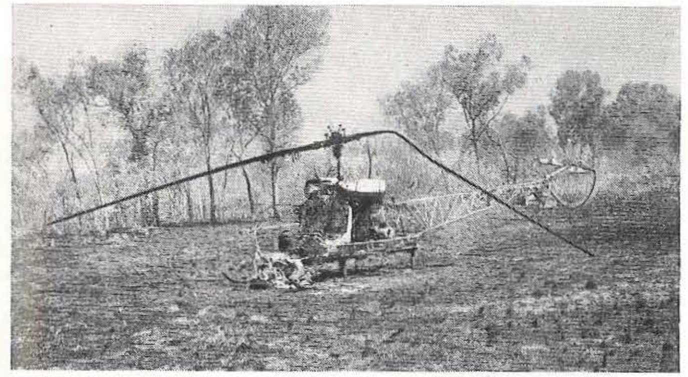
Notwithstanding the fact that the captain turned on the *"No Smoking"* sign in the cabin, and briefed the hostesses to ensure that the sign was strictly observed by the passengers, his decision to use oxygen in this instance to overcome the effects of the fumes, created an even more hazardous situation. The oxygen enrichment of the cockpit atmosphere resulting from the use of the oxygen, together with the fuel vapour already present inside the aircraft would have produced a highly inflammable mixture, and in the event of any source of ignition occurring, even a minor electrical short circuit, could have produced an explosive conflagation in the aircraft.

In the other incident, fuel leaked from freight being consigned on a Boeing 727 at Perth airport. While the freight was being loaded into the aircraft, one of the porters reported that he could smell petrol coming from a wooden box. The box, which was approximately 2′6″ square, was off-loaded from the Boeing and the lid unscrewed. It was found to contain an industrial engine, fitted with a half-gallon petrol tank that was nearly full of petrol. The discovery was made only because the engine happened to be turned on its side during the loading operation, allowing the fuel to leak out of the filler cap vent hole.

These three incidents show that, despite most stringent requirements covering the carriage of dangerous goods set out in Air Navigation Orders, Part 33, leakages of a potentially hazardous nature still occur. The very elaborate measures which had to be taken to check the two aeroplanes involved in the mercury spillage incident, cost the operating company several thousand dollars, quite apart from indirect costs involved with aircraft re-scheduling and aircraft "down time". The fuel leakage incidents also involved considerable expense in investigating the circumstances of the incidents.

* * *

These three case histories emphasize once again how necessary it is for everyone associated with the handling of air cargoes to be constantly vigilant for goods of a dangerous nature, to ensure that they know exactly what they are accepting or despatching, and that they know that the relevant packaging requirements have been met. Incidents such as these could certainly involve the consignors or carriers in prosecutions for a violation of Air Navigation Regulations. Much worse than this however, they have a real potential for results infinitely more serious—a major aircraft disaster resulting in heavy loss of life.



Remember this one?

— NOW ANOTHER HELICOPTER SETS THE GRASS ON FIRE

In the December issue of the Digest we published a warning to helicopter pilots on the danger of fire when landing in long dry grass, and quoted two instances in which helicopters were damaged by fire in this way (See "Helicopter Pilots—", Aviation Safety Digest No. 48, December 1966).

A third instance occurred quite recently in Arnhem Land, when another helicopter, engaged in a soil sampling operation, landed in a clearing. The sampling geologist stepped out and the pilot followed, after tightening the friction nuts on the flight controls, because the engine was to be left idling. The engine exhaust set the surrounding grass on fire and it spread rapidly, forcing the crew back from the helicopter. The pilot grabbed a branch of a tree, quickly beat a path to the cockpit and managed to reach in and open the throttle before he was driven back again by the flames. The increased rotor wash fanned the fire outwards from the aircraft and the pilot was then able to enter the cockpit, climb in and take-off. He landed again half a mile away to pick up the geologist, and after ensuring that the helicopter was airworthy, flew it back to its base. Fire damage in this case, was confined to distortion of the starboard door and the lower section of the cockpit bubble, and slight "cooking" of the shroud assembly and electrical insulation.

The pilot's quick action in operating the throttle to fan the fire away from the helicopter, undoubtedly helped save the aircraft from serious damage or even complete destruction. It must be remembered however, that with the relatively slight loading that is sustained by the engine when the rotor has no significant pitch applied, such a hurried throttle opening is fraught with the danger of overspeeding the engine, causing damage to the transmission and rotor assemblies. For this reason, such drastic measures can only be justified in an emergency, and even then, extreme caution should be exercised.

Caught out by CARBURETTOR ICE

THIS forlorn looking Victa Airtourer was being flown on a cross country navigational exercise in Queensland, by a woman pilot holding a restricted private pilot licence.

Having successfully completed the first two stages of the cross country flight, the pilot refuelled her aircraft at Bundaberg and it took off on the third leg of the exercise at 1300 hours local time. The weather was fine with a surface temperature of 25 degrees centigrade and there was four eighths of cumulus cloud at 3,500 feet.

After setting course from Bundaberg for Kingaroy, the pilot climbed to 3,000 feet to cruise just below the cloud base. A little over half an hour later, just after passing abeam Biggenden in the ranges forty miles south-west of Bundaberg, the engine exhaust note seemed to lose its healthy crackle and the engine began to run hesitantly. From time to time there would be a slight abnormal vibration in the engine and the R.P.M. needle would fluctuate for a moment or two, then all would seem normal again until the cycle repeated itself a few moments later.

The pilot opened the throttle slightly to maintain the desired power setting of 2,500 R.P.M., and checked the magneto switches, but could find no fault in the ignition system. The engine fluctuations continued however, with the performance gradually deteriorating, and the pilot gained the impression that the engine was starving for fuel. She tried applying a small amount of carburettor heat, but this did not appear to make any significant difference to the engine's performance, and after a short time she returned the carburettor heat control to the cold position. By this time, the aircraft was approaching Murgon, twenty miles north of Kingaroy, and rather than try to continue the flight to her destination, the pilot decided to look for a suitable landing area before the engine power deteriorated too far. There is another aerodrome at Wondai, six miles beyond Murgon, but as the pilot considered that the terrain in between is unsuitable for a forced landing and the engine performance was now causing her concern, she decided to land in a nearby open area while she still had some engine power left.

Although there was virtually no wind, the pilot decided to make a flapless landing and, with the throttle closed, made a gliding approach to land at 70 knots. Just before crossing a line of tall trees on the boundary of the clear area, the pilot tried to apply some power but the engine would not respond. The aircraft cleared the trees but, as the pilot rounded out to check the rate of descent, the aircraft struck the ground very heavily in a three point attitude. The nose wheel broke off and the aircraft fell on its nose and skidded for nearly 100 feet. Towards the end of the skid, the starboard wing dug into the ground and the

aircraft slid to the right, coming to rest at 90 degrees to the approach path. The pilot was unhurt and after quickly turning off the switches and fuel, she left the aircraft. The aircraft did not catch fire.

* * *

During the subsequent investigation of the accident, it very quickly became clear that there were three possible factors to be considered in determining the reason for the loss of engine power:—

- A mechanical or electrical malfunction in the engine.
- Contamination of the fuel.
- Meteorological conditions.

An examination of the engine and its systems showed that it was in excellent condition and there was nothing to suggest that any defect had existed which could have caused the loss of power which the pilot experienced.

Samples of fuel taken from the aircraft's fuel system were tested by the oil company which had refuelled the aircraft, and were found to be free of contamination. It was also established that other aircraft which had been refuelled from the same refuelling point at about the same time as the Victa, had also been free from any malfunctions suggestive of fuel contamination.

An investigation of actual weather conditions in the Murgon area at the time of the accident, indicated that conditions were conducive to the formation of carburettor ice. At surface level, the air temperature was 25 degrees centigrade with a dew point of 13 degrees and a relative humidity of 46 per cent. There was four eighths of cumulus cloud at 3,500 feet and it was estimated that at 3,000 feet, the height at which the aircraft was cruising, the relative humidity could have been as high as 80 per cent with an outside air temperature of 17 degrees centigrade. It was also learned from a Departmental Examiner of Airmen, who happened to be flying a light aircraft some eighty miles south of Murgon on the afternoon of the accident, that he had experienced persistent carburettor icing throughout his flight.

Questioned again later about her use of the carburettor heat control after the engine trouble had developed, the pilot explained that she had pulled the carburettor heat control out approximately half way and had left it there for about two minutes before returning it to the cold position. The pilot had a theoretical knowledge of the symptoms to be expected from carburettor icing but had had no other practical experience of observing these symptoms in the three and a half years she had been flying.

When the pilot was actually confronted with carburettor icing on this flight, she had obviously not recognized the condition and the "half measures" she had adopted to check the possibility of carburettor icing were clearly ineffective in removing the ice that had evidently already formed. Had the pilot applied full carburettor heat to remove the ice when the engine symptoms first became apparent and then subsequently corrected any further indication of icing, there is little doubt that the loss of engine power would have been prevented and there would have been no need for the pilot to have attempted a precautionary landing. Thus, although the direct cause of this accident was that the pilot allowed the aircraft to strike the ground heavily during a precautionary landing, which she had quite unnecessarily decided to make without flaps, the fact remains that the accident would not have occurred at all if the pilot had employed the correct procedure to counter the effects of carburettor ice.

This is by no means the first time that undetected carburettor ice has led to an accident to a light aircraft in Australia. Indeed, just one year ago in an article entitled *"Be Alert for Carburettor Ice"*, the Digest discussed the problem in detail and warned pilots of the dangers of not recognizing the symptoms of carburettor icing in time to take effective corrective action. It is obvious that there are still some pilots who need to study this subject carefully, especially now that winter weather is approaching again.

Space does not permit us to publish the article again in the Digest at the present time, but as the matter is of such importance to pilots of light aircraft generally, and as there may be a number of recently trained pilots who have not yet had the opportunity to read the article, the Department is prepared in this instance to make reprints of the article available to pilots and flying training schools on request. Applications for reprints should be forwarded to the Editor at the address shown in the inside front cover of this Issue.

The Wrong Fluid

WHILE checking the water methanol tank contents of a Fokker Friendship during a refuelling stop at Derby, Western Australia, it became apparent to the refuelling attendant carrying out the work that the water methanol already in the tank was contaminated with turbine fuel. Rather than draining and flushing the aircraft's water methanol tanks to remove the contamination, it was decided to pump in fresh water methanol to attempt to float the turbine fuel out through the filler necks of the tanks. During this pumping, the refuelling attendant discovered to his dismay that he was in fact pumping in more turbine fuel from an apparently uncontaminated water methanol dispensing unit. Further checks then revealed that the drum branded "water methanol" on the dispensing unit actually contained turbine fuel.

An investigation to determine the reason for this highly dangerous state of affairs established that, two days previously, a quantity of turbine fuel had been pumped out of a Fokker Friendship to avoid overloading. At the time, the only suitable container available at the airport into which the fuel could be pumped was an empty water methanol drum. After transferring the excess turbine fuel from the aircraft into this drum, the refuelling attendant responsible had neglected to mark it in any way to indicate that it did not in fact contain water methanol. A further unfortunate set of circumstances subsequently led to the drum being placed on the water methanol dispensing unit and used to service the same Friendship on two occasions.

This incident had all the makings of an accident, and it was obvious that a disaster was avoided only by the narrowest of margins. In the Rolls Royce Dart engines fitted to Fokker Friendship aircraft, water methanol is injected up stream from the combustion chambers during take off, to increase the density of the fuel/air mixture and enable normal take off power to be developed at higher ambient temperatures. Some years ago, in the United Kingdom, turbine fuel was inadvertently injected into a Dart engine in this way through the water methanol system, and the flame propagation which resulted virtually blew the engine up. As a result, Rolls Royce Ltd issued a Notice to Operators, warning of the hazards which can arise from contamination of the water methanol system.

In this latest incident in Western Australia it was found that the aircraft had performed no less than four "wet" take offs during the time that the turbine fuel was in the water methanol tanks, but because water methanol is denser and does not mix readily with turbine fuel, the water methanol had remained in the lower portion of the tanks and no turbine fuel had been injected into the engines! It requires little effort to imagine the possibilities that could easily have resulted but for the vigilance of the refuelling attendant who checked the tanks. The dire possibilities which this incident poses emphasize once again the importance of always ensuring that the fluid being pumped into an aircraft during servicing and refuelling operations, is the correct one.

The occurrence brings to mind other instances of the use of incorrect fluids in aircraft servicing. For example, the hazards of water methanol contamination are not restricted to aircraft fitted with Rolls Royce Dart engines such as Viscounts and Friendships. The Pratt & Whitney R-2800 radial piston engines fitted to Douglas DC-6 and Convair 440 aircraft also use water methanol injection for boosting power during take off, and contamination of these systems can also lead to serious engine troubles. Cases have occurred where avgas has been mistakenly injected into these engines through the water methanol injection system, and caused severe malfunctioning.

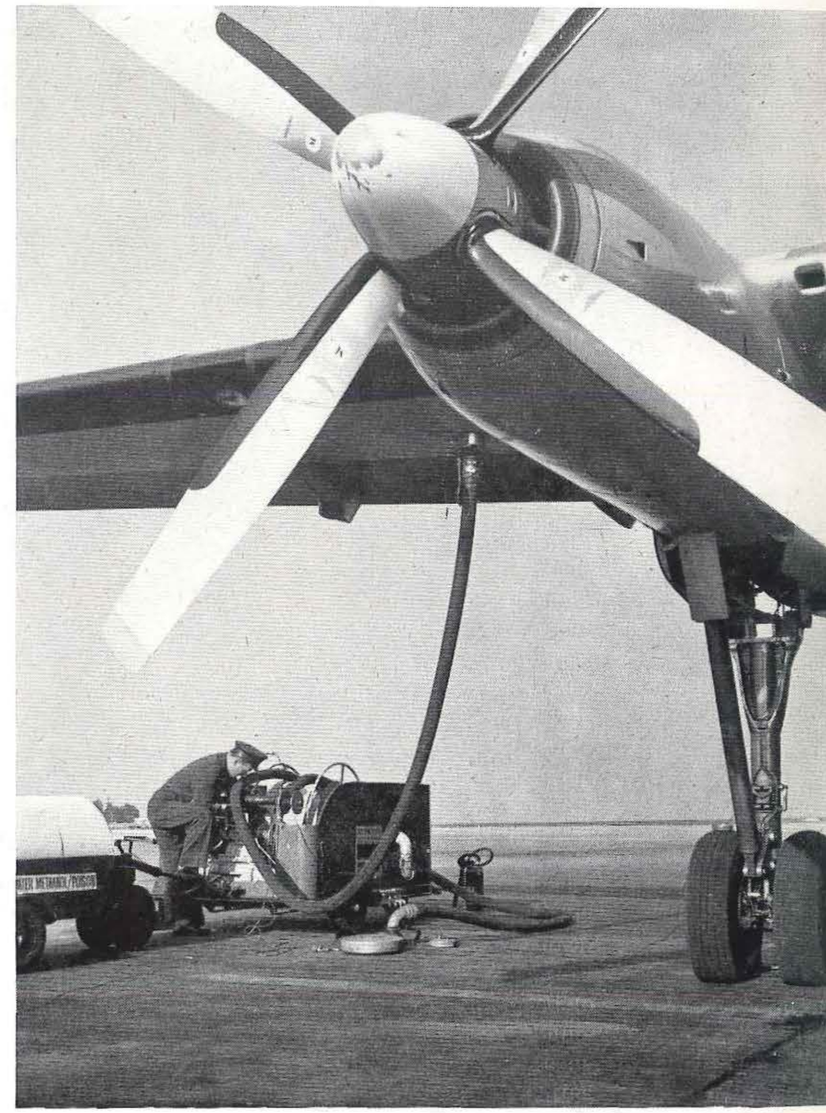
The use of an incorrect grade of fuel can also cause problems in any aircraft fitted with piston engines. This pitfall is probably a better known one but it is worth emphasising again. For example, a light aircraft piston engine designed to operate on 80/87 octane avgas can operate quite well on 100/130 fuel, but this is not recommended for long periods. The higher grade fuel has a higher tetra ethyl lead content which, over a period, can cause unwanted lead deposits to build up on the spark plugs and lead to misfiring or to pre-ignition. But, it is the opposite case that is by far the more critical: An engine designed to run on 100/130 avgas should NEVER for instance, be operated on 80/87 fuel. In such a case, detonation and loss of engine power is likely to occur at higher power settings and mechanical failure of the engine at an early stage in its life would be a real possibility.

Other types of failures and malfunctions can occur in both turbine and piston engines if an incorrect engine lubricant is used. Lubricants of too high a viscosity for the temperatures at which the engine operates, could cause sluggishness, especially so in piston engines, while a lubricant of too low a viscosity could result in a serious break-down in lubricant film strength and lead to bearing failure.

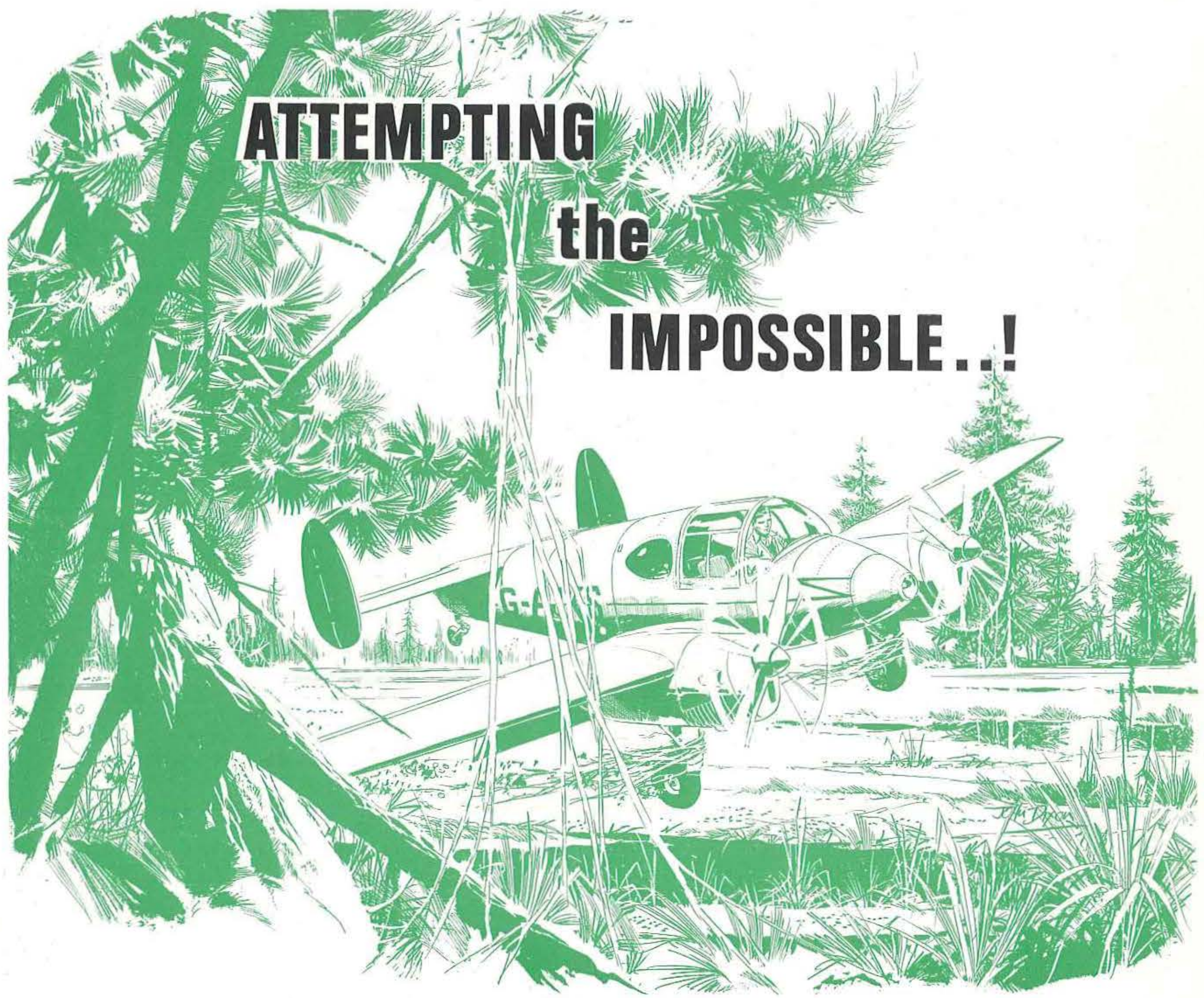
The use of a wrong hydraulic fluid for servicing hydraulic systems must also be scrupulously avoided. For example, the use of Skydrol 500 fluid in a system designed to use Aero-Shell Fluid 4 would, if not detected very quickly, cause deterioration of the seals in the hydraulic system. In such a case, as well as the necessity for completely draining and flushing the system, it is quite likely that all the seals in the system's components would require replacement.

Many other cases could be quoted to illustrate the problems which can occur as a result of using incorrect fluids. Some readers may be inclined to think the errors of the sort we have described are rare in actual practice, but the Department's records show that the case in Western Australia is but one incident among many to disprove this —and we have all heard of *"Murphy's Law"!*

So whenever you are involved in replenishing or replacing fluids in engine or aircraft systems, be sure to check that the fluid being used is the correct one. If it does become necessary to decant any fluid into a container for which it is not specifically intended, re-identify the container immediately and ensure that it is placed somewhere well away from its normal position. It may even be better to dispose of this fluid altogether rather than risk the chance of it being used later for the wrong purpose. And if, for some reason, despite all precautions, the wrong fluid IS used in any aircraft, remember that the system should be completely drained and flushed and replenished with the correct fluid before any attempt is made to operate the aircraft. A little more care on the part of pilots, maintenance engineers and refuelling attendants is all that is necessary to eliminate incidents of the sort that can be labelled "THE WRONG FLUID".



ATTEMPTING the IMPOSSIBLE..!



(Based on Report by Canadian Department of Transport, Published by Ministry of Aviation, United Kingdom.)

A Private Pilot with less than 100 hours total flying experience set out in a Miles Gemini to make a solo trans-Atlantic flight from Prestwick, Scotland to Montreal, Quebec, via Keflavik, Iceland, Narsarssuaq, Greenland, and Goose Bay, Labrador. The first two legs of the flight were completed uneventfully and the aircraft landed at Narsarssuaq as intended.

At Narsarssuaq the pilot planned for an early morning take-off and before departing was provided with a weather forecast which indicated generally favourable weather throughout the route to be flown, with a slightly adverse wind component of minus seven miles per hour. Before he finally departed, but after the aircraft had been refuelled, the pilot also made a short local flight at Narsarssuaq, early in the day. The aircraft was not refuelled again after this flight and the pilot departed from Narsarssuaq for Goose Bay at 0758 hours local time. The pilot had flight planned to cruise at 2,000 feet at 105 knots and his estimated time interval for the leg was 6 hours 15 minutes with a total fuel endurance of 7 hours 30 minutes.

The aircraft subsequently failed to arrive at Goose bay and a search was begun. It was eventually found five days later in swamp country 65 miles south-east of Goose Bay. The aircraft was inverted and damaged and had apparently overturned in the course of a forced landing. The pilot was not with the aircraft and a further extensive ground and air search subsequently failed to find him.

Evidence at the scene of the accident, indicated that the pilot had spent at least the first night after the forced landing with the aircraft, and had then apparently walked away carrying little equipment with him. A quantity of food and a flare pistol with cartridges was still in the aircraft There was no evidence that the pilot had been injured in the accident.

The forced landing had been made in an extensive swamp area which is mostly level and sparsely covered with small trees. The accident site is 1,000 feet above sea level and its approaches unobstructed. From the air, the ground appears to be suitable for a forced landing. The aircraft's undercarriage was extended, and marks on the marshy ground showed that it had touched down on its wheels, bounced, touched down again, and then overturned.

The aircraft's fuel supply had been exhausted at the time of the forced landing. An additional fuel tank had been installed in the back seat of the aircraft but was not connected to the fuel system and could not have been used. There was no evidence that any fault existed in the engines or airframe before the accident. No radio navigational equipment was carried, and the aircraft was fitted with VHF communications radio only.

The weather at Goose Bay at about the time the accident occurred was quite favourable, with layers of strato-cumulus cloud at 3,000 and 8,000 feet and a visibility of 20 miles. The wind was 230 degrees at 14 to 20 miles an hour and the temperature was +15 degrees C. The weather during the period of the flight was never below the minimum required for visual flight and the lowest visibility reported was fifteen miles in light rain showers. An analysis of actual weather reports made after the accident, established that the weather conditions and winds had not differed significantly from the forecast the pilot had been given.

The distance between Narsarssuaq and Goose Bay is 685 nautical miles. There is no high ground between the west coast of Greenland and Goose Bay Airport, and flights can be conducted safely as low as 2,000 feet above sea level. An ocean station vessel, positioned approximately midway between Greenland and Labrador, provides communications and navigational assistance to aircraft flying this route, and there are also a number of communications stations on the coast of Labrador.

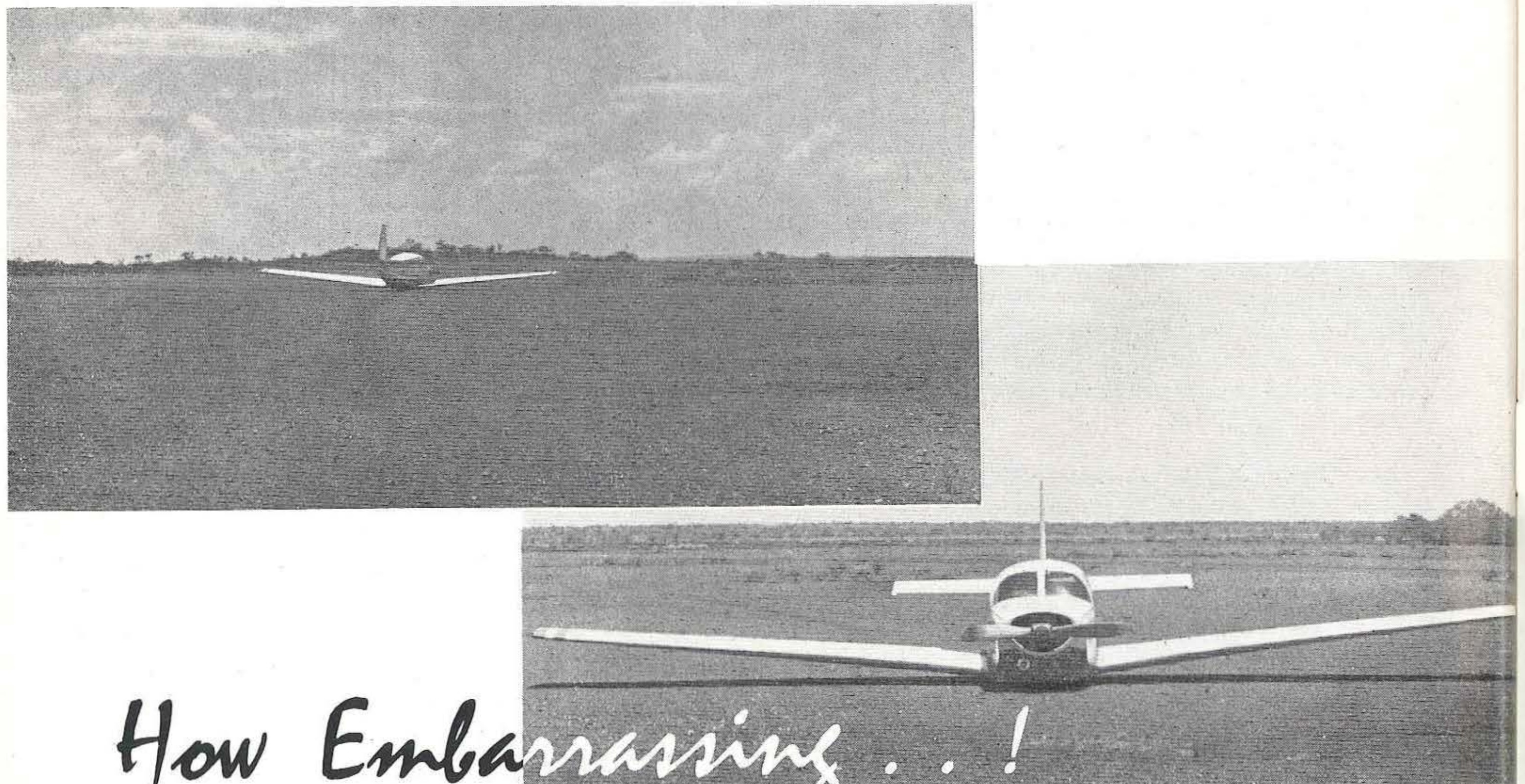
The pilot had transmitted an "operations normal" report to a communications station in Greenland at 0842 hours. He did not however, make contact with the ocean station vessel at his approximate half way point during the flight, and his next radio report was received by a station at Cartwright, 135 miles east of Goose Bay at 1425 hours. This was the last transmission received from the aircraft. The aircraft's fuel supply would have been exhausted about an hour later.

The pilot's flight logs were found in the aircraft and contained a number of errors, the principal one of which had been made in the dead reckoning calculations for the final leg of the flight. It was apparent that the pilot had measured the distance between Narsarssuaq and Goose Bay in nautical miles but had calculated his estimated ground speed in statute miles per hour. This error in calculation showed the flight to be feasible, whereas when the correct ground speed in knots was applied to the distance, it was clear that it would have been almost impossible for the aircraft to complete the flight with the fuel available.

Comment:

We leave it to our readers to interpret for themselves the object lessons in overconfidence and lack of airmanship, with which this case history abounds.

Without suggesting that the occurrences or the circumstances were similar, this unfortunate pilot's experience has one point in common with the story of a Wackett in South Australia a few years ago (see Aviation Safety Digest No. 44, December, 1965).—Both should help us always to remember that navigating an aircraft on long cross-country flights, especially in sparsely populated regions, is a task which brooks no liberties.



How Embarrassing . . . !

The pilot of this Mooney didn't *forget* to lower his undercarriage—he remembered it just once too often!

The aircraft was being flown on a cattle mustering operation at a large station property in Western Australia. Much of the flight, lasting four and a half hours, was conducted at a low airspeed with the undercarriage lowered, and for the last half hour of the flight, the undercarriage was down continuously.

At the end of mustering flight, preparatory to landing at an out-station airstrip on the station property, the pilot checked that the undercarriage was in fact down and locked, and began his approach to land. Intending to make a short field type of landing, the pilot reduced speed to 55 knots and controlled the aircraft's descent with engine power towards his intended point of touch-down. Just as the pilot was flaring the aircraft for the landing however, a warning horn began to sound continuously in the aircraft. Immediately assuming it was the undercarriage warning horn, the pilot quickly moved the undercarriage selector and continued with the touch-down.

Only as the aircraft settled and the propeller struck the ground and stopped, did the pilot realize what he had done. He had mistaken the stall warning for the undercarriage horn, and in the heat of the moment, had reacted by moving the undercarriage lever to its opposite position, actually raising the undercarriage.

The pilot said that the two warning horns had similar tones and apparently, because of the considerable amount of power the pilot was using right down to touch-down, the undercarriage horn itself did not sound when the pilot unintentionally retracted the wheels just before the aircraft settled.

Illustration from an advertisement in the aviation press

H'mm . . .

Take <u>another</u> look Gentlemen — It's warmer than you think!

It seems that even "old hands" in the aviation business can be caught out by three pointer altimeters!