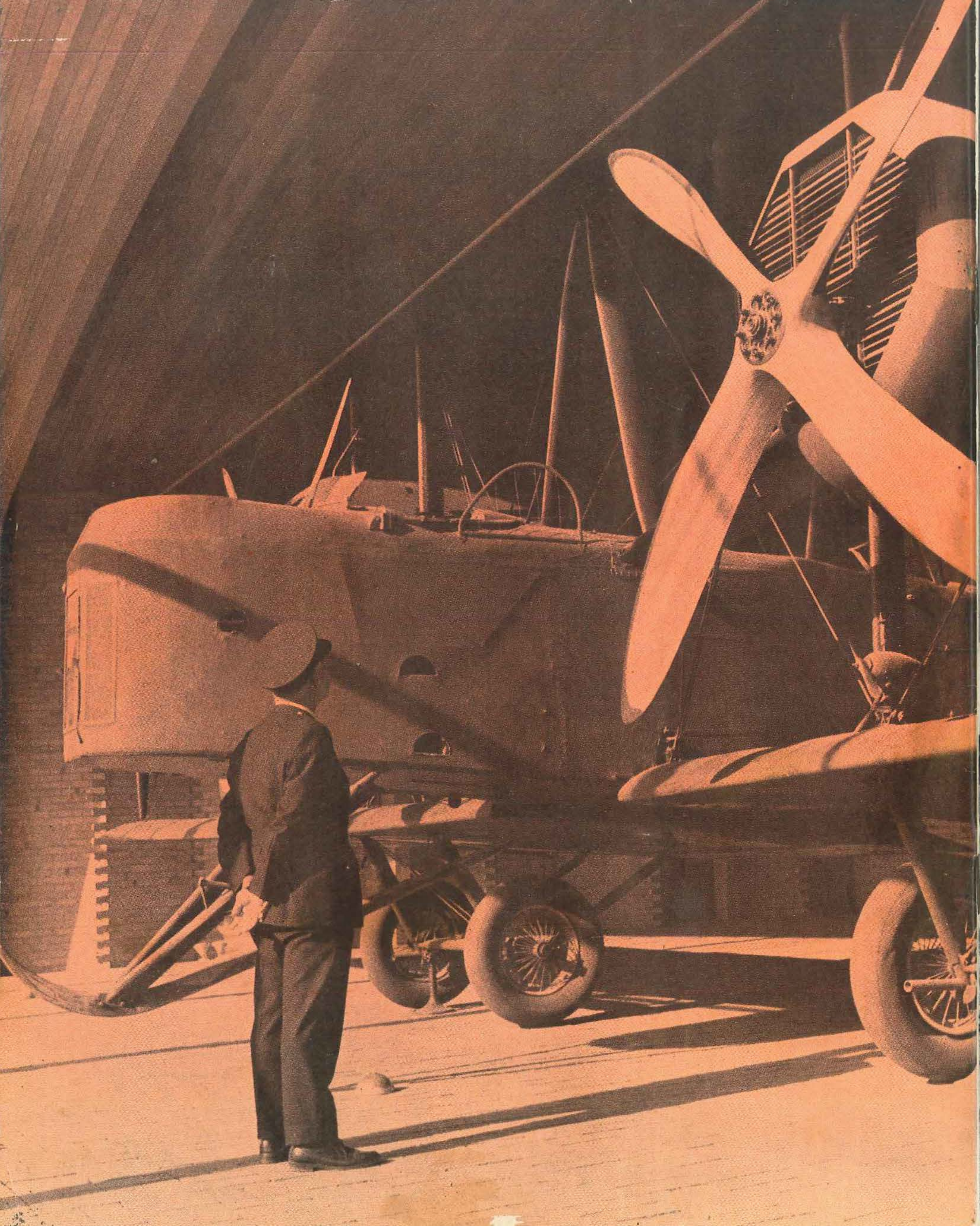


No. 64 SEPTEMBER 1969

AVIATION SAFETY DIGEST

DEPARTMENT OF CIVIL AVIATION AUSTRALIA

AVIATION SAFETY DIGEST

No. 64 SEPTEMBER, 1969

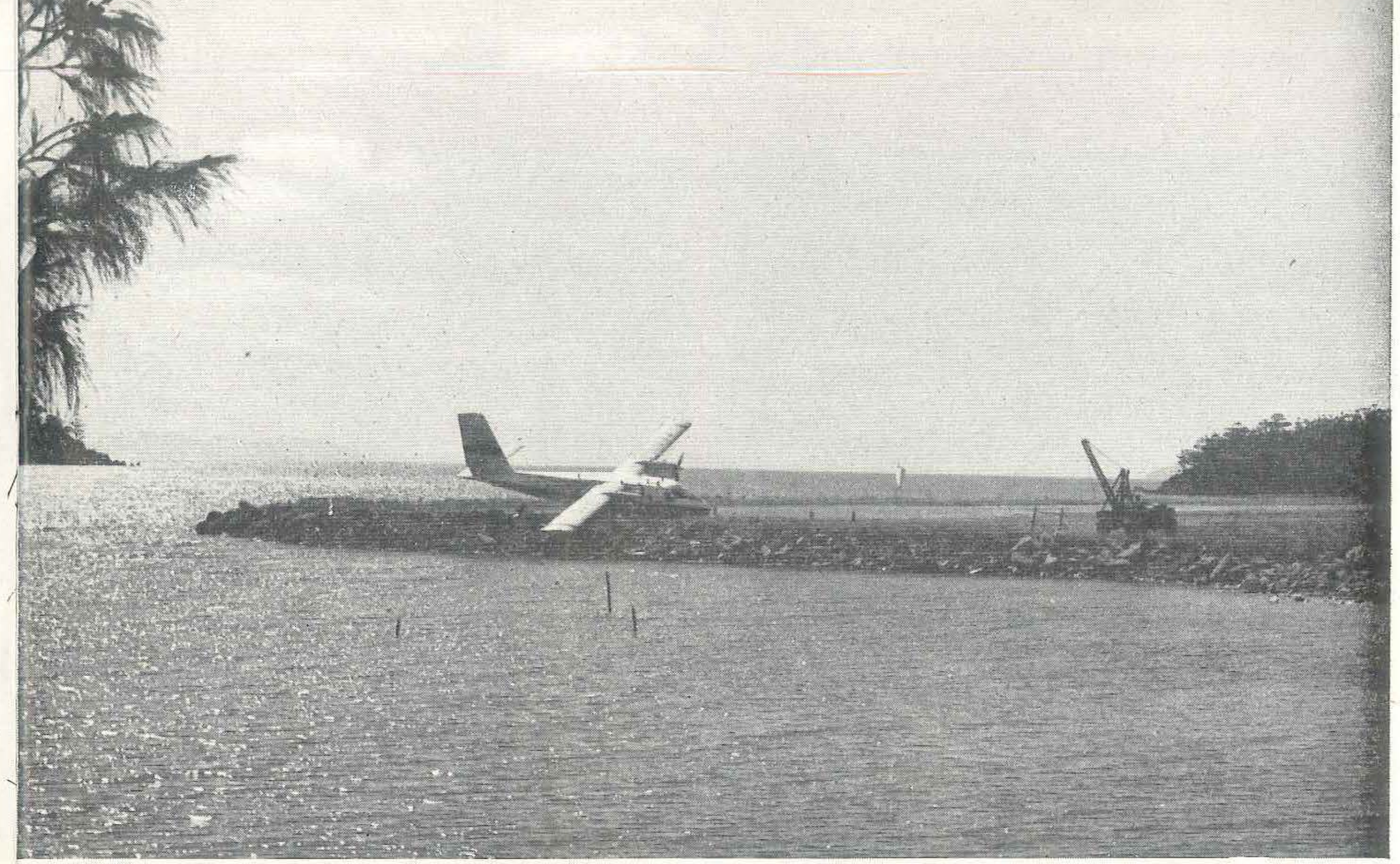
DEPARTMENT OF CIVIL AVIATION, AUSTRALIA

Contents

COVER (Front and Back): Fifty years have flown. The rapidity with which global air transport has developed is strikingly portrayed in our cover photographs. On the front DC-8's, 707's and a VC-10 at Sydney's Kingsford-Smith Airport, representing five nations and four continents, exemplify the cosmopolitan character of to-day's international air traffic. By contrast, on the back cover, the Vickers Vimy in which Sir Ross and Sir Keith Smith first blazed the trail from England to Australia only five decades ago, seems to be from another age. The Vimy is permanently housed in a memorial to the aviation pioneers at Adelaide Airport.

AUSTRALIA

Printed by The Ruskin Press Pty. Ltd., 39 Leveson Street, North Melbourne



COSTLY UNDERSHOOT...

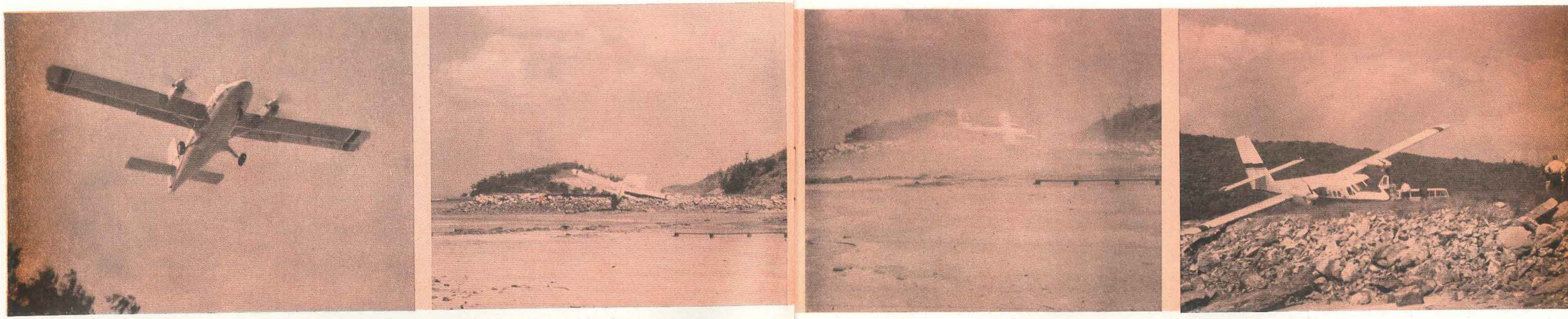
Late on final approach to the airstrip at Brampton Island, North Queensland, a de Havilland Twin Otter suddenly lost height and struck an embankment some distance short of the strip threshold. The aircraft was severely damaged by the impact and several of the passengers suffered minor injuries.

* * *

The aircraft was engaged on a charter flight from Mackay to the holiday resort at Brampton Island, 22 nautical miles north of Mackay on the North Queensland coast. The flight was a single pilot operation carrying eight passengers and a cabin attendant. One passenger, who was an employee of the operator, occupied the right hand cockpit seat. After an uneventful flight of about 10 minutes duration, the aircraft arrived over Brampton Island where the pilot assessed the surface wind as being in excess of 20 knots and blowing from approximately 110 degrees. He accordingly positioned the aircraft on a right base leg for a landing into the south-east.

The single unsealed strip at Brampton Island is aligned north-west to south-east. It is built on reclaimed ground on the north-eastern foreshores of the island and for most of its length is bordered on one side by a sloping rock retaining wall, the top of which is almost level with the strip surface. At the end towards which the approach was being made on this occasion, the top of the retaining wall is approximately 12 feet above the level of the adjacent sea bed. Some 810 feet from this end of the strip, a taxiway leading to a small terminal building and the aircraft parking area, joins the strip at right angles.

The aircraft turned on to final approach at a



This sequence of pictures, showing the accident as it actually happened, were taken by an amateur photographer who was on the beach over which the aircraft approached to land. The photographer's position for the first three pictures was some 650 feet north-west of the threshold of the strip. The tide was out at the time the pictures were taken. At high tide the low lying area in pictures 2 and 3 is flooded. (1) Aircraft, apparently operating normally, passes over photographer on final approach to land. (2) Aircraft loses height short of strip and in wing-down attitude strikes rock retaining wall with undercarriage and starboard wing tip. Note the dust beginning to rise. (3) Aircraft bounces up on to reclaimed area, slews to right and comes to rest in a cloud of dust. (4) Passengers evacuating aircraft after it had slithered to a stop. Strip is to the right in this picture. The starboard wing is overhanging the rock retaining wall against which the aircraft impacted.

height of approximately 1,200 feet and the pilot progressively extended the flaps to the full-down position as he reduced speed.

Late on final approach, when still some 300 feet short of the threshold, the aircraft began to lose height rapidly. Although the pilot appiled full power and raised the nose to arrest the descent, the starboard wing dropped and the aircraft continued to sink in a wing-down attitude until it was below the level of the strip. The nose-wheel and underside of the forward fuselage struck the earth top of the retaining wall, while the starboard main undercarriage assembly and outer section of the starboard wing impacted on the sloping rock surface some five feet below the top. The aircraft bounced and, due to its momentum, continued up on to a level area between the retaining wall and the north-west end of the strip. The starboard main wheel had been dislodged when it struck the top of the wall and the aircraft slewed violently to starboard before coming to rest, facing almost at right angles to the strip direction, some 35 feet short of the strip threshold.

* * *

An extensive examination of the damaged aircraft and its components, supported by witness reports and statements by the pilot, revealed nothing to suggest that the aircraft would not have been capable of normal operation during the approach. A subsequent detailed inspection of the aircraft's engines, propellers and associated systems confirmed that these components were functioning normally immediately prior to the accident.

Evidence of the weather conditions at the time of the accident, indicated that the surface wind had been varying in direction between east and south-east at 20-25 knots, which was substantially as assessed by the pilot on his arrival over the island. Because the strip at Brampton Island is situated about midway between hills on Brampton Island (710 feet) and the adjacent Carlisle Island (1,300 feet), it can be subject to a marked wind funnelling effect under certain strong wind conditions, while the turbulence in the lee of the hills can be severe. Pilots with local knowledge avoid these areas at such times. Although the combination of wind strength and direction at the time of the accident did not create a particularly hazardous situation for a normal approach and landing, a degree of caution was nevertheless needed in the circumstances.

The latter part of the approach and the impact were seen by several witnesses on the ground and, from their description of these events, together with statements made by some of the passengers in the aircraft itself, it was clear that the final approach had been conducted at an unusually slow speed. The passenger who was occupying the right hand cockpit seat said that after the aircraft had turned on to final approach, it seemed to him that the aircraft was "more or less stationary" in the air, but he attributed this impression to the

strength of the wind. He also noticed that the stall warning lamp on the pilot's instrument panel was flashing during much of the approach. Late in the approach however he was looking out the window at the strip and did not notice whether or not the stall warning was still flashing.

The normal landing procedure for the Twin Otter as laid down in the operator's Operations Manual calls for an approach speed in the full flap configuration some 19 knots above the power-off stalling speed. On the other hand, the stall warning light which the passenger in the right-hand seat saw flashing throughout most of the approach is designed to operate at a speed of between four and nine knots above the stall in all configurations. It is thus apparent that the final approach, as flown by the pilot on this occasion, was a marked departure from the specified procedure, and the aircraft was being operated at an airspeed critically close to the stall.

A number of witnesses who had observed the approach on which the accident occurred, as well as many previous landings of Twin Otter aircraft at Brampton Island, said that they had noticed this particular pilot conducting similar approaches at very slow speeds on quite a high proportion of his landings into the south-east. They also indicated that, on these occasions, the landing roll was short enough to permit the aircraft to turn off the strip at the taxiway located only 810 feet from the approach end.

The Twin Otter is capable of operation from very short strip lengths subject to the use of special short take-off and landing aircraft handling techniques. There was nothing to indicate however, that on the approach which culminated in the accident, or on any of the pilot's previous approaches, he had employed the recognised short-landing technique. This latter operation involves the use of a marked nose-down approach attitude and a high rate of descent, while maintaining an airspeed close to the figure specified in the Operations Manual for a normal landing. Rather, it appears that the pilot, in order to achieve the reduction in landing distance necessary to permit a turn off to be made at the taxiway, had adopted a technique based on a combination of an approximately level aircraft attitude and a reduced airspeed, at the same time planning his approach so as to cross the embankment at the end of the strip at a very low height to touch down right on, or very close to, the threshold.

An indication of just how low some of these previous approaches had been could be gauged from reports of witnesses who on one occasion estimated the aircraft's height over the embankment as being as low as two feet and very little higher on a number of other occasions. Combined with a slow approach speed, such a procedure would be hazardous in any circumstances. When used at Brampton Island in strong wind conditions however, it would place the aircraft in an extremely critical situation which could rapidly and irretrievably deteriorate as a result of only minor adverse variations in airspeed and rate of descent caused by wind gradient effects.

As the approach on which the accident occurred was also being flown at a very slow speed, there can be little doubt that the pilot was once again planning a short landing, followed by a turn-off at the taxiway.

* * *

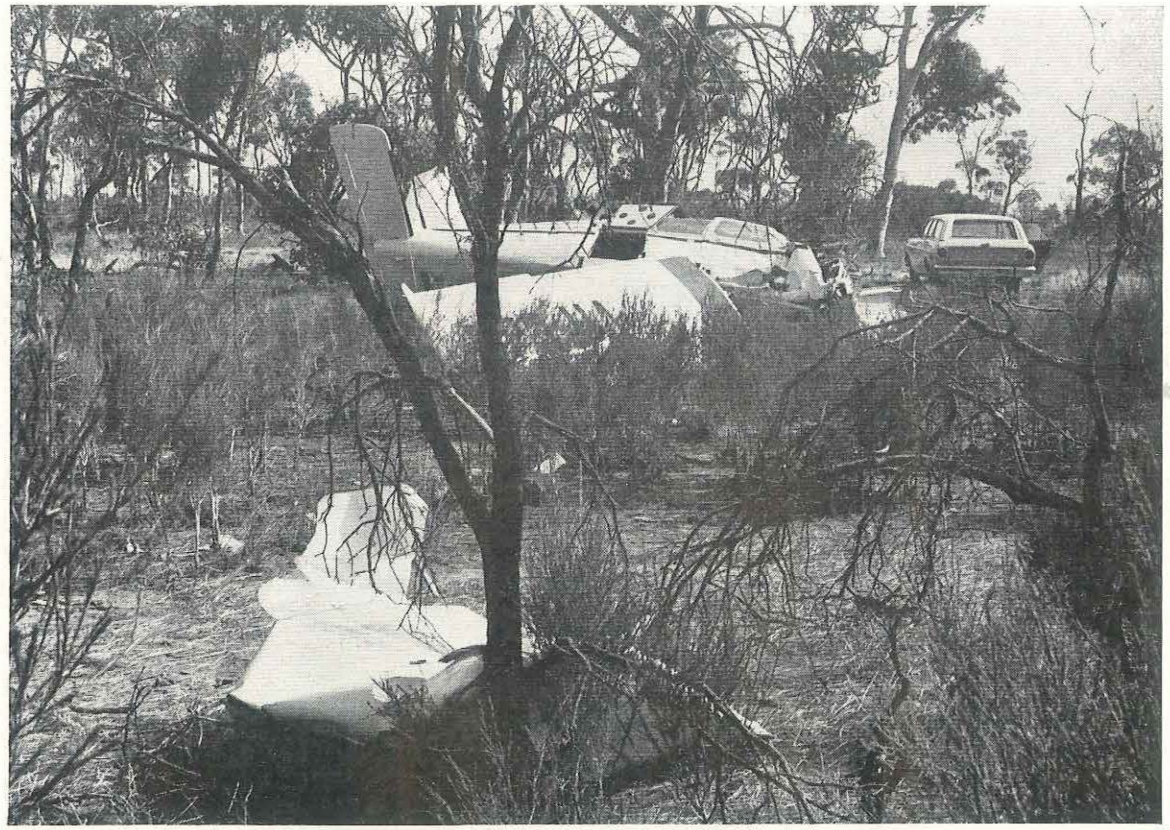
It is apparent that the pilot, in carrying out landing approaches with the main object of effecting short ground rolls and stopping by the time he reached the taxiway, completely lost sight of the dangers inherent in conducting such operations in the conditions at Brampton Island. While this procedure would facilitate reaching the unloading area with the minimum of effort through not having to back-track on the strip itself, the time actually saved, compared to the hazards involved, would be insignificant. In view of the pilot's extensive experience in this area involving many hundreds of landings on the Brampton strip, he could hardly have been unaware of the local wind variations and associated areas of turbulence, and the consequent need to exercise caution when operating in the vicinity of the island. The fact that he had repeatedly carried out such approaches, despite their hazardous nature, suggests that he had reached a stage in his career where his experience of the area and of the aircraft type led to an over-confident assessment of his own ability. By persisting with approaches and landings of this type, the pilot placed himself in a situation where it could only be a matter of time before a slight decrease in his already critically low approach airspeed would result in an accident of some sort. It is obvious that such a reduction in airspeed did occur on this occasion, but whether this was actually caused by turbulence, wind gradient, or simply misjudgement by the pilot, could not be positively determined.

Whatever the mechanics of this final, critical airspeed loss, it is almost certain that the accident would have been avoided if the pilot had maintained an approach airspeed that provided a safe margin above the stall in accordance with the procedures contained in the Operations Manual.

Cause

The probable cause of this accident was that the pilot operated the aircraft at a speed which did not provide sufficient margin above the stalling speed in the existing conditions. ●

Aerial view of strip looking south-east, taken when tide was in. The taxiway leading to the terminal area can be seen running off to the right of the strip. The sequence of pictures on the previous pages were taken from the far side of the sand-spit in the foreground.



Cherokee Arrow Strikes Tree During Take-Off

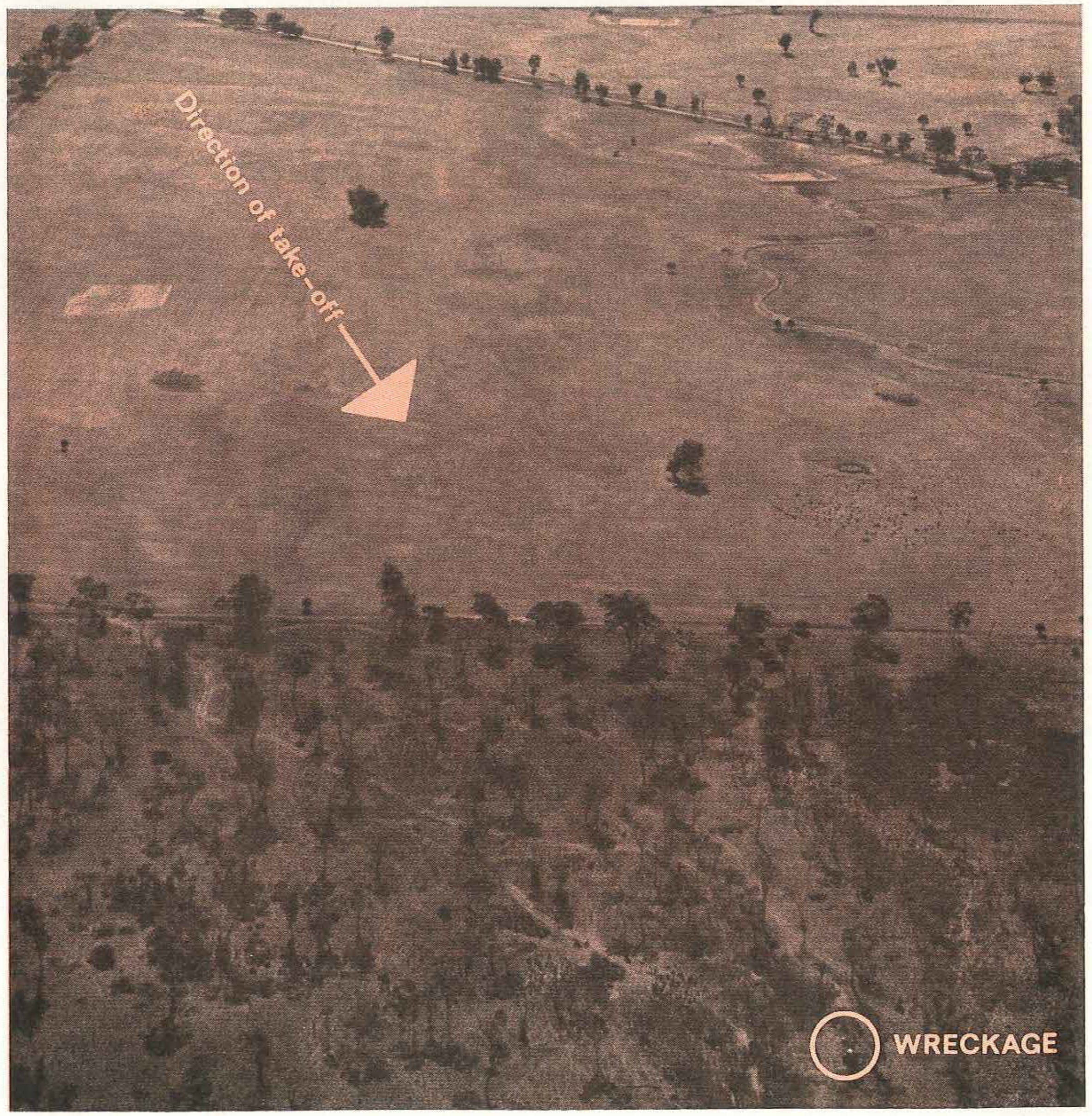
After taking off from a field at Highbury in Western Australia, a Piper Cherokee "Arrow" climbed steeply in an attempt to clear tall trees at the boundary fence. The aircraft cleared the first line of trees, but the port wing then dropped sharply and the aircraft dived into a heavily timbered area. Both front seat occupants were killed and one of the rear passengers sustained serious injuries. The aircraft was destroyed by impact forces.

The pilot had leased the aircraft from Moorabbin Airport, Victoria, and accompanied by his wife, had departed from Moorabbin a week previously to visit relatives at Highbury. After two overnight stops en route, the aircraft arrived at Narrogin, Western Australia, where a landing was made on the local aerodrome. The pilot and his wife were met by relatives and driven by car to Highbury, their ultimate destination, some 10 miles to the south.

The next day, the pilot inspected a field on the property of his relative and, apparently satisfied that it would be suitable for his operations, ferried the aircraft from Narrogin that same afternoon. The following morning, the pilot carried out a solo circuit to check the suitability of the selected field, then conducted two further short local flights carrying three passengers on each occasion, all without incident. The take-off and landing area used for these operations was aligned in an east-west direction, with the climb-out path to the east over heavy timber commencing at the boundary fence. In the course of these latter three flights, take-offs were successfully made both into the west, and towards the east over the trees. A strong northerly wind was blowing at the time.

Three days later, the pilot again decided to conduct some local pleasure flights from the same field and, early that morning, made the aircraft ready. Accompanied by three passengers who were friends of his relatives, the pilot boarded the aircraft, started the engine and allowed it to warm for several minutes. He then taxied the aircraft to a position adjacent to the western boundary fence where, in response to a question by one of the passengers as to how he determined the take-off direction, he pointed out a wind sock tied to a nearby dead tree and replied that there was very little wind to worry about as the wind sock was hardly moving. The pilot then completed the engine run-up and pre-take-off checks, and began a take-off into the east.

Aerial view of paddock and accident site, looking west.



A number of bystanders saw the aircraft become airborne about two-thirds of the way along the paddock and commence a steep climb towards the trees at the boundary fence. It cleared the first trees on the fence line but then the port wing suddenly dropped and the aircraft began to lose height rapidly. The port main wheel struck the top of a 20 foot high tree and the aircraft, with the engine still operating at high power, dived into the ground. Both wings were torn from the fuselage and the forward part of the cabin and engine section were demolished by the impact.

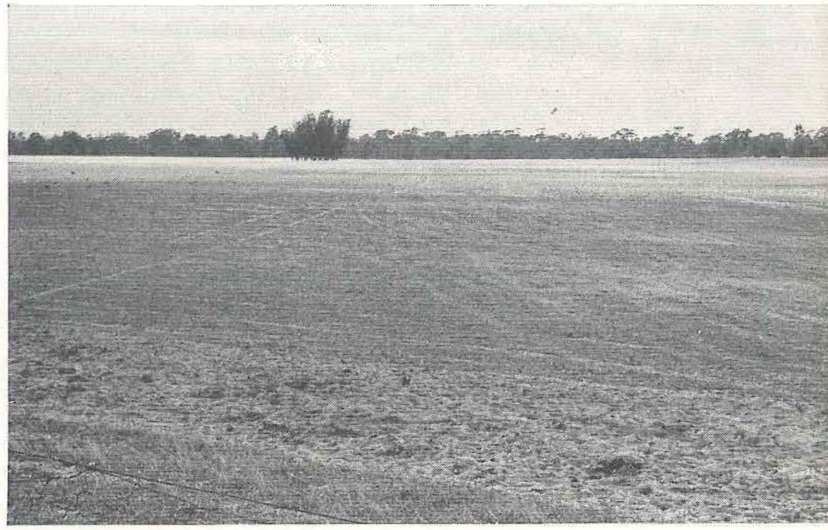
A small fire broke out in the damaged engine compartment but was promptly extinguished by one of the rear seat passengers who had received only minor injuries and extricated himself from the wreckage unaided.

* * *

From a detailed examination of the damaged aircraft and the evidence of witnesses who had observed the take-off, it was clear that there had been no structural or system failure which could have contributed to the accident. Witnesses heard the engine running normally during and after take-off and a workshop inspection subsequently confirmed that it was capable of normal operation immediately prior to the impact. The aircraft had been loaded within the approved weight and centre of gravity limits, although the gross weight at the time of take-off was close to the maximum permitted for the type as specified in the aircraft Flight Manual.

The weather at the time of the accident was generally fine, with a surface temperature of about +20 degrees Centigrade (72 degrees F). From the weight of evidence provided by witnesses and the reported indications of the wind sock on the field, it was concluded that the wind had in fact, been blowing from a south-westerly direction at approximately seven knots. During the take-off therefore the aircraft would have been affected by a tailwind component of some four knots.

The approved take-off weight performance chart for the aircraft type shows that, in the prevailing conditions with a field elevation of 1,000 feet AMSL, the required take-off distance to 50 feet would have been approximately 3,350 feet in zero wind, increasing to 3,750 feet with a four knot tail-wind component. A survey of the take-off site however, revealed that a total distance of only 3,000 feet was available from fence to fence. A further most significant fact was that the location and height of the trees at the eastern end of the field were such that the effective operational length for take-off in that direction was reduced to a mere 1,800 feet. The take-off distance available was thus more than 1,900 feet short on this occasion.



View of take-off path taken from fence near commencement of run.

The point where the aircraft left the ground approximately 2,000 feet from the start of the take-off run, is consistent with its expected performance in the existing conditions of high gross weight and a tailwind component. After using such a large portion of the available distance to become airborne, it is apparent that the pilot then attempted to climb the aircraft at reduced airspeed as a natural reaction to his anxiety over the closeness of the trees at the boundary.

* * *

Although an approved flight manual had been issued for this aircraft and there was a requirement under the Air Navigation Regulations for it to be carried in the aircraft, the manual was not found in the wreckage. The flight manual stowage position was empty and the manual could not be located elsewhere in the aircraft or among personal effects. There was some evidence that the manual was being carried when the aircraft left Moorabbin and the pilot was known to have been conversant with the use of the take-off and landing weight performance charts contained in the manual. Furthermore he had spent some time reviewing in detail the performance and loading sections before departing for Western Australia. There was nothing to indicate however that the manual had been used to establish the adequacy of the distance available in the conditions prevailing at the time of the accident.

In view of the pilot's choice of take-off direction it seems very doubtful that he appreciated at any stage the full significance of the trees, which averaged 50 feet in height, at the eastern end of the field and their dramatic effect on the effective operational length available for the take-off. There was some evidence that the owner of the property had previously told the pilot that the length of the area was "about 3,000 feet", and it appears likely that he had accepted this figure, in conjunction with his own initial visual assessment of the field, as representing the total distance available, without regard to obstacle clearance considerations. From his earlier reference to the performance charts, he would have at least been aware of the order of take-off distance the aircraft normally required and, relating this to the overall length of the field, probably judged the aircraft as capable of "fitting" into the distance available.

In undertaking the flight on which the accident occurred, without referring to the appropriate performance chart, the pilot was apparently relying on his knowledge of the total field length and the aircraft's performance during the flights he had made three days beforehand.

It is significant that the first of these earlier flights was conducted solo and therefore at a very light gross weight, while some of the passengers on the remaining two flights were children whose weights were substantially less than those of the adults on board when the accident occurred. These factors, combined with more favourable wind conditions on this earlier occasion, would have shortened the take-off distances, although the previous operations into the east must have been at best only marginally acceptable.

In not referring to the aircraft's take-off performance chart the pilot could not possibly have known what increase in distance was required to allow for the substantial increase in gross weight over the previous occasions, or the effect which the tailwind component would have on his aircraft's performance. Taking these factors into account with the effective operational length in the direction used, an accident on this particular take-off was virtually inevitable.

Cause

The cause of this accident was that the pilot did not ensure that, in the existing conditions, the selected flight path was safely within the performance capabilities of the aircraft. ●

The wreckage as it came to rest. The flap position was the result of impact forces.

A problem that could easily be solved

At Gurney, Papua, a Piper Aztec took off for a flight to Rabaul, New Britain, with a refuelling stop en route at Popondetta. About ten minutes after take-off, the starboard engine began to run roughly. The pilot tried each magneto in turn but the roughness remained. He then noticed that the cylinder head and oil temperature indications for the other engine were rising rapidly. Forced to feather the port engine, the pilot diverted towards Raba Raba, ten minutes' flying time away. By this time the oil temperature for the starboard engine was also rising and despite a reduction in power and the use of full rich mixture, the starboard oil temperature was "in the red" by the time the aircraft entered the Raba Raba circuit area. The pilot nevertheless made a successful single-engine landing.

When the aircraft was inspected by a company engineer at Raba Raba, it was found that the fuel in the aircraft's tanks was contaminated with aviation turbine kerosene. Further enquiries revealed that before taking off from Gurney, the pilot of the Aztec, with the assistance of another professional pilot, had refuelled the aircraft from drums, not noticing that the drums were branded "Avtur" and not "Avgas". The pilots ascribed their error to the fact that the drums, supplied by a different oil company from the one they were accustomed to, were painted the same colour as the Avgas drums the pilots normally used.

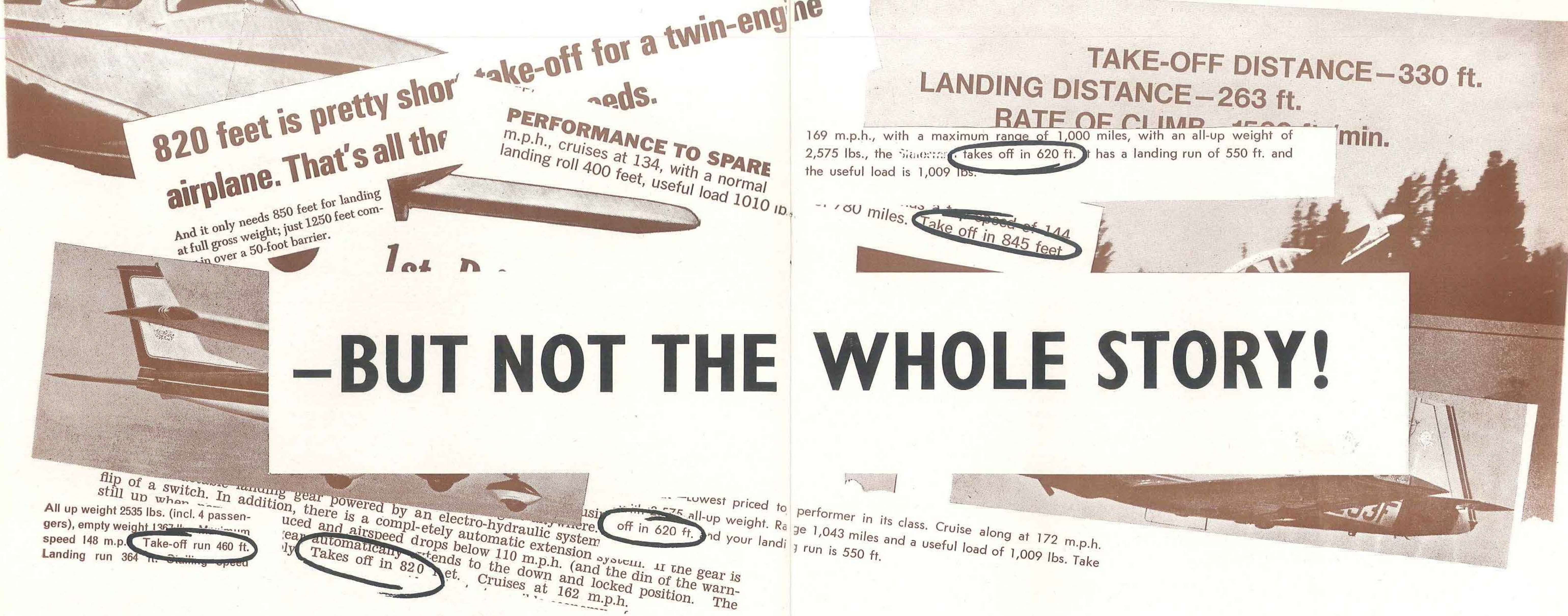
While this fact could perhaps contribute to an initial error in identification, the whole incident says little for the thoroughness of the pilots' refuelling procedures. Had they taken any care at all to examine a sample of the fuel before pumping it into the aircraft, such as during a check for water and other impurities, it should have been immediately evident to them from the colourless appearance of the Avtur that the fluid was not Avgas, which is always coloured red in the case of grade 80/87 octane, and green for grade 100/120 octane.

This problem of using "the wrong fluids" in aircraft has been the subject of previous articles in the Digest. On past occasions, however, the errors in identification have been made by refuelling assistants or other ground personnel. It is hardly the type of error to be expected of experienced pilots, especially those in the professional category as were the two involved in this incident.

From this and other recurring accidents and incidents, it seems clear that there are some pilots who pay scant attention to the warnings the Department issues, through its various publications, for the very purpose of alerting them to the possibilities of such easily-made errors. Until these persons accept that such errors are not only the bane of "someone else" and that they too are just as liable to make them, it seems that the Department's accident and incident statistics will continue to grow.

Fortunately in this case, the aircraft was airborne only a short time, but had the pilot not been able to divert and land so soon, it is clear that the outcome could have been very different indeed. ●

—BUT NOT THE WHOLE STORY!



ELSEWHERE in this issue of the Digest is an account of an accident in which a light aircraft crashed while attempting to take-off from a paddock 3,000 feet long. Two people lost their lives as a result.

Press advertisements for this type of aircraft, that have appeared in various aviation journals and magazines in recent months, have consistently included the unequivocal statement that the aircraft "takes off in 820 feet". This information is also included among other "performance specifications" in the owner's handbook for the aircraft type, issued by the manufacturer.

It is true that the pilot erred in not consulting the take-off performance chart in the aircraft's flight manual issued by the Department, to ensure that his selected take-off path was within the aircraft's performance capability. It is nevertheless pertinent to ask to what extent the "facts" proclaimed in the advertisements and sales brochures could have influenced the pilot to believe that the length available for take-off at the time of the accident, was adequate. In contrast to the advertised figure of 820 feet, reference to the take-off performance chart shows that, at the weight to which the aircraft was loaded at the time, and in the existing conditions of wind and density altitude, **a required take-off distance of no less than 3,750 feet was necessary to clear a 50-foot obstacle!** Although the paddock being used on this occasion measured 3,000 feet in length, the presence of trees just beyond the boundary fence in the direction of take-off, reduced the available effective length to 1,800 feet, only about half that required by the take-off chart in the existing conditions. This drastic reduction in effective operational length, which was obviously not appreciated by the pilot, appears to have been one of the principal factors leading to the accident.

Standards for aircraft performance and the physical characteristics of authorised landing areas are laid down by the Department as a means of ensuring the safety of operations from such areas. The required characteristics and dimensions of authorised landing areas are contained in the Aeronautical Information Publication and the Visual Flight Guide, and it is a pilot's responsibility to make himself thoroughly familar with these requirements before he attempts to operate into such areas. In addition to conditions of strip surface, width and slope, the Department specifies that the approach and climb-out areas shall be clear of all obstacles above a gradient of 1:20 (5%), from the ends of the strip. In cases where fixed obstructions extend above these obstacle-free gradients, the effective operational length of the strip must be reduced to a figure which will provide the required clearance.

In regard to aircraft performance, the take-off performance chart contained in the flight manual which the Department issues with an aircraft's Certificate of Airworthiness, limits the maximum gross weight for take-off to ensure that in the particular meterological conditions and having regard to effective operational length available, the aircraft will be at a height of at least 50 feet as it crosses the end of the effective strip length. Furthermore, the Department requires that, after take-off, the aircraft shall be capable of achieving a still-air climb gradient of at least 6%. To ensure compliance with this climb gradient requirement, the performance chart may also limit the maximum gross weight for take-off independently of the strip length available. Thus, when the aircraft has reached the 50-foot height point on take-off, this 6% climb gradient ensures that it maintains a margin of clearance above the 5% obstacle-free gradient from the end of the strip.

As a standard, the 6% aircraft climb gradient requirement is specified by the Department for zero wind conditions. While a margin of safety exists in these circumstances, there are occasions when other conditions can cause the margins inherent in this standard to be reduced. It will be recalled that the pilot involved in the accident under discussion took-off with a small tail-wind component, apparently being under the impression that, as the wind was only light, it would not have had any appreciable effect on the aircraft's performance. Although the effect of a tail-wind component on the take-off distance to 50 feet is provided for in an aircraft's take-off weight chart, and may be easily computed by a pilot, it is perhaps not quite so obvious just to what extent the climb gradient **after** take-off is affected in these circumstances.

Climb gradient is a measure of height reached in horizontal distance travelled. In still-air conditions, the "air distance" covered to reach a particular height will of course, be the same as the ground distance. On a normal climb after take-off, a head-wind component will reduce the aircraft's ground speed and cause in turn, a corresponding reduction in the still-air distance to reach a given height at the same rate of climb. If we assume a constant wind velocity at all heights above ground level, then the uniform gradient of climb relative to the ground will be greater than the still-air figure by an amount proportional to the strength of this steady head-wind.

Just the opposite occurs during a take-off in tail-wind conditions, in that the increased ground speed results in a longer distance being taken to reach the same height. The actual gradient of climb in this case will be somewhat less than the figure achieved in still-air. If the gross weight for take-off has already been limited by the aircraft's performance chart to meet the 6% still-air climb gradient requirement, or if the aircraft just achieves this figure at an unrestricted weight, then in the more adverse tail-wind situation, the margin above the 5% obstacle-free gradient from the end of the strip will be reduced. If the tail-wind component is strong enough, the aircraft may even descend relative to the required obstacle-free gradient. These variations in climb gradient are shown in Fig. 1.

So far, no mention has been made of the effects of wind shear on aircraft climb gradient and only a simplified situation has been considered, as would exist if the wind strength did not alter with height. This situation of course, is never actually found in practice, as wind speed at the lower levels is reduced by friction with the earth's surface. From ground level therefore, wind speed increases with height up to the "gradient level" where surface friction is no longer effective. A down-wind take-off thus becomes even more critical, for as the aircraft leaves the lower levels and climbs into areas of increasing wind speed, the

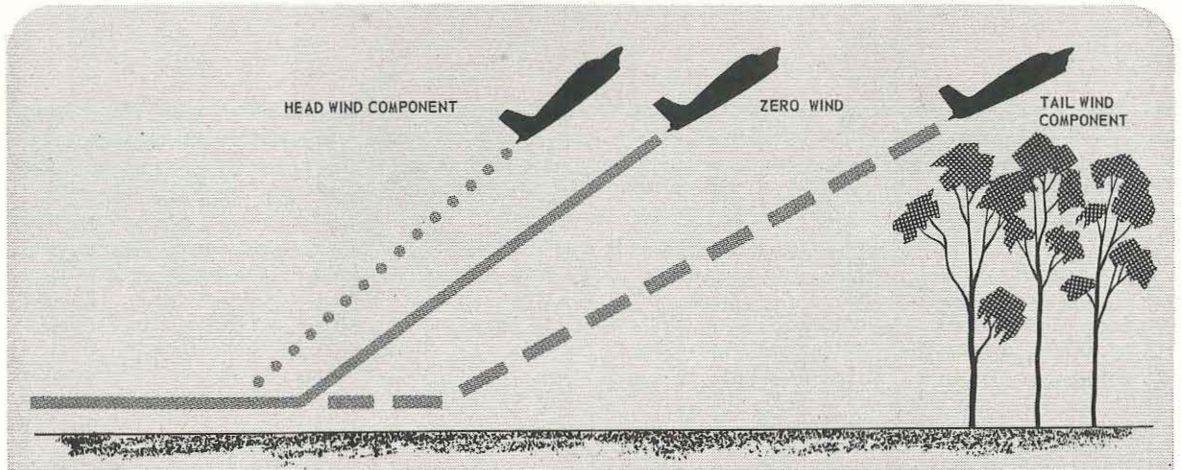


FIG.1. RELATIVE GRADIENTS OF CLIMB IN HEAD AND TAIL-WIND CONDITIONS

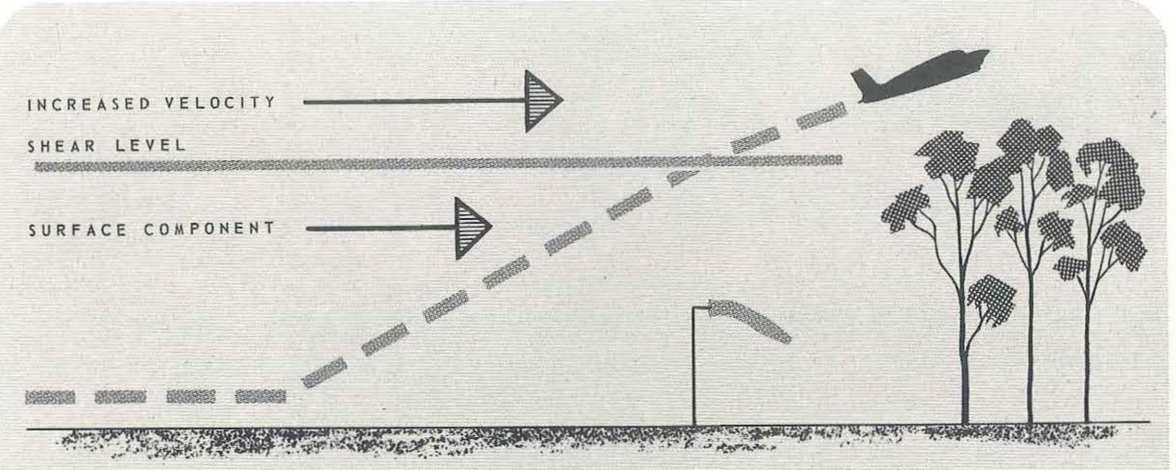


FIG.2. EFFECT OF SEVERE WIND SHEAR ON GRADIENT OF CLIMB IN TAIL-WIND CONDITIONS

tail-wind component increases and with it, the distance to reach a given height; i.e., there is progressive reduction in climb gradient as height is gained. This situation is illustrated in Figure 2.

There is yet another way in which tail-wind conditions can adversely affect an aircraft's gradient of climb. In some circumstances, changes in wind velocity with height can be quite severe and where an aircraft, passing through an area of pronounced wind shear, cannot accelerate or decelerate at the same rate as this change in velocity, these wind variations will be reflected in changes of airspeed. A sudden strengthening of a tail-wind component may result in a loss of airspeed which, in turn, could place the aircraft critically close to the stall during a climb at slow speed after take-off. If the engine is already operating at full power, the only way in which the pilot can accelerate his aircraft in these circumstances, is to lower the nose and sacrifice rate of climb as a means of regaining flying speed. This of course would further aggravate a situation in which gradient of climb has already been diminished by the normal tail-wind effects already described.

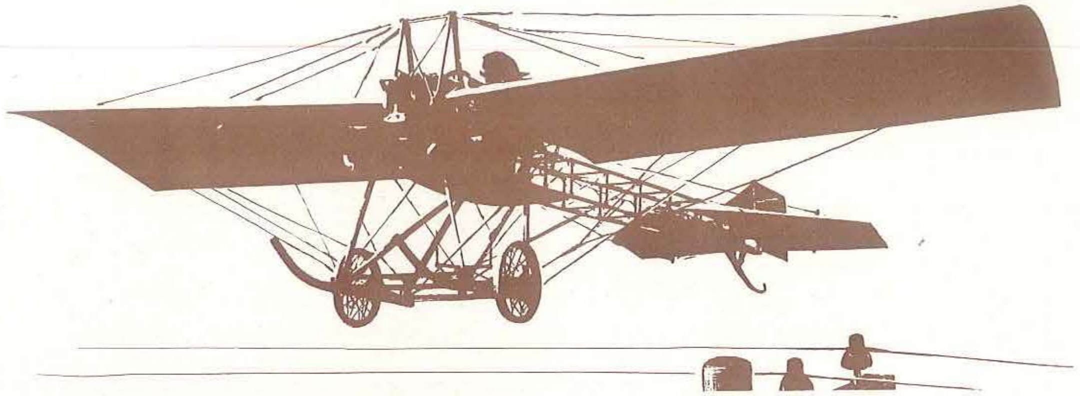
There may often be occasions when a pilot is faced with a down-wind take-off over obstacles such as trees, power lines, or rising ground, any of which could pose critical clearance gradient problems. In these circumstances, it is essential to make proper allowance for the effect of these obstacles on the effective operational length of the strip being used, the increase in take-off distance to 50 feet, and the reduction in aircraft climb gradient beyond this point, all of which are vital to the safety of the operation.

It will be seen that the overall picture presented by these performance considerations is a vastly different one to that conveyed by some of the advertisements reproduced in the title of this article. It cannot of course be denied that under certain favourable conditions and without any margin for error, these aircraft can "unstick" in the distance claimed. But there is a lot of difference between "unsticking" and completing a **take-off!** Also, the "certain favourable conditions" are not the conditions which prevail over most of Australia for most of the time.

In such circumstances the Department has no alternative but to urge light aircraft pilots to pay little regard to any performance claims made in advertisements and sales brochures for the aircraft they are flying, and to reassess their concept of the aircraft's performance in the light of the information contained in the aircraft flight manual issued by the Department. Even some performance figures quoted in owners' handbooks (which are **not** approved flight manuals) should be regarded with caution. The Department has on occasions queried some manufacturer's claims, including those published in owner's handbooks, issued by the manufacturers to purchasers of their aircraft. Regrettably this has had little effect and on one occasion a manufacturer explained to the Department that their owner's handbook "uses sales figures" which are "incorrect"!

By referring to the performance charts in the flight manual, preferably as a matter of routine, but certainly whenever there is the slightest doubt as to the adequacy of a proposed landing area, accidents such as the one referred to can be avoided. It is hard to understand why some pilots do not make better use of their performance charts. Even if all turns out well, guess work on a marginal strip can be enough to produce premature grey hairs! ●

WIRES ARE WHERE YOU FIND THEM . . .



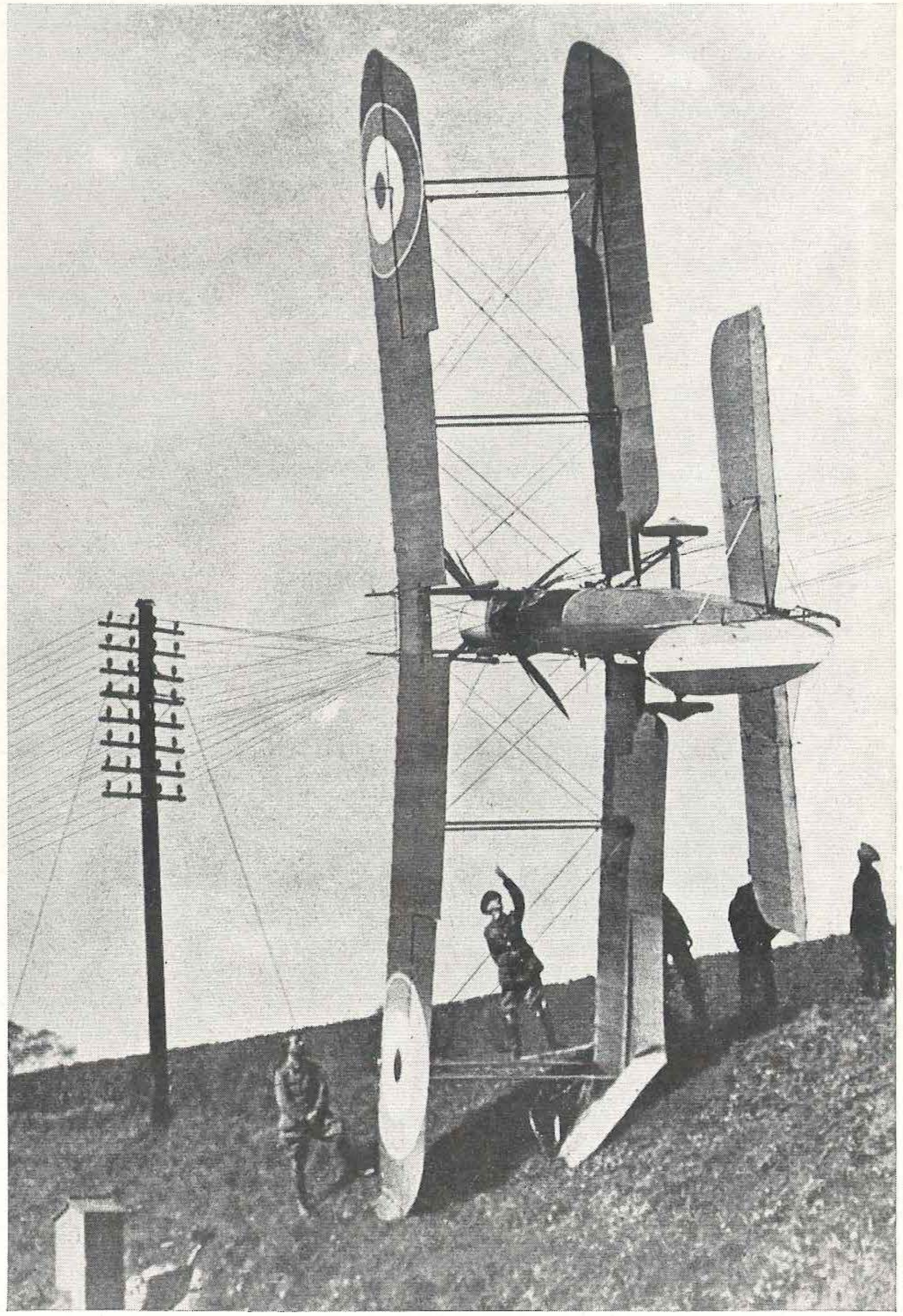
WIRES! The downfall of many a pilot, whether going about his lawful occasions as in agricultural aviation, or indulging in an unauthorised beat-up in some locality "safe" from the eyes of officialdom. Whatever the reason for it, an encounter with wires all too frequently has the same disastrous results.

The hazard is almost as old as aviation itself. The ancient flying machine pictured in silhouette above is a Deperdussin, one of Australia's first military aircraft. Only a week after the first of the type was assembled at Point Cook, some time before the outbreak of World War I, it crashed while being demonstrated before the then Minister for Defence. The reason for its untimely end? None other than it collided with a nearby telephone line!

The photograph of the biplane, from a little later period of aviation history, is another interesting example of an overhead wire encounter. The aircraft that has tangled so "arrestingly" on this occasion is, we believe, a B.E.2c, operating in France during World War I.

But what about today? Accidents resulting from wire strikes, especially those in the "unauthorised low flying" category have been featured in the Digest ad nauseum in recent years. Just how many potential accidents this might have prevented is anybody's guess, but without doubt there are numbers of pilots who have recognised needless low flying for the folly it is and have firmly resolved that they are not going to become victims of the snare. It is to these pilots in particular that we have something fresh to say on the subject—**the way things are today you don't HAVE to be an agricultural pilot or to indulge in a "beat up" to expose yourself to a wire strike.** Rather, if some recent occurrences are any guide, all you need to do is to make an approach to land at an unfamiliar non-licenced landing area!

Sharp-memoried readers may remember the little article "A Built-in Snare" published just a year ago in Digest No. 58, which told how a pilot, landing a 172 at a station property airstrip, was horrified to see he was passing beneath an unmarked power line which he would have undoubtedly hit had his approach path been a little higher. Since that time, several incidents have occurred and, in at least three cases, aircraft have actually hit power lines while making quite normal approaches to land on private airstrips. In one instance the pilot had actually been warned before departing for the strip, to watch out for the power line. In another case, the pilot had made what he believed was a careful inspection of the area from the air before beginning his approach to land. Fortunately in all three cases, the aircraft remained in flight after striking the wires and were able to land safely.

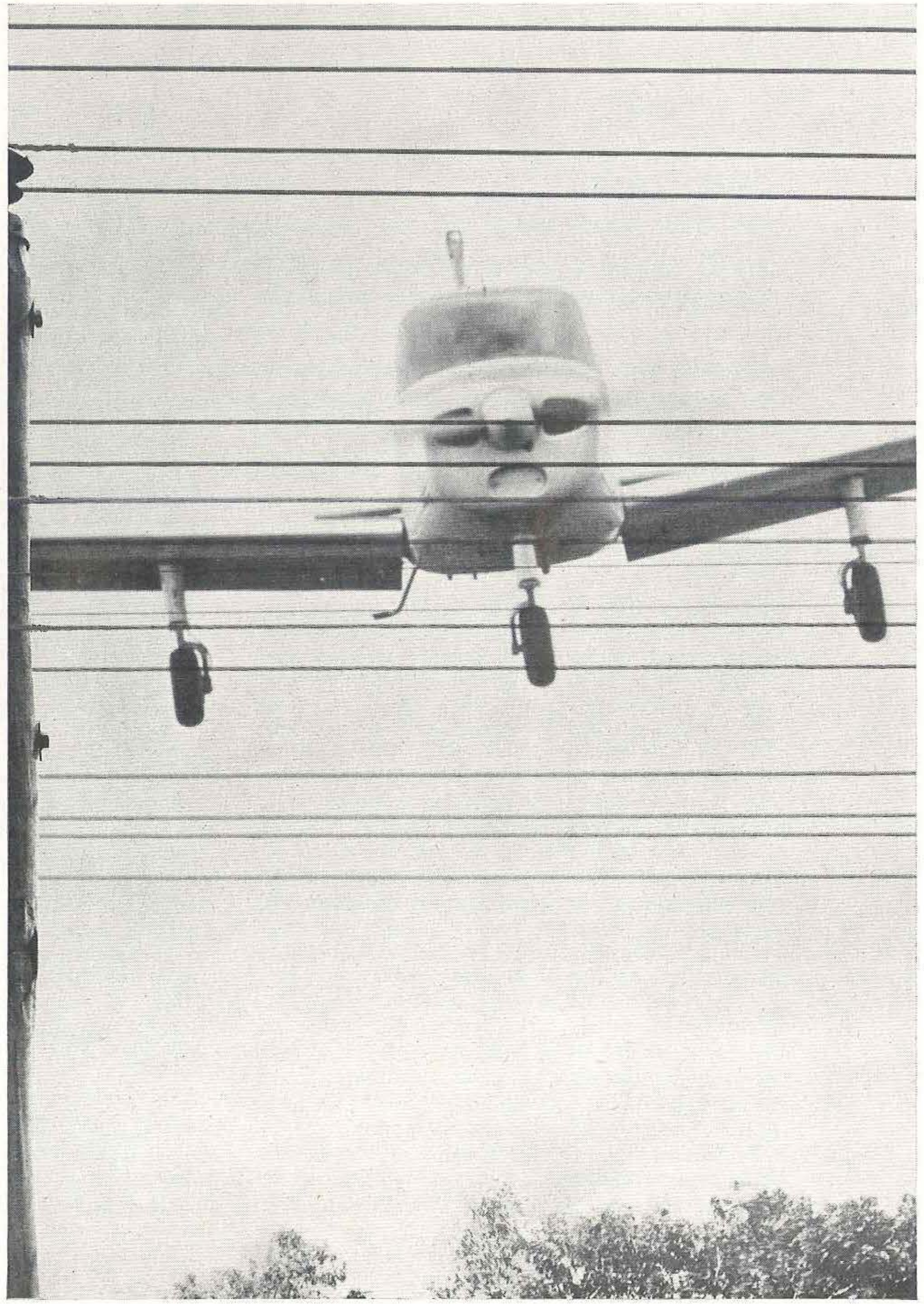


But this fact must not encourage complacency. Overhead wires today are almost everywhere there is settlement and are proliferating even farther afield as rural electrification schemes extend into our less populated areas. The hazard has thus grown with the years and will become greater as time goes by. The fact that an unlicenced airstrip had clear approaches when last used is no guarantee that power lines have not been erected in the vicinity since.

It may not be generally appreciated that pilots themselves are entirely responsible for establishing the suitability of a proposed landing area for their aircraft. The physical dimensions and characteristics of government and licenced aerodromes are of course available from the Department's AIP's and the Visual Flight Guide. Whenever such an aerodrome becomes unserviceable, or its condition varies in any other way from the published data, the facts are promulgated in appropriate Notams and the aerodrome is marked accordingly. In the case of a landing area that is not a government or licensed aerodrome however, a pilot must obtain its dimensions and characteristics himself to ensure that it conforms to the standards for authorised landing areas set out in the AIP and VFG.

Wise pilots make a practice of obtaining **all** such information before departing on a flight to a proposed landing area and then make a careful inspection of the area from the air before attempting a landing. Spur-of-the-moment decisions to land on an unfamiliar landing area just because it "looks all right" can court trouble. Accepting advice about little known strips from well intentioned but inexpert lay persons can also be very unwise.

Adequately checking the characteristics of a distant landing area may be irksome and a nuisance at times. But it is as nothing compared to the possible consequences of a collision with an unseen power line during an approach to land. **You cannot be TOO careful!**



FIRE IN FLIGHT

(Adapted from Report published by Board of Trade, United Kingdom)

* * *

Less than a minute after taking-off from Heathrow Airport, London, for a flight to Zurich, Switzerland, the No. 2 engine of a Boeing 707 failed and a few seconds later caught fire. The aircraft turned back and was manoeuvred for an emergency landing on the most readily accessible runway. During the approach the No. 2 engine fell away but the aircraft made a good landing. Emergency evacuation began as soon as the aircraft could be brought to a stop but the fire, which continued to burn in the port wing, increased in intensity and the port fuel tanks exploded. Four of the 116 passengers and one stewardess were overcome by heat and smoke and did not escape from the aircraft, which was largely destroyed.

The aircraft had taken off from Heathrow's Runway 28L in fine and almost calm conditions. In addition to the normal crew complement, a supervising captain was on the flight deck occupying the "jump seat" immediately behind the left control seat. The second officer occupied the navigator's position during the take-off.

About 20 seconds after the aircraft had become airborne, the flight crew felt and heard a combined shock and bang. The thrust lever for the No. 2 engine "kicked" towards the closed position and the instruments showed the engine running down. The captain ordered "Engine Failure Drill" and the flight engineer began the actions for the drill. Because the undercarriage was retracted, the warning horn sounded when the flight engineer retracted the thrust lever. The check captain and the flight engineer simultaneously pulled the horn cancel switch on the pedestal but the first officer erroneously presed the fire bell cancel button in front of him. The flight engineer also went to pull the No. 2 engine fire shut-off handle, but for some reason did not actually pull it. About this time the check captain, looking out the port side flight deck window, reported there was a serious fire in No. 2 engine, and that a landing should be made at the earliest possible moment. The fire warning light in the No. 2 engine fire shut-off handle was then seen to be on, and the captain ordered "Engine Fire Drill". Shortly afterwards the first officer transmitted a Mayday call. Air Traffic Control offered the aircraft Runway 05R for landing as it would result in a shorter flight path. This was accepted and other landing aircraft were ordered to overshoot to ensure a clear approach path and to clear the aerodrome for the passage of fire fighting vehicles.

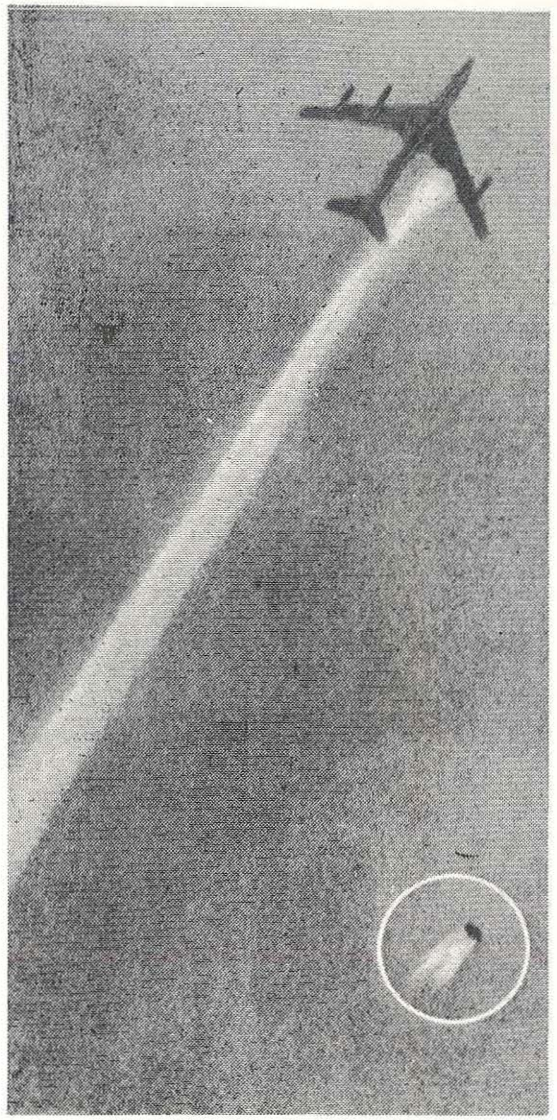
Meanwhile, the flight engineer, changing from the "Engine Failure Drill" to the "Engine Fire Drill", carried out Phase I of the drill from memory as required, then used his copy of the aircraft check list to complete Phase II of the drill. The first officer at this stage began to read the check list, but the flight engineer told him the check had already been completed. The check captain, in the meantime, had been giving his attention to the fire in the wing and offering comments to assist the captain to position the aircraft for landing.

A minute and a half after the start of the fire, the No. 2 engine, with part of its mounting pylon, fell from the aircraft. The flight crew were unaware of this, but knew that the fire was still burning.

The undercarriage and full flap were selected down and, although the undercarriage extended and locked down normally, the hydraulic pressure and contents indications were seen to fall and the flap extension came to a stop three degrees short of the fully down position.

The approach to Runway 05R was made from a difficult position, the aircraft being close to the runway, at a height of about 3,000 feet, and having reached a speed of 225 knots. There is no glide slope guidance to this runway, but the approach was well judged and the aircraft touched down approximately 400 yards beyond the threshold. To help bring the aircraft to stop in the shortest possible distance, reverse thrust from Nos. 1 and 4 engines was used down to a very low speed, which caused the flames to be deflected towards the fuselage. The aircraft came to a stop just to the left of the runway centre-line, about 1,800 yards from the threshold, on a heading of 035 degrees Magnetic.

Taken by an on-the-spot photographer, this picture shows the No. 2 engine falling from the burning port wing as the aircraft was returning to land.



When the aircraft came to a rest the flight engineer commenced the Engine Shut-Down Drill. Almost simultaneously the captain ordered Fire Drill on the remaining engines, but before this could be carried out there was an explosion in the port wing which increased the intensity of the fire and blew fragments over to the starboard side of the aircraft. The captain then ordered immediate evacuation of the flight deck. The engine fire shut-off handles were not pulled and the fuel booster pumps and main electrical supply were not switched off. There were more explosions and fuel released from the port tanks spread beneath the fuselage and greatly enlarged the fire.

In the passenger cabin, the cabin staff and some of the passengers had felt the aircraft shake shortly after the take off and then saw that the No. 2 engine was on fire. The "Fasten Seat Belt" sign was still on, and in the short time before the emergency landing, the chief steward, with the assistance of the other cabin staff, prepared the passengers and the aircraft for evacuation. Before the aircraft had come to a stop, the cabin staff had opened both starboard over-wing exits. As soon as the aircraft came to rest, the rear starboard door, and the forward port and starboard doors, were opened and the escape chutes were rigged. Supervised by the cabin staff, the passengers commenced evacuation from the two starboard over-wing exits and, when the chutes had been inflated, from the rear starboard galley door and then the forward starboard galley door. Because of the spread of the fire under the rear of the fuselage however, the escape chute at the rear galley door soon burst and, after the first explosion, the over-wing escape route also became unusable. The great majority of the survivors left the aircraft via the forward galley door escape chute.

The first officer, who could not get into the galley to help with the evacuation, left the aircraft through the starboard flight deck window by use of the escape rope at that position. The second officer, who helped guide the passengers in the initial stages, followed. The captain, having assisted the stewardess to inflate the port forward chute, also left by the flight deck window after seeing the evacuation was proceeding satisfactorily. The flight engineer saw that the port forward chute had not inflated properly so he climped down it to straighten it. Immediately after it inflated however, it became affected by heat and burst.

Generally, the evacuation took place in an orderly manner but when the rear galley door and starboard overwing routes became unusable, some momentary confusion resulted amongst passengers who had to revise their initial escape routes. Conditions inside the cabin were quite good in the early stages of the fire but deteriorated very rapidly when the integrity of the fuselage was breached at the rear of the aircraft, the first part of the fuselage to be overwhelmed by the fire. Four of the passengers and one stewardness were overcome by heat and smoke at the rear of the aircraft and did not escape, whilst thirty-eight passengers sustained injuries during the evacuation. The passenger evacuation had been largely completed by the time the airport fire and rescue services reached the aircraft and had begun to provide assistance. The fire services prevented the fuel in the starboard tanks from catching fire but the rear fuselage and port wing were burnt out.

* * *

Examination of the wreckage revealed no evidence of damage to the wing other than that sustained from the fire. Inspection of the flight deck controls showed that none of the fire shut-off handles had been activated. The port fire extinguisher transfer switch was found set to "transfer". The fuel booster pump switches for the main wing tanks were "on" and the switches on the engineer's panel for the fuel shut-off valves were set to "open". The normal tank to engine fuel supply was set up. The fuel and hydraulic oil shut-off valves for the No. 2 engine were located in the wreckage and found to be fully open.

The No. 2 engine was recovered from a water-filled gravel pit approximately five miles from the threshold of Runway 05 Right. It was substantially complete and only slightly damaged by fire. A short section of the rim of its No. 5 stage LP compressor wheel was found nearby.

An intensive search was made of the ground beneath the aircraft's flight path. Just inside the airfield perimeter and close to the up-wind end of Runway 28L, some severely damaged engine stator and rotor blades from the LP compressor were found, together with fragments of the LP compressor casing. Further along the flight path, portions of the No. 5 LP compressor wheel rim were found and also the main fuel feed pipe for the engine. Strip inspection of the engine revealed that No. 5 LP compressor wheel had disintegrated, throwing several pieces of its rim and blading through the casing.

The fire had resulted when the disintegrating compressor wheel breached the main fuel feed pipe, allowing fuel to be delivered under pressure by the booster pumps from the broken joint at a rate of about 50 gallons per minute. Ignition, either by ingestion into the damaged compressor and thence to the combustion area, or from the hot jet pipe, probably took place immediately. The fuel and hydraulic shut-off valves were not closed, so the fire continued to burn. Within a very short space of time it weakened the light alloy structure of the pylon and the engine fell away from the aircraft.

The fuel, fed by the booster pumps, then continued to burn as it issued from the fractured pipe in the remains of the No. 2 pylon, just forward of the leading edge of the wing. When the aircraft came to a stop, the booster pumps continued to run, probably for about 20 seconds until their electrical circuit was broken by the fire. The explosion that followed released more fuel from the port tanks and the fire spread and increased in intensity.

In the Boeing 707 means are provided for smothering an engine fire by flooding the engine cowling space with an inert gas. The system for each engine is controlled through its fire shut-off handle and appropriate switches, located on the pilot's glare shield. In the event of an engine fire, a red warning light illuminates in the appropriate fire shut-off handle and the fire warning bell rings. The fire shut-off handle requires a force of approximately 12 lb. to operate or reset and when pulled, protrudes about ½ inch from the adjacent handles.

Pulling the fire shut-off handle causes a number of vital actions to take place, including electrically arming the fire extinguisher discharge switch, and causing the fuel shut-off valve for that engine to close, at the same time shutting off supply of hydraulic oil to the engine-driven hydraulic pumps. Only after the fire shut-off handle has been pulled can the fire extinguisher bottles be discharged. If the fire continues to burn despite the first discharge, the appropriate transfer switch is moved to "transfer" and by pressing the same fire extinguisher button again, the extinguishant from the bottles for the adjacent engine can be used.

Detailed examination of both No. 1 and No. 2 fire extinguisher bottles revealed that both had been severely heated in the fire and both were discharged. Strip examination however, showed that the bottles had been discharged by overheating and that they had not been fired electrically from the flight deck.

Firemen subduing the fire in the fuselage. Most of the survivors escaped from the aircraft before the fuselage was breached.

The fuel tanks of the Boeing 707 are an integral part of the wing structure with the front wing spar forming the forward face of each fuel tank. Just behind the front spar and inboard of the centreline of each engine pylon is a fuel-free area known as the dry bay, housing the electrically operated shut-off valve. The shut-off valve can be operated either by an individual gated switch on the flight engineer's fuel panel on the flight deck, or by the appropriate engine fire shut-off handle on the glare shield between the two pilots. All fuel to an engine must pass through the shut-off valve in the dry bay and thence through the front spar and down the centreline of the pylon through a 1¾-inch steel pipeline inside the pylon fairing. When the fuel shut-off valve in a dry bay is closed, no fuel can be supplied to the appropriate engine, except for the fuel contained in the 1¾-inch pipe between the shut-off valve and the engine itself. This would not be sufficient to sustain an in-flight fire for more than a few seconds after closure of the shut-off valve.

* * *

The wreckage examination revealed no evidence of damage to the fuel tanks or defects in the mechanical or electrical elements of the fire extinguisher system other than those sustained in the ground fire. It is evident that after the engine and part of the pylon had fallen away, the fire continued to burn fiercely from the broken fuel pipe forward of the leading edge of the wing. When considered with the evidence that the fire extinguisher bottles had not been discharged electrically, it is apparent that the fire continued to burn because the No. 2 engine fire shut-off handle was not pulled as required by the fire drill. That the handle was not pulled is further substantiated by the loss of hydraulic fluid which occurred after the engine fell away from the aircraft. The hydraulic shut-off valve, which is also operated by the fire shut-off handle, would have prevented this loss of hydraulic fluid if it had been closed. It is pertinent to consider why the operation of the fire shut-off handle was omitted when the Engine Fire Drill was carried out, and why the omission was not noticed by the crew on the flight deck.

When an engine fire of this magnitude occurs, there will inevitably be some doubt in the minds of the crew that it may not be possible to put it out. Fire drills must therefore be designed in the knowledge that the situation will be treated with a sense of considerable urgency. The call for prompt action will be accentuated if the fire breaks out on take-off, because a return to the aerodrome for an immediate landing will be made whenever possible and time will be short.

The drills in force at the time of the accident had been regularly practised by the crews and there is no doubt they could be accomplished successfully provided they were performed methodically and with precision. However, the circumstances of this accident show that in an atmosphere of urgency, with the fire drill supplanting the Engine Overheat or Failure Drill, confusion can occur between what actions had been completed and what still needed to be done. Apart from the action to silence the fire warning bell, the drills differed only in one critical action, the pulling of the fire shut-off handle.

On this occasion, the difference between the two drills was inadvertently obscured by the flight engineer, who went for, but did not pull, the fire shut-off handle, whilst carrying out the Engine Overheat or Failure Drill. Apparently this not only gave him the impression that he had pulled the handle as part of the fire drill, but it also gave the same impression to the first officer.

From the flight engineer's station, directly facing the fire shut-off handles, it is not easy to see at a glance that a handle has not been pulled, because its movement, directly towards him, is only half an inch. When viewed from the side, i.e. from either pilot's seat, it is more easily seen. Nevertheless, because of the very small movement, it is questionable whether its position would be readily apparent to pilots whose attention is concentrated on handling the aircraft during an approach to land in circumstances requiring accurate judgement from external cues. It is the operating company's view that in some emergency situations, the captain will be so preoccupied with the physical handling of the aircraft, that he cannot monitor in detail the performance of the drills. Hence he must place great reliance on the crew members' report that the drills have been completed.

The check captain did not watch the fire drill being carried out, but concentrated on keeping the captain informed of the state of the fire and giving him assistance to position the aircraft for landing; he did not notice that the fire shut-off handle had not been pulled. By the time he turned his attention to activities on the flight deck itself, the engine had fallen away. The warning light in the fire handle had gone out in consequence, so his attention was not drawn in that direction.

An inherent weakness in the drill in use at the time appears to have been that the vital operation of pulling the fire shut-off handle relied solely upon memory and required no later check of this action. An additional factor leading to the breakdown of the drill was the workload on the first officer. In the very short time available, in addition to his other tasks, he was instructed to make a "May-day" call. Also, when he started to read the check list, the flight engineer told him the check had already been completed. It is highly significant that even if he had read back the items of the fire drill, as required by the operations flying manual, a check of the fire shut-off handle would not have been included.

From the weight of evidence, it seems that the fire bell did not ring because the first officer, hearing the undercarriage horn sound, misidentified the action required and was pressing the fire bell cancel button at the instant when the bell would have started to ring. Consideration has been given to the possible effect this may have had on the performance of the drills. No definite conclusion can be reached, but it is possible that the flight engineer would have been more alerted to the need to begin the memory items of the fire drill if the first action he was required to perform had been the cancellation of the warning bell.

Little time was available for the cabin staff to prepare the passengers for the landing and subsequent evacuation. Nevertheless, from the mass of favourable comment from the passengers and the evidence available, it is clear that everything possible was done and the cabin staff, under the leadership of the chief steward, behaved with commendable coolness and efficiency throughout. It seems certain that the stewardess who lost her life, did so whilst trying to help passengers at the rear of the aircraft in the rapidly deteriorating conditions. It is undoubtedly due to the efforts of the cabin staff that the loss of life was not greater.

During the evacuation it was found that the great concern of passengers to take small belongings with them tended to block up the gangways. It is also clear from this accident, that inflatable escape chutes are very susceptible to heat and flame. Since it has been shown that a very large number of passengers can escape down one chute in a short space of time, it seems highly desirable that further research and development should be undertaken in the design of chutes in general and the materials of which they are made for greater fire resistant characteristics. Even an extra half minute's use of a chute could save many lives.

The investigation of the accident as a whole showed up a number of deficiencies in the fire-fighting facilities and methods in use at the airport.

The essence of fighting an aircraft fire is the speed and weight of the initial attack to isolate the fuselage and preserve door escape routes, as well as to attack the source with the aim of diminishing the intensity of the fire as quickly as possible. Thus, seconds gained in reaching the scene of the fire are important.

With the present location of the main fire station at the airport, there is a potential delay in reaching the scene of an accident. Extreme care is therefore necessary to ensure the best possible liaison between the fire service, the police and air traffic control and so minimize delay. Improvements have already been effected since the accident, but now that the airport is being used to a greater extent by bigger aircraft, there remains the question of reviewing the number and location of fire stations.

The tactical approach to this fire was not entirely in accordance with accepted principles, and the positions taken up by the two foam tenders early in the operation were not well judged. As a result, most of the foam volume available could be applied neither to isolating the fuselage, nor to the seat of the fire itself. The design of the appliances used is such that once the decision to stop and make foam is taken, they become virtually immobile as they cannot move and make foam simultaneously. This deficiency is to be rectified by replacing the equipment with new appliances which can move and make foam at the same time.

The failure of a handline from one foam appliance was serious, as it reduced the already limited volume being applied, to a very low figure at a critical time. The reason for the hose bursting has not been determined, but hoses of a new design have since been fitted as standard to all foam appliances and water tenders on the airport.

The amount of "water on wheels" required by the aerodrome licence takes into account the airport's hydrant system, which is capable of delivering 450 gallons per minute from any of its 248 outlets. It is vital therefore, if a continuous supply of foam is to be available from the appliances, that the hose-laying and coupling procedures do not fail. On this occasion, partly because the hose-laying vehicle was exercising at the time of the accident and arrived later than the main body of appliances, water was not available from the hydrants for about a minute after the wheel-borne water ran out.

Cause

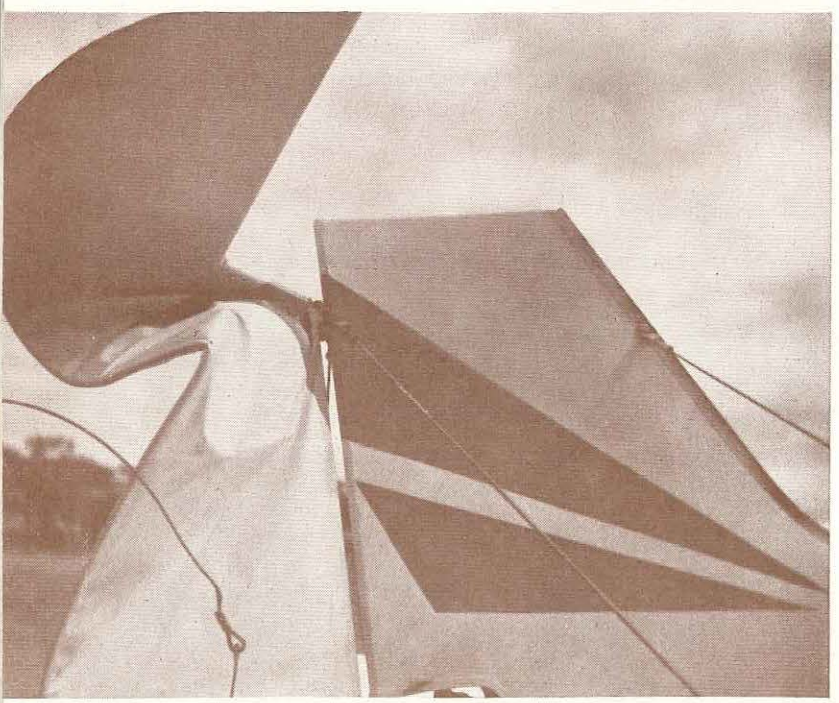
The accident resulted from an omission to close the fuel shut-off valve when No. 2 engine caught fire following the failure of its No. 5 low pressure compressor wheel. The failure of the wheel was due to fatigue.

* * *

The Board of Trade believes that there are lessons to be learned from this airport fire-fighting operation, bearing in mind the expected increase in traffic density and size of aircraft coming into service. Because of this it has taken the unusual course of publishing, in addition to their overall report of the investigation of the accident, the actual report of the Fire and Rescue Services Working Group, which participated in the investigation. Copies of this latter report, which is included as an annex to the published accident report, have been made available to all Airport Fire Service Units under the Department's control, so that the lessons from Heathrow can be put to good use at Australian airports. ●

Pilot's instrument panel in the Boeing 707, showing position of fire shut-off handles.

IS YOUR NECK WORTH FIFTY CENTS?



Above: The Pawnee's rudder after its encounter with the power line. Despite the severe distortion, the aircraft remained under control.

IN northern New South Wales, a Pawnee was spraying a field of cotton, making passes beneath a long span, single wire power line which crossed the area. All went well until the pilot worked his way to about the middle of the power line span, where the sag in the wire reached its lowest point.

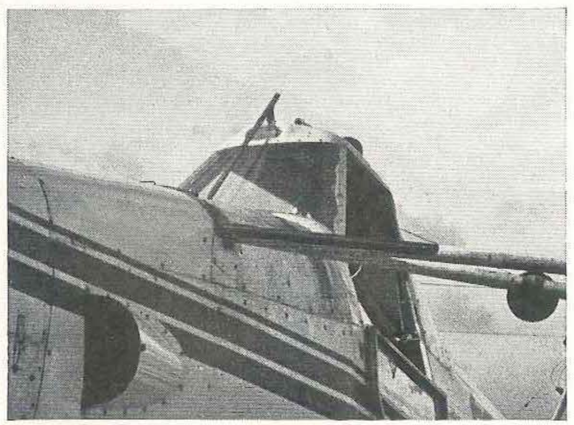
As the aircraft passed beneath the wire on this run, the pilot heard a sudden sharp crack. The pilot lifted the aircraft to a safe height clear of obstructions, then looked back to see what had happened. The rudder was badly buckled and its horn balance torn back as shown in the picture at left. The deflector cable between the cockpit canopy and the top of the rudder had also been severed at its forward end and was flapping. Fortunately, the aircraft was still controllable and the pilot was able to land without difficulty.

Apart from the useful operational lesson that can be drawn from this accident, there is also an important message in it for pilots, maintenance engineers and operators, on the readiness of agricultural aircraft for operations where collisions with wires are a distinct possibility. When this aircraft was examined after the accident, it was found that the deflector cable attachment to the top of the rudder was not equipped with the anti-snag deflector normally fitted to this model aircraft. The anti-snag deflector is designed to prevent a power line or any similar wire encountered in flight from snagging on the deflector cable attachment fitting to the top of the rudder. The power line under which the aircraft was passing at the time of this mishap was thus able to catch on the deflector cable attachment, and inflict the damage to the rudder as shown.

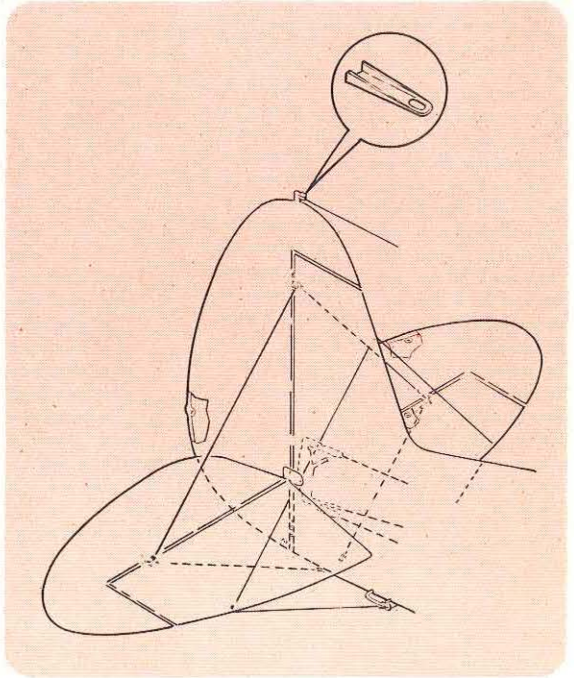
Further investigation established that the anti-snag deflector was introduced as standard equipment for the aircraft type, well after production had begun, presumably as the result of experiences such as this one described above and, because of this fact, there are a number of earlier Pawnee aircraft operating in Australia which would not have been fitted with the deflector. As a result of this accident it has been suggested that in the interests of pilots and operators, all such aeroplanes (i.e. Pawnees manufactured before Serial Number 2712) should be fitted with the anti-snag deflector. There is little problem in fitting the part as it attaches to the existing deflector cable attachment lug and, as its price is approximately 50 cents, it would certainly be cheap insurance!

It is rather interesting that the particular aircraft involved in this accident was manufactured **after** the anti-snag deflector was introduced as standard equipment. It is apparent that the deflector had been removed at some time during the aircraft's life, possibly to renew the deflector cable, and for some reason was not replaced. If this was so, the person responsible could have had no appreciation whatever of the importance of such devices to the safety of agricultural aircraft.

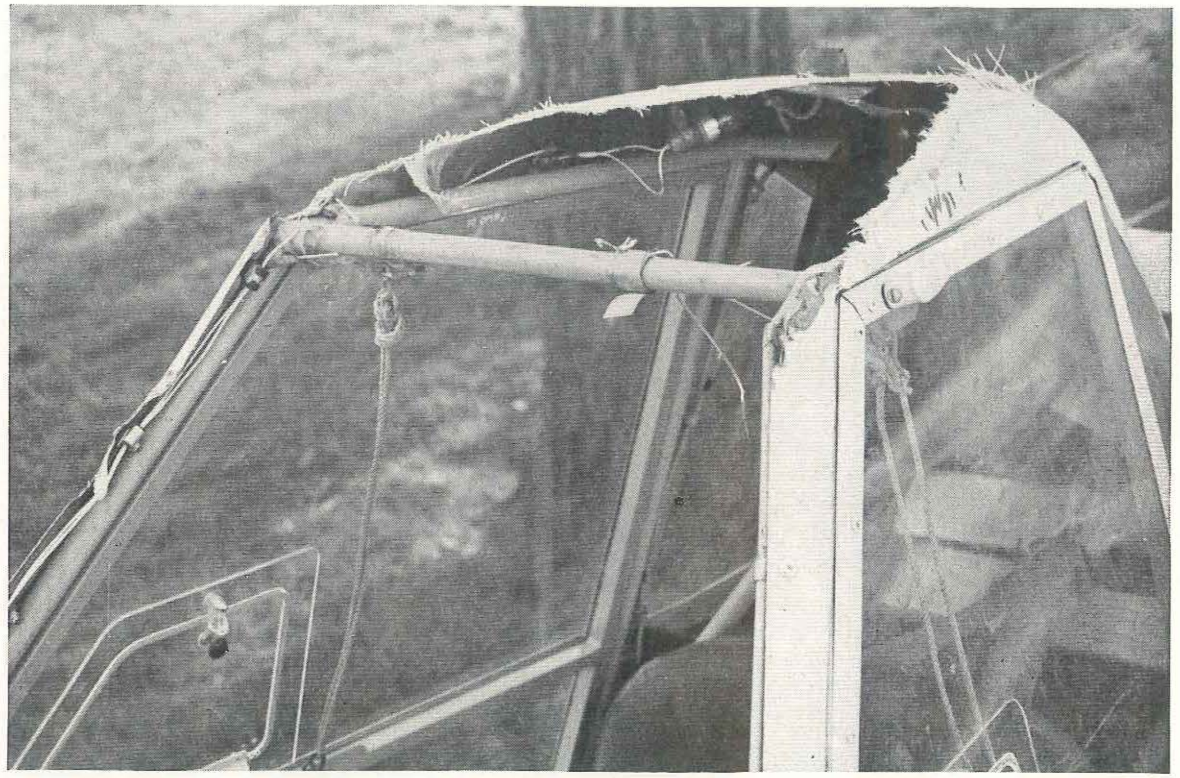
The same philosophy of "good insurance" could also be applied to the fitting of wire-cutters to the windscreens of Pawnee Aircraft. This safety device was also introduced well after production had begun, and, as in the case of the anti-snag deflectors, there are a number of aircraft flying in Australia without them.



Above: Wire cutter as fitted to the windscreen of later model Pawnee aircraft.



Left: Position of anti-snag deflector fitted to deflector cable on top of rudder of some Pawnee aircraft. Such a fitting might have prevented the damage shown on page 22.



The windscreen and cockpit roof were torn off this Pawnee when it struck overhead wires while spraying in Queensland. The windscreen was not fitted with a wire cutter.

Another example, also from Queensland, of a wire strike shattering the windscreen of a Pawnee. A windscreen wire cutter of the type shown on the previous page would probably have prevented this damage.

The photographs taken of two different accidents on this page show what a wire strike can do to the windscreen of an aircraft. There is little doubt that the serious degree of damage, and risk of injury to the pilot, that occurred in each case, could have been avoided if these aircraft had been fitted with windscreen wire cutters. In this case again there is little installation problem and the cost is not great — certainly insignificant in comparison with the damage shown in the pictures!

It would be nonsense to infer that, by fitting all possible anti-snagging devices to their aircraft, agricultural pilots can afford to be more cavalier in their attitude to the hazard of overhead wires. It is an unfortunate statistical fact however, that agricultural aircraft will strike wires despite the efforts of pilots and operators generally. As well as continuing to take all possible precautions to avoid wire strikes, it is only sound common sense to take advantage of every known method of reducing the severity of the consequences while the possibility exists for an aircraft to become another wire strike statistic. ●

WOULD YOU BELIEVE . . .

OUR award for the most remarkable Digest contribution of the month goes to the pilot whom our little sketch purports to represent. It all happened when he was checking an aeroplane before setting off on a night flight from a secondary airport (which shall be nameless). Attempting to check the fuel contents in the dark, he dipped his fingers into the tank but still found it difficult to gauge the level of the fuel. Stepping back from the aircraft he then lit a match to "increase the light", as the pilot's report so pithily puts it.

The effect exceeded his expectations. Immediately his hand, still wet with fuel, was enveloped in flame. Attempting to shake the fire out, it then spread to the open filler neck of the aircraft's fuel tank. The pilot's report continues: "I then ran from the aircraft to where an instructor was standing and together we extinguished the fire. I realise what a stupid thing I did . . . . , this has taught me a lesson I will not forget".

Comment

We should hope so! Frankly we just did not think it could happen, but as the old saying puts it "truth is stranger than fiction". The fact that the fuel tank was full, exposing only a very small surface area of fuel, was probably the saving grace of the incident allowing the pilot and his instructor to put out the fire before it did more than scorch the paintwork of the wing. ●

Too much — too soon

A STUDENT pilot making his second solo flight was attempting to land this Cessna 150 when he got into difficulties. He had carried out a satisfactory circuit and made the final portion of the approach with full flap and the throttle closed. The aircraft rounded out at a normal height, but then ballooned to about ten feet above the ground. The student continued to hold off at this height until the aircraft stalled and it landed heavily, nose-wheel first. It ran for about 70 feet, then the nose leg collapsed, and the aircraft skidded to a halt on its nose 35 feet farther on.

At the time of the accident, the student's total aeronautical experience amounted to only seven hours. He had flown five hours thirty-five minutes up to the day of the accident, all of it on the Cessna 150, and of this time, one hour ten minutes had been spent on circuits and landings.

On the morning of the accident, the student was given further dual instruction in circuits and landings in the Cessna 150. The student performed well, and after completing three circuits, during which the procedures for engine failure after take-off, and a baulked approach were demonstrated, the student was sent off on his first solo flight. This he completed satisfactorily and the instructor then decided to send him for another solo circuit. It was at the conclusion of this flight that the accident occurred.

The weather at the time was fine with a light north-westerly wind, and played little, if any part in the accident. The failed nose-leg structure was examined but showed no signs of cracks or fatigue failure.

All the damage sustained by the nose leg attachments was the result of over-stressing consistent with what would be expected in a heavy landing. Examination of the impact marks, particularly that of the nose-wheel, which left an indentation three inches deep and eighteen inches long in the turf surface of the airstrip, indicated that there was a substantial vertical component in the aircraft's initial contact with the ground. As far as the nose strut was concerned, this was probably accentuated by the nose dropping after the aircraft had reached the point of stall. This evidence, together with that of the instructor who said the undercarriage appeared to "spread a little" as the aircraft landed, left no doubt that the landing was a heavy one.

The student's training record showed that, in the few hours of training he had received up to the time of the accident, he had flown with three different instructors. During his one and only period of circuits and landings before the day of the accident, he had been assessed as "very good", but it is evident that he had not been thoroughly instructed in how to deal with badly judged round outs, ballooning and bouncing.

Cause

The cause of the accident was that the pilot did not receive adequate training before he was permitted to fly solo.

Comment

Even if student pilots do not show any tendencies to make errors of judgement during the early stages of their flying training, it is most important for instructors to induce these errors to satisfy themselves that the student is capable of handling any situation that might develop as a result of faulty technique, particularly during the landing phase.

Sending a student off for a second solo circuit immediately he had completed his first solo is not a practice to be recommended. The "first solo" is a big event in any student's life and invariably produces a feeling of elation and often a tendency to relax flying discipline. For this reason a distinct break is obviously most desirable before the second solo flight is made and even then, this should be undertaken only after a further satisfactory dual check flight. ●

Erroneous Instrument Readings

WHILE about mid-way across Bass Strait, during a flight from Launceston to Melbourne, the auto-pilot of a Fokker Friendship made a mild bunt. The first officer immediately disconnected the auto-pilot to hand-fly the aircraft, but then saw that his altimeter and vertical speed indications were varying from those of the captain by 500 feet and 1,000 feet per minute respectively. After a few fluctuations, the instruments settled down again.

The instruments continued to function normally until the aircraft was approaching to land at Essendon, when the first officer's altimeter and airspeed indications both rose above the readings on the captain's instruments. This time the altimeter rose by 400 feet and the airspeed indication by 30 knots. The discrepancies remained throughout the approach until after the aircraft was on the ground.

The aircraft had been parked at Launceston for two hours before the flight during which there was continuous heavy rain. It was found when the aircraft was inspected at Essendon that some rain had entered the pitot-static system during this time, and it was this that had caused the errors in the instrument readings.

Such an occurrence is not very abnormal in the weather conditions that existed at Launceston, and it is not this fact alone which makes the incident noteworthy. The more interesting point of the story is what the captain did **not** do when the trouble occurred. It was subsequently learned that at no time after the erroneous indications developed did he consider selecting the alternative static source for the instruments. Had he done so, the instrument reading errors that occurred during the aircraft's approach to land would probably have been averted. In this instance, weather conditions at Essendon were such that a visual approach was possible and the crew were conducting only a practice ILS approach when the trouble showed itself the second time. But it is not hard to imagine the safety of an aircraft being seriously compromised if an instrument error of similar magnitude occurred during a "real" instrument approach.

THAT ELUSIVE WATER . . .

JUST before starting the engines for a flight from Lae to Mt. Hagen, New Guinea, the captain of a DC-3 decided to request an additional water check from all fuel tank drain points. A fuel sample, which had already been taken and left beside the aircraft, was clear but as the DC-3 had been standing in the open in heavy rain for a number of hours, the captain decided to "play safe".

Sure enough, when the port main tank was checked, approximately half a pint of water was drained from it. This prompted a further check of all drain points, during which the aircraft's wings were rocked from side to side to help dislodge any pockets of water remaining in the tanks. This time, all samples taken were clear. However, after the aircraft was swung around on the apron, another full drain check produced a further two pints of water from the port main tank.

At this stage the captain postponed the flight and left the aircraft in the hands of the engineers and after they had towed it around the apron several times, even more water was drained from the tanks.

Reporting the episode, the captain pointed out how easy it would have been in this situation to believe that adequate precautions had been taken. Had the captain not requested the additional checks, and accepted the first sample as satisfactory, the water would have remained undetected in the port main fuel tank, and might have resulted in an engine failure on take-off. The moral for pilots of aircraft both large and small, is obvious. ●