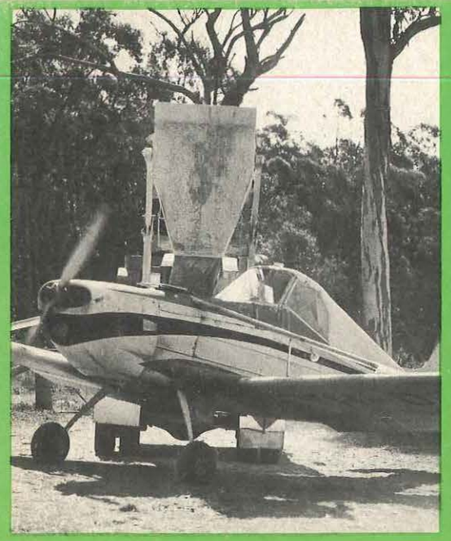

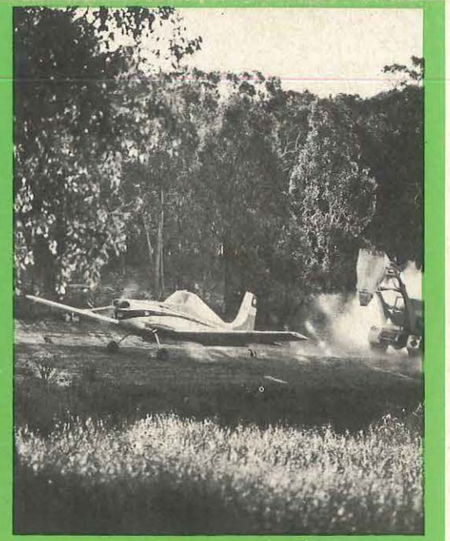

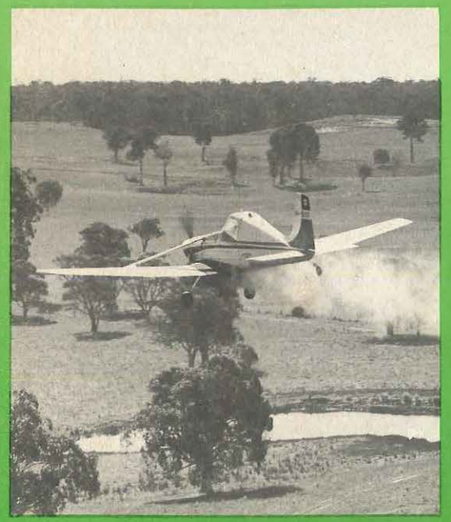

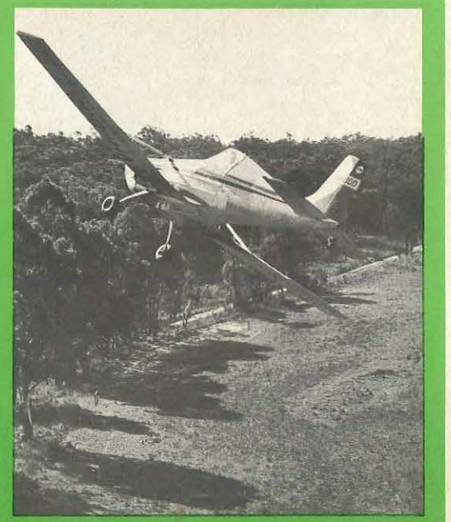

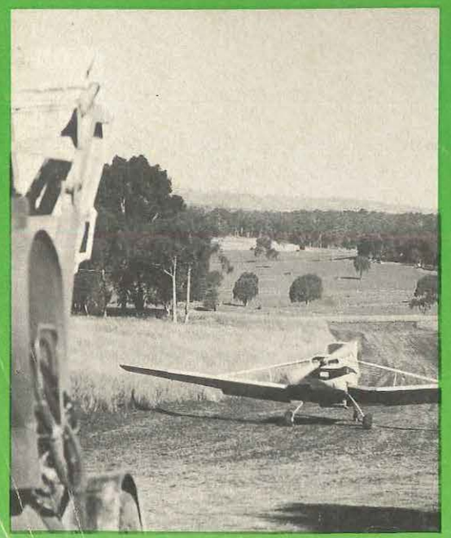

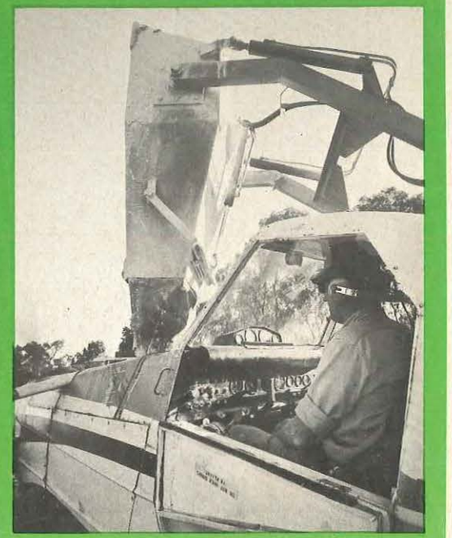

Number 80 July 1972 DEPARTMENT OF CIVIL AVIATION AUSTRALIA

AVIATION SAFETY DIGEST

Number 80 July 1972

DEPARTMENT OF CIVIL AVIATION AUSTRALIA

Cover and above:

Agricultural aviation in action: These days, with things not quite what they were in some of our rural areas, agricultural flying isn't often in the limelight. Yet despite all the problems, economic as well as operational, the industry's exacting work continues unobtrusively and is taken for granted in many places. Such a situation speaks well, not only for the managements of aerial agricultural operators, but also for the level of professionalism and operational safety achieved by their pilots and maintenance staffs. In this issue's cover, featuring a typical superphosphate spreading operation by Hazelton Air Services in central New South Wales, Aviation Safety Digest pays tribute to this demanding but often unsung facet of Australian aviation at work.

– D.C.A. Photographs by J. Montgomery.

AVIATION SAFETY DIGEST

Contents

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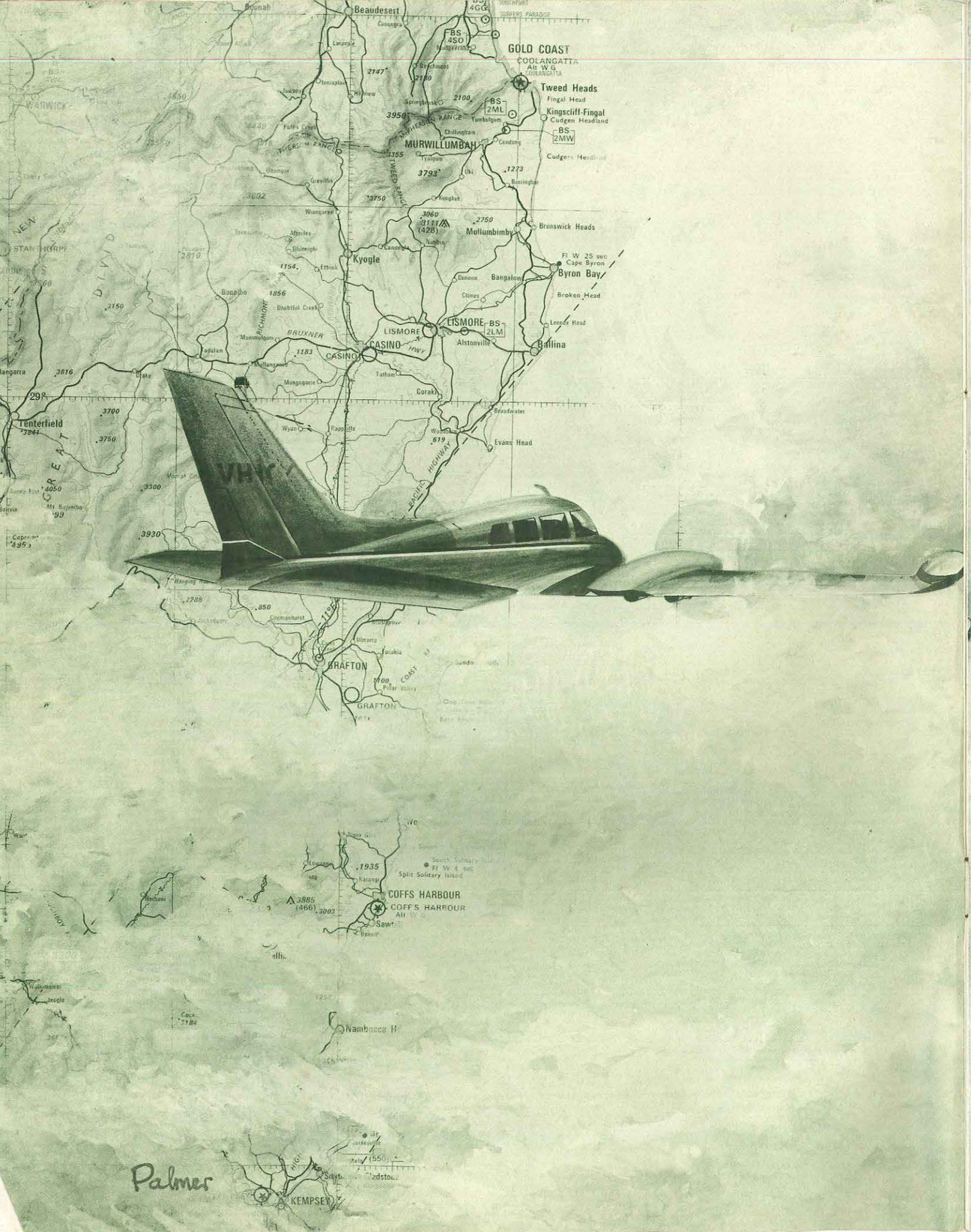


WITHOUT TRACE . . .

While engaged in a private flight from Bankstown Airport, New South Wales to Coolangatta, Queensland, a Cessna 320 disappeared after reporting its position 52 miles south of its destination. A subsequent large scale air and ground search failed to find any trace of the aircraft or its two occupants. The weather in the area at the time of the flight was marginal for VFR operations.

THE aircraft had departed Bankstown at 1634 hours on the afternoon of the accident. According to the pilot's VFR flight plan, the flight was to be made OCTA and below 5,000 feet, via the coast. The estimated time interval was 116 minutes, giving an ETA Coolangatta of 1830 hours, 16 minutes before last light.

The forecast weather conditions, though indicating that VFR flight was possible over the route, were by no means favourable. On the coast north of Port Macquarie, scattered rain showers were expected, with up to six eighths of stratus cloud at 2,500 feet. In the showers, visibility was expected to be reduced to three miles and at both Coffs Harbour and at Coolangatta Airports, it was possible that conditions would deteriorate below VMC for periods up to 30 minutes.

After being cleared from Bankstown Tower frequency, the aircraft established contact with Sydney Flight Service and, at 1655 hours, reported its position 12 miles south of Nobby's Head at Newcastle. In response to an enquiry from the aircraft, the pilot was advised that the Williamtown Control Zone and its associated restricted areas were released for transit. At 1740 hours, the aircraft called Coffs Harbour and reported its position as 60 miles south. Some five minutes later, it reported again 40 miles south of Coffs Harbour. At 1754 hours, the Cessna requested that its SARTIME to Coolangatta be amended from 1815 to 1900 hours, and four minutes later reported that it was over Coffs Harbour at 2,000 feet.

Ten minutes after this at 1804 hours, an airline Fokker Friendship en route from Port Macquarie to Grafton, reported over Coffs Harbour at 8,500 feet, estimating Grafton at 1813, and asked if there was "any known traffic for our descent Grafton". The Cessna's last position report was passed to the Friendship, which then called the Cessna requesting its track and asked "are you visual now". The Cessna replied "affirmative" and in response to a further question regarding its track and position, reported it was "tracking up the beach".

Shortly after 1806 hours, Coolangatta Tower contacted Coffs Harbour and requested that their present weather be passed to the Cessna, as conditions in the Coolangatta area were now very marginal for VFR flight with the aerodrome visibility reduced to two miles in rain. Coffs Harbour transmitted this information to the aircraft and the aircraft acknowledged the call.

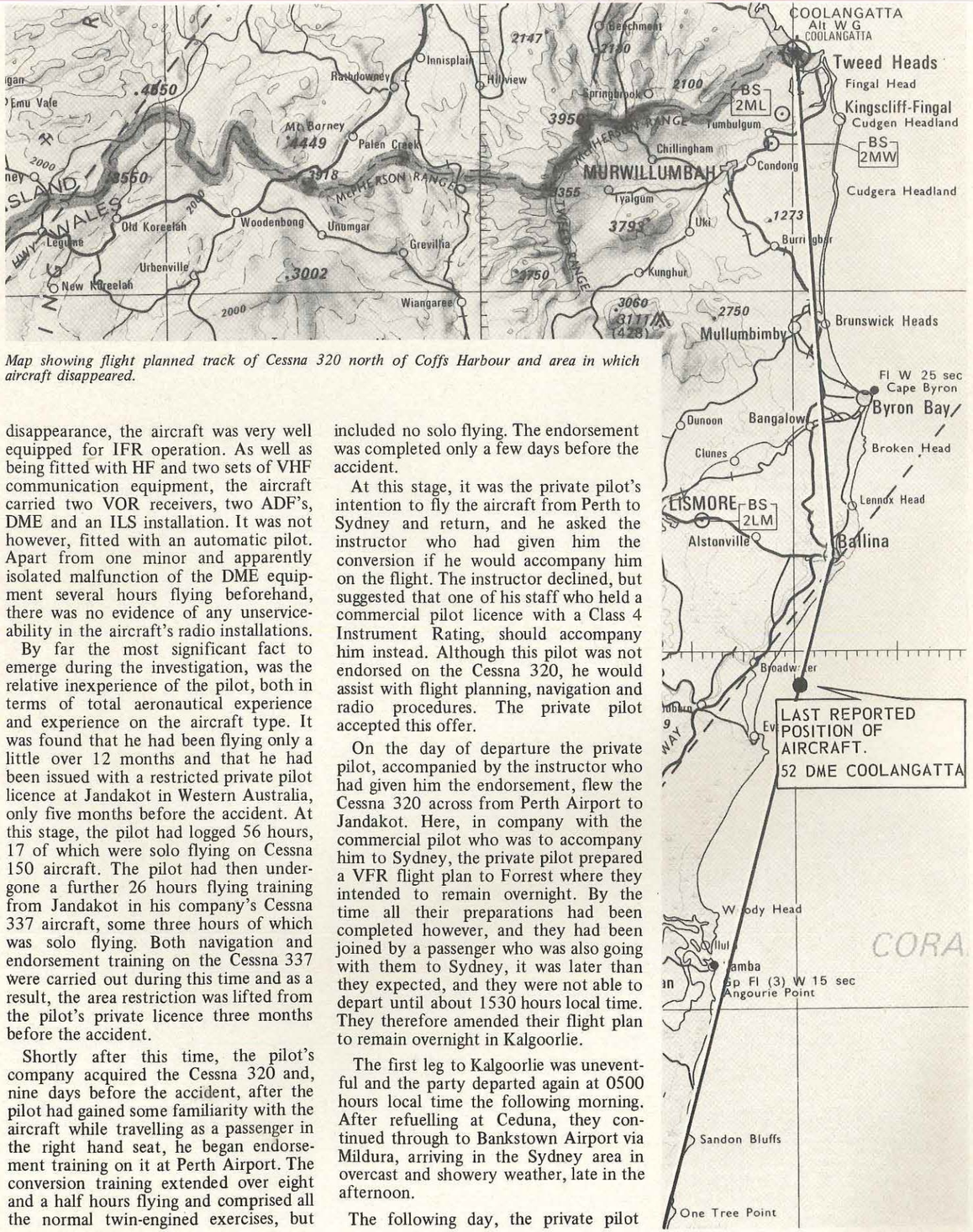
Eleven minutes later, the Cessna called Brisbane Flight Service and reported its position as "30 miles DME south of Casino". The aircraft next called Brisbane again at 1824 hours and reported it was now "52 miles DME south of Coolangatta". Brisbane Flight Service then informed the aircraft that the cloud base at Coolangatta was 700 to 1000 feet in rain, and that last light was at 1845 hours. The acknowledgement of this weather report proved to be the aircraft's final transmission. At 1831 hours Brisbane Flight Service attempted to contact the Cessna again to request it to call Coolangatta Tower on 118.7 MHz., but there was no reply.

When the aircraft did not subsequently arrive at Coolangatta, and extensive communication checks had failed to reveal any information on its whereabouts, the phases of search and rescue operations were progressively introduced. Early the following morning, an intensive air and ground search for the missing aircraft was begun. The search continued for the next six days, during which numerous sighting and hearing reports from along the coast, and throughout the mountainous area inland from the aircraft's flight planned route, were checked both from the air and by ground parties. As well as this, all possible areas over which the aircraft could have flown from its last known position were searched several times. Even after the main search effort had failed to uncover any trace of the missing aircraft, further sorties were flown to check additional information which came to hand. Altogether a total of 47 aircraft, both aeroplanes and helicopters, flew over 200 hours in the course of the search, but nothing was found that could provide any indication of what had overtaken the aircraft in the eleven minutes that elapsed between the time of its last acknowledgement of Brisbane Flight Service's transmission and when it was instructed to call Coolangatta Tower.

* * *

Evidence obtained during the subsequent investigation of the circumstances of the aircraft's disappearance, revealed nothing to suggest it was other than completely airworthy at the time of the flight. Both its Certificate of Airworthiness and Maintenance Release were valid at the time and, at Bankstown immediately before the flight, it had undergone a 25 hourly inspection and been refuelled to capacity.

Although it was being operated in the VFR category at the time of its



Map showing flight planned track of Cessna 320 north of Coffs Harbour and area in which aircraft disappeared.

disappearance, the aircraft was very well equipped for IFR operation. As well as being fitted with HF and two sets of VHF communication equipment, the aircraft carried two VOR receivers, two ADF's, DME and an ILS installation. It was not however, fitted with an automatic pilot. Apart from one minor and apparently isolated malfunction of the DME equipment several hours flying beforehand, there was no evidence of any unserviceability in the aircraft's radio installations.

By far the most significant fact to emerge during the investigation, was the relative inexperience of the pilot, both in terms of total aeronautical experience and experience on the aircraft type. It was found that he had been flying only a little over 12 months and that he had been issued with a restricted private pilot licence at Jandakot in Western Australia, only five months before the accident. At this stage, the pilot had logged 56 hours, 17 of which were solo flying on Cessna 150 aircraft. The pilot had then undergone a further 26 hours flying training from Jandakot in his company's Cessna 337 aircraft, some three hours of which was solo flying. Both navigation and endorsement training on the Cessna 337 were carried out during this time and as a result, the area restriction was lifted from the pilot's private licence three months before the accident.

Shortly after this time, the pilot's company acquired the Cessna 320 and, nine days before the accident, after the pilot had gained some familiarity with the aircraft while travelling as a passenger in the right hand seat, he began endorsement training on it at Perth Airport. The conversion training extended over eight and a half hours flying and comprised all the normal twin-engined exercises, but included no solo flying. The endorsement was completed only a few days before the accident.

At this stage, it was the private pilot's intention to fly the aircraft from Perth to Sydney and return, and he asked the instructor who had given him the conversion if he would accompany him on the flight. The instructor declined, but suggested that one of his staff who held a commercial pilot licence with a Class 4 Instrument Rating, should accompany him instead. Although this pilot was not endorsed on the Cessna 320, he would assist with flight planning, navigation and radio procedures. The private pilot accepted this offer.

On the day of departure the private pilot, accompanied by the instructor who had given him the endorsement, flew the Cessna 320 across from Perth Airport to Jandakot. Here, in company with the commercial pilot who was to accompany him to Sydney, the private pilot prepared a VFR flight plan to Forrest where they intended to remain overnight. By the time all their preparations had been completed however, and they had been joined by a passenger who was also going with them to Sydney, it was later than they expected, and they were not able to depart until about 1530 hours local time. They therefore amended their flight plan to remain overnight in Kalgoorlie.

The first leg to Kalgoorlie was uneventful and the party departed again at 0500 hours local time the following morning. After refuelling at Ceduna, they continued through to Bankstown Airport via Mildura, arriving in the Sydney area in overcast and showery weather, late in the afternoon.

The following day, the private pilot told his companion that he intended to fly to Coolangatta that afternoon, taking a passenger from Sydney with him, and he invited the commercial pilot to accompany him once more. This time the commercial pilot declined as he had business to attend to at Bankstown airport, but he offered to assist the private pilot with his flight planning.

After having lunch at the airport, the two pilots went to the Bankstown briefing room and prepared a VFR flight plan for the proposed flight to Coolangatta. After the two pilots had studied the area forecasts covering the route, and discussed the flight with a briefing officer, the pilot-in-command completed a flight plan form while the commercial pilot did the calculations for him. It was about 1530 hours by the time they had lodged the plan. They then went out to the aircraft with the passenger, and the commercial pilot assisted the pilot-in-command to carry out a pre-flight inspection. Finally, after the two occupants were seated in the aircraft, he closed the door for them and walked back to the hangar where he had been working earlier.

Some 20 minutes later, when the commercial pilot left the hangar again to go to another building, he was somewhat concerned to see that the Cessna 320 was only just taxi-ing out. It was already 1620 hours, and they had previously noted that last light at Coolangatta was 1846 hours. He waited to watch the take-off and was conscious that the pilot seemed to take an "excessive length of time" to taxi out and carry out his pre-take-off and engine run-up checks. By the time the aircraft finally took-off, it was 1630 hours.

* * *

It was clear from the evidence concerning the pilot's flying experience, as well as from the events of the preceding few days, that the flight on which the aircraft disappeared was the very first occasion on which he had flown the Cessna 320 without some assistance from another, more experienced pilot. The evidence relating to the pilot's preparation and conduct of the flight, including the transcripts of the aircraft's communications with Bankstown Tower and Sydney, Coffs Harbour and Brisbane Flight Service Units, showed unmistakable signs of this inexperience, as well as the pilot's unfamiliarity with radio procedures. With the advantage of hindsight, the contents of these transcripts could also be taken to indicate that the pilot was under some pressure in coping with his task.

In view of all the evidence of the pilot's lack of experience, together with the fact that very marginal weather conditions existed on the far north coast of New South Wales at the time of the aircraft's disappearance, the question of the pilot's capacity to handle the situation was closely examined.

The flying instructor, who had given the pilot his conversion training on the Cessna 320, said that, from the first, he had been impressed with the pilot's knowledge and handling of the aircraft. At the end of the training, he felt that a thorough conversion had been carried out by "a surprisingly competent pilot", considering the relatively low number of hours that he had logged. At the time, the instructor said, they had discussed the handling of the aircraft in marginal weather and he had pointed out that, because of its high performance, it could quickly get him into trouble. He had recommended slowing the aircraft down in such conditions, lowering some flap and reducing power as necessary. The instructor conceded that he had done no cross-country flying with this pilot, and that he had no knowledge of his ability to fly on instruments.

There was no evidence that the pilot had undergone any instrument flying training during his short flying career, or that he had been given any formal instruction in the use of the radio navigation aids fitted to the aircraft. Other persons with whom the pilot had been associated, believed he had had little or no experience in flying in conditions of poor visibility.

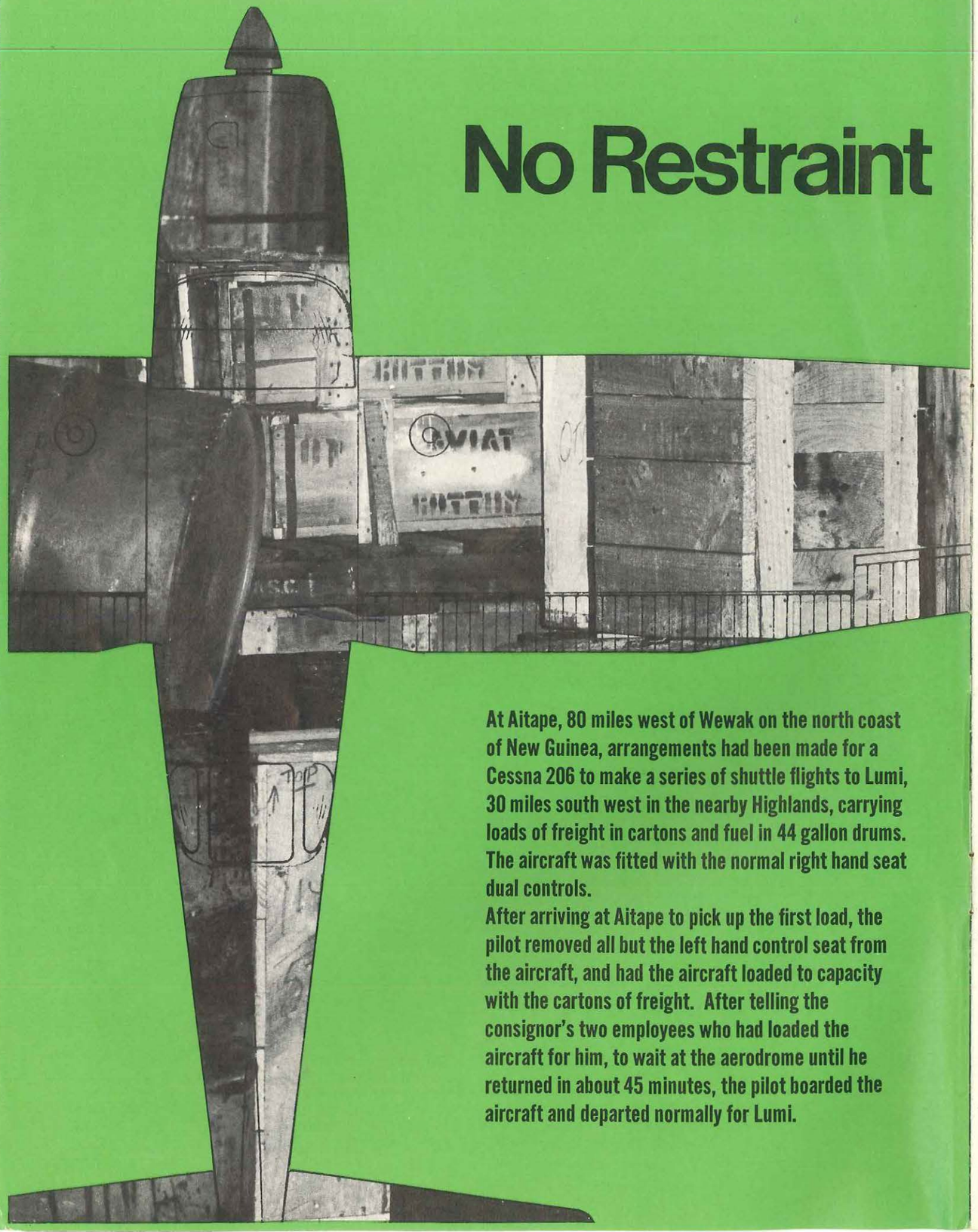
The commercial pilot who had accompanied the pilot on the flight from Western Australia, indicated that although his general handling of the aircraft was "quite good" and that his attitude to checking and operating procedures was most methodical, the pilot had experienced difficulty in maintaining control when they had encountered heavy rain and reduced visibility while approaching Sydney. On several occasions during this period, the commercial pilot had felt obliged to take control and stabilise the aircraft.

* * *

As no trace of the missing Cessna 320 has yet been found, it is of course, impossible to state with certainty what happened to the aircraft after its final radio transmission, but the circumstances point strongly to the combination of deteriorating weather and lack of flying experience, especially on such a sophisticated and high performance aircraft, producing a situation that was beyond the pilot's capacity to handle safely. There can be little doubt that as a result, the aircraft either flew into the sea, or crashed somewhere on the high and inaccessible terrain of the Tweed and McPherson Ranges which, covered in dense rain forest, lie only a few miles to the west of the aircraft's flight planned track. It is quite conceivable that, despite the most thorough searching from the air, the wreckage of a light aeroplane could go undetected in many parts of these ranges. Indeed, just such a situation as this occurred as long ago as 1936, when a Stinson tri-motor, flying from Brisbane to Sydney, disappeared seemingly without trace. The wreckage and two survivors were eventually found in the McPherson Ranges, but only after 10 days, despite the most intensive air search, and then only by the resourcefulness of a bushman who had lived in these mountains all his life.

But this is to diverge from the point at issue. Even in ideal weather, a pilot of the level of experience of the one involved, would have been fully extended in conducting a cross-country flight in an aircraft of the complexity of the Cessna 320. In the actual event, not only was the weather very marginal for visual flight, but there was very little reserve of daylight. In the prevailing conditions in fact, it could well have been quite dark before the "official" onset of darkness. Like the accident to the Aztec covered in our last issue, the disappearance of the Cessna 320 provides a costly and tragic object lesson on the wisdom of equating the operational nature of the flight to be undertaken with the level of the pilot's flying experience.

No Restraint



At Aitape, 80 miles west of Wewak on the north coast of New Guinea, arrangements had been made for a Cessna 206 to make a series of shuttle flights to Lumi, 30 miles south west in the nearby Highlands, carrying loads of freight in cartons and fuel in 44 gallon drums. The aircraft was fitted with the normal right hand seat dual controls.

After arriving at Aitape to pick up the first load, the pilot removed all but the left hand control seat from the aircraft, and had the aircraft loaded to capacity with the cartons of freight. After telling the consignor's two employees who had loaded the aircraft for him, to wait at the aerodrome until he returned in about 45 minutes, the pilot boarded the aircraft and departed normally for Lumi.

After landing at Lumi about 15 minutes later and discharging the load of freight, the pilot obtained assistance to load the aircraft with empty fuel drums which were to be returned to Aitape for re-filling. He then departed again for Aitape.

Some 20 minutes later, the aircraft was sighted returning towards the Aitape circuit area from a westerly direction. Approaching the single north-west-south-east strip at right angles, the aircraft was seen to turn steeply to the right to enter a downwind leg for a circuit and landing on runway 34. Immediately it had done so, it suddenly nosed-down, descending steeply and rapidly, before levelling out again at a height of between 200 and 300 feet above the ground. It was then seen to continue southwards on the same heading and height until it passed out of view beyond hills which lie to the south of Aitape airstrip. A mission station is situated on the southern side of the hills about three miles from the strip and shortly afterwards some of the mission staff inside the buildings heard the aircraft's engine behaving unusually as though the throttle were being opened and closed several times. The engine was then heard to resume a normal note as though the aircraft was flying back in the direction of the strip. The aircraft was also seen by a farmer who was working in a field in this area. It was heading north at very low level in the direction of the Aitape airstrip, and at first he thought the aircraft was going to collide with his farm house. But then engine power seemed to be applied and the aircraft climbed a little to pass very low over the tops of the hills between his farm and Aitape airstrip. The aircraft's flaps appeared to be down throughout the time that it was in the farmer's view.

Watchers in the vicinity of the airstrip next saw the aircraft come into view on a northerly heading, barely clearing the hills to the south of the airstrip. Having done so it descended rapidly and made a straight-in approach to land on runway 34. It touched down close to the threshold, bounced high into the air and there was a sudden burst of power. The throttle appeared to be closed again and the aircraft touched down a second time, 1,200 feet from the threshold. Again it bounced and again the power came on suddenly and harshly and with full flap still lowered, the aircraft flew level along the strip at a height of about 30 feet. As the aircraft reached the upwind boundary of the strip its engine noise suddenly ceased and it descended and plunged into the Aitape River, just beyond the boundary of the aerodrome at a point in line with the centre of the runway. Witnesses who hurried to the scene of the crash found the wreckage upside down in the river almost completely submerged. The pilot had been drowned.

* * *

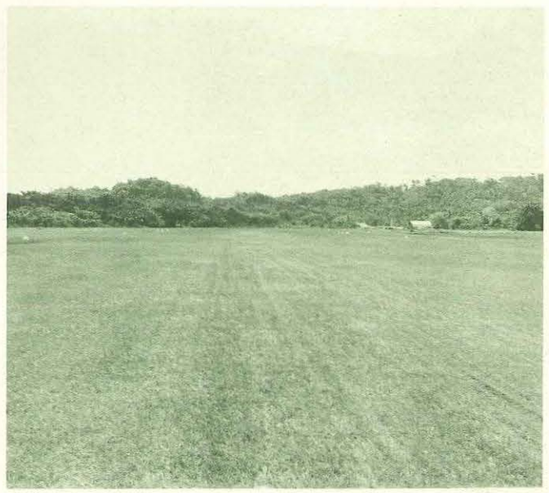
When the wreckage was examined, it was found that the aircraft had been carrying five empty 44 gallon drums, instead of four, as was the operator's normal practice for this type of aircraft. A detailed examination of the wreckage including a subsequent strip inspection of the engine, revealed nothing to indicate that the aircraft was other than completely airworthy at the time of the flight. Although it was not possible to physically determine the amount of fuel in the tanks at the time of the accident, details of the aircraft's last refuelling operation and the subsequent flight time, showed that the quantity on board would have been ample. At the time of impact, the fuel was turned on, the ignition was off and the flaps were extended fully. Damage sustained by the propellor indicated that the engine was not under power when the crash occurred.

The pilot held a commercial licence and had nearly 1,200 hours experience, more than 300 hours of which had been gained in Cessna 206 aircraft. There was nothing to suggest that he was other than fit and well on the day of the accident, and a post mortem examination disclosed no evidence of any sudden incapacitation.

The operating company's normal procedure for carrying empty 44 gallon drums in Cessna 206 aircraft was to leave the right hand front seat in place, and to lie two drums across the cabin immediately behind the front seats. A third drum could be carried lengthwise in the rear of the cabin, and a fourth, crosswise on top

The accident site looking in the direction of impact. The aircraft's undercarriage and tail can be seen just above the water on the far bank of the river.

View taken from centre of Aitape airstrip looking north towards upwind end. After commencing to go around, the pilot apparently realised he would be unable to out-climb the hills in the background. The river in which the aircraft crashed is amongst the trees on the left of the picture.



Reconstruction of aircraft loading at time of accident. Above: View taken through main door of aircraft showing relative position of drums. The fifth drum is on its side in the rear of the cabin just out of the picture to the left.

Below: View from rear of cabin showing limited cockpit area available to pilot.

of the first two drums. In view of the fact that the right hand front seat had been removed from this aircraft before the flight, and the pilot had departed from Lumi with five drums, a detailed study was made of this aspect of the operation in an attempt to determine whether such loading arrangements could have affected the controllability of the aircraft to the extent of causing the accident.

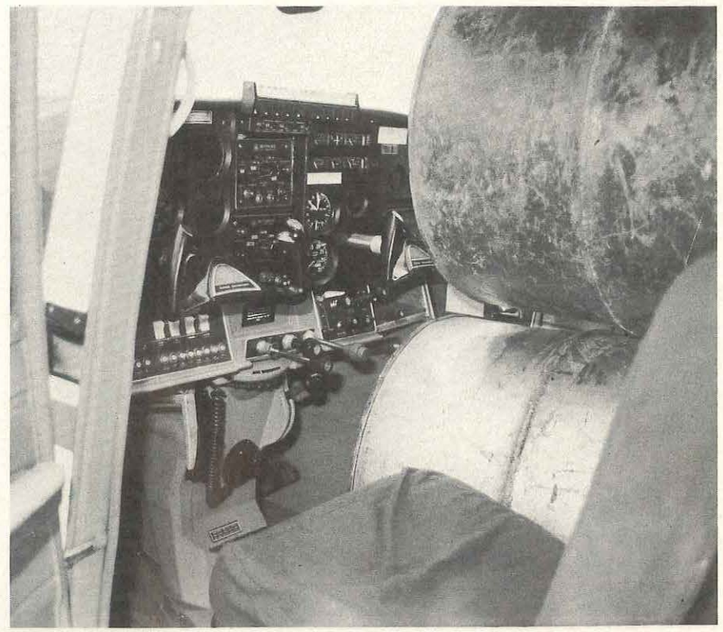
A witness at Lumi aerodrome at the time the aircraft departed for Aitape, said that his attention was drawn to it as it was taxi-ing out for take-off, by a comment he heard someone make about its load. From his position on the aerodrome, he was looking at the aircraft from its starboard side, and the drums appeared to fill the whole cabin "right to the roof". The witness was not able to see the pilot, because of the drums in the forward section of the cabin. He was certain that the uppermost forward drum was lying on its side with one end towards the front of the aircraft, and believed that this drum would have been touching the cabin roof.

After further enquiries at Lumi, the investigation succeeded in locating the person who had assisted the pilot to load the aircraft with drums for the flight to Aitape. This witness then explained that one drum had been laid on its side at the front of the cabin next to the pilot's seat, with another drum also on its side, directly on top of it. Behind these drums, two more were loaded standing in an upright position, and behind those again, the fifth drum was laid on its side in the rear of the cabin.

A series of experiments conducted with another Cessna 206 to determine how five empty drums could be fitted into the cabin, showed that this could be achieved in a number of different ways, provided always that the right hand front seat was first removed. In no case however, could five drums be loaded without impeding some of the fore and aft movement of the right hand control wheel. When adjustments were made to give the right hand control wheel full rearward movement, no combination of drum positions could be achieved which allowed the cabin doors to be closed. It was also found that, once the five drums were loaded into the aircraft, it was impossible to gain access to the tie down points in the cabin to secure the load. It was also obvious that during the flight on which the accident occurred, there would have been nothing to prevent the two foremost drums loaded one on top of the other on their sides, from moving further forward while the aircraft was airborne. As the upper of these two drums, even with the load in the most rearward position possible, would have obstructed the rearward movement of the right hand control wheel to some extent, any subsequent movement of the load could only restrict the available elevator control further.

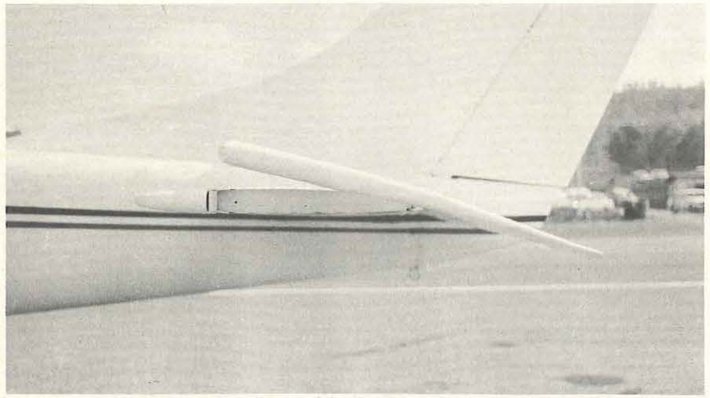
In the circumstances in which the accident occurred, it is obviously not possible to reconstruct the exact sequence of events that led to the crash, but it seems almost certain that the pilot was confronted with a serious control problem shortly after entering the circuit area at Aitape. There was nothing to suggest that he was in difficulties before this time, as the aircraft appeared to be operating normally as it was departing from Lumi, and when it was first seen approaching Aitape from the west. The pilot's position reports to Wewak Flight Service Unit, both on his departure from Lumi and his arrival in the circuit area at Aitape, were also perfectly normal and contained no hint of any operational emergency that might have been developing.

It thus seems reasonable to assume that, despite some restriction to the backward movement of the elevator control, the flight went according to plan until the aircraft steep-turned on to its downwind leg at Aitape and entered the sudden steep descent seen by witnesses on the ground. Whether the steep-turn was a deliberate manoeuvre which caused the load to move and affect the controls so that the aircraft entered the dive, or whether movement of the load had caused a normal turn on to downwind leg to steepen and produce the same result, cannot be known, but it seems likely that for one reason or another, forward movement of the load forced the elevator controls on the right hand side forward, thus placing the aircraft in the dive. If this were so, the manner in which the pilot succeeded in recovering from the dive can only be a matter of speculation, but it seems possible that he was able to find some combination of power and flap which provided the nose-up pitch necessary in the circumstances to offset the nose-down pressure on the elevator control. This possibility is supported by the evidence that the aircraft's flaps appeared to be down when it was flying at low level in the vicinity of the mission station on the southern side of the hills from Aitape airstrip. It could also help to explain the aircraft's very extended downwind leg together with the unusual manoeuvres which the aircraft apparently performed in the vicinity of the mission station before heading back towards the strip at low level. For if the pilot was



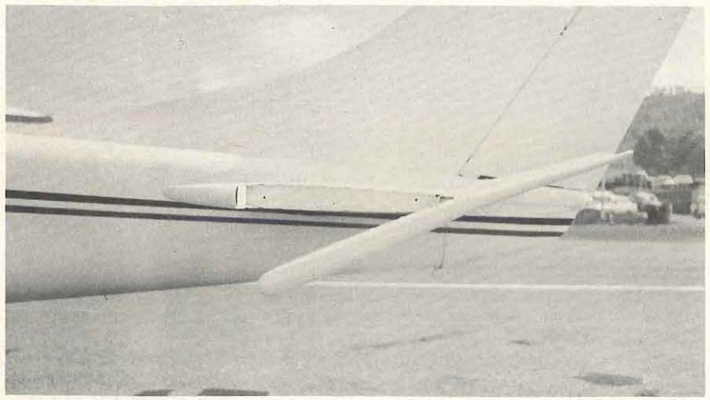
Above: Position of two foremost drums relative to instrument panel and starboard control wheel. In this position the drums prevented full rearward movement of the control column. Any further forward movement of the drums would restrict up-elevator travel even more.

Below: With the aircraft loaded in this manner, it was not possible to secure the drums to the cargo tie-down points.

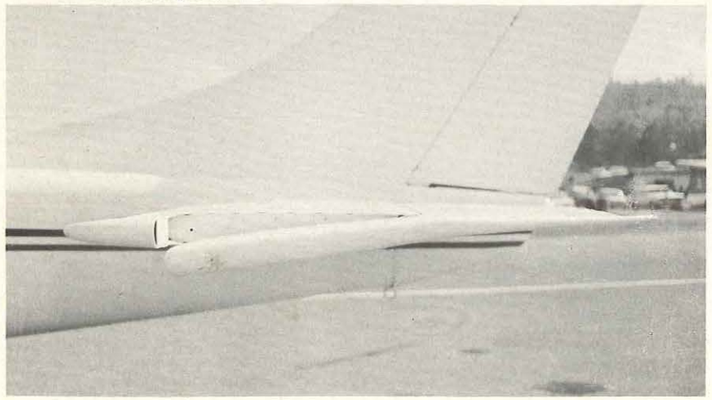


Above: Normal full downward deflection of elevator of Cessna 206.

Below: Normal full upward deflection of Cessna 206 elevator control.



Below: Limited amount of upward deflection available in aircraft loaded with five drums.



experiencing control interference and had just checked an unintentional descent by lowering flap, and applying power, it is reasonable to expect that he would want to experiment to determine how effective was this measure of control, and to what extent he could make use of it for his approach and landing.

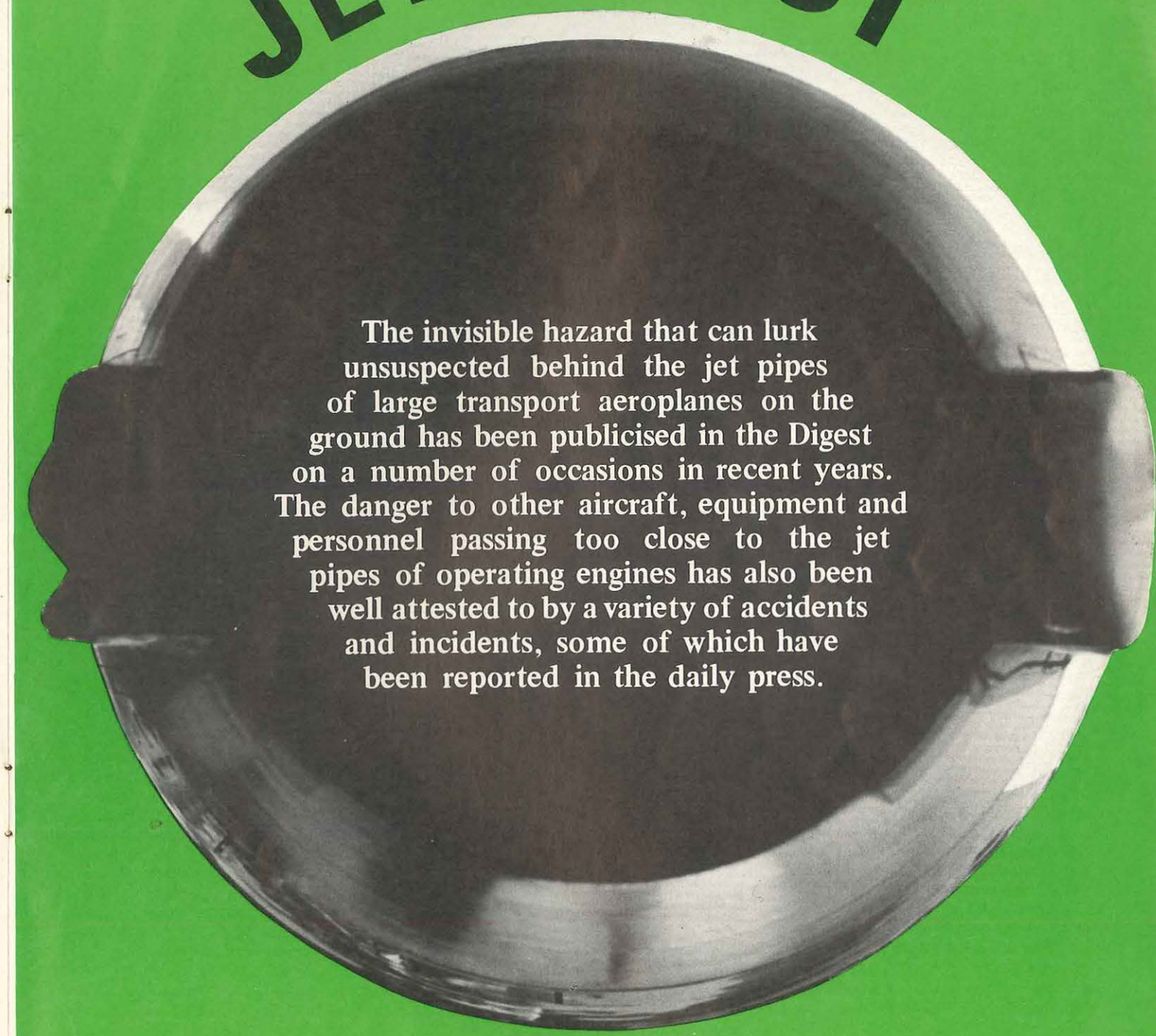
Although the pilot evidently had sufficient control to position the aircraft for a straight-in approach, once he had cleared the hills, as well as to ensure that the aircraft touched down initially close to the threshold of the strip, the range of control available to him was apparently inadequate to make a successful landing on his first two attempts. As the engine power remained on after the aircraft's second bounce, and the aircraft then maintained height as it continued above the strip it seems probable that at first the pilot intended to try and go round. However, he apparently then saw that the aircraft would not be able to clear the higher ground to the north of the airstrip and decided to abandon the attempt, evidently by turning off the ignition switches. The reason for the aircraft maintaining the runway heading from this point onward until it crashed into the river, when by diverging only a few degrees to the right, it could have reached a cleared area approximately 1000 feet long, could not be determined. It can only be presumed that once again the pilot was prevented from doing so by the movement of the drums.

The reason why the pilot chose in the first place to uplift five drums instead of the normal load of four must also remain a mystery, as there was no operational reason or requirement for him to have done so. Whatever the reason for his decision however, its final outcome illustrates the vital necessity of ensuring that an aircraft is never loaded in a manner that could deprive the pilot of full and free movement of the controls. It also stresses the importance of securing loads in such a way that there is no possibility of movement during flight.

Cause

The cause of the accident was not determined, but it is likely that the manner in which the aircraft was loaded deprived the pilot of full effective use of the elevator control.

JET BLAST



The invisible hazard that can lurk unsuspected behind the jet pipes of large transport aeroplanes on the ground has been publicised in the Digest on a number of occasions in recent years. The danger to other aircraft, equipment and personnel passing too close to the jet pipes of operating engines has also been well attested to by a variety of accidents and incidents, some of which have been reported in the daily press.

JET BLAST.... DANGER AREAS

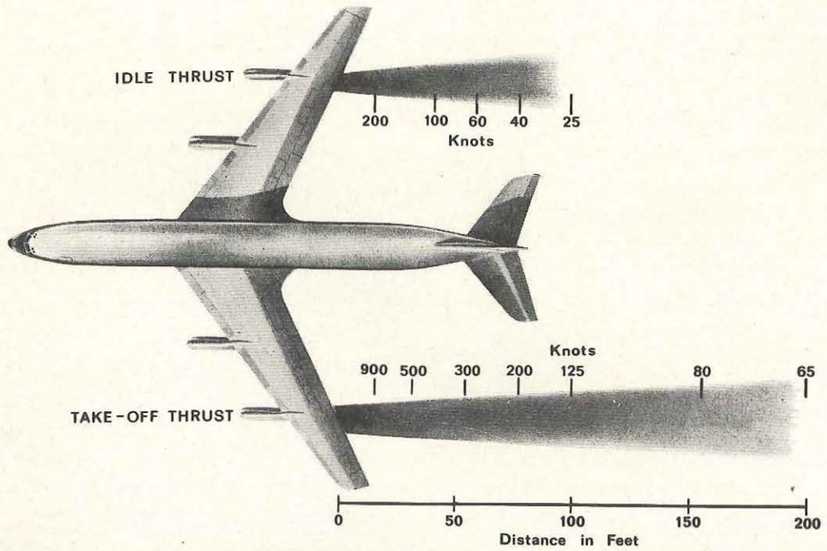


Diagram showing efflux velocities that may be expected behind large jet aircraft at idle and take-off power settings.

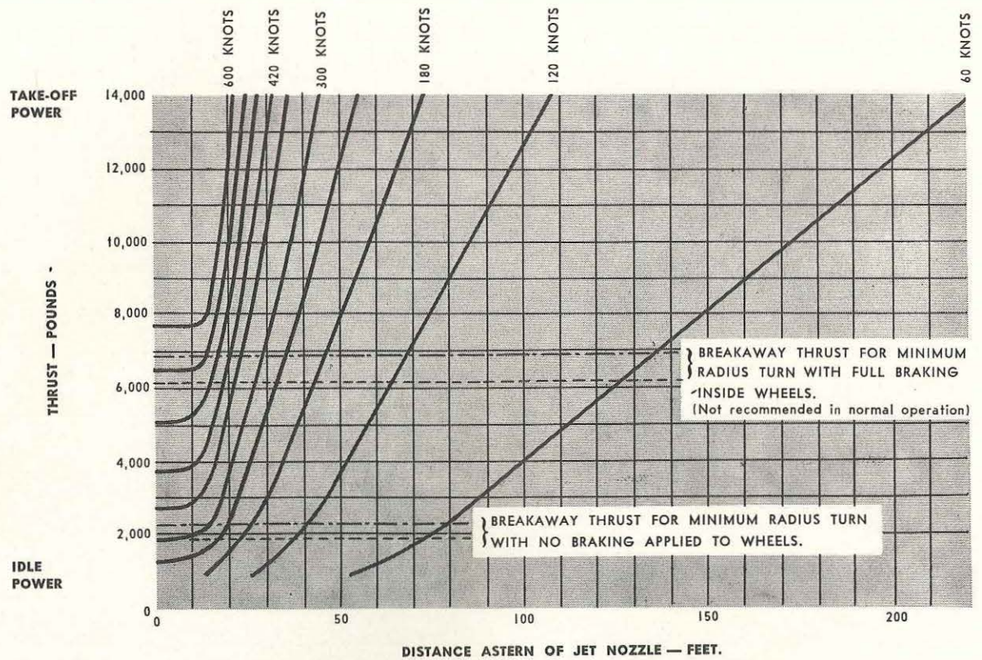
WARNING: Wind conditions can have a marked effect on jet effluxes. These figures for still air conditions, should not be regarded as absolute, but as a guide only.

THE article "Beware of Jet Blast", published in Aviation Safety Digest No. 50 (May 1967) included a graph, developed from tests conducted by a jet aircraft manufacturer, which showed jet efflux velocities to be expected behind a typical large jet aircraft at power settings ranging from idling power to take-off thrust. Even a brief look at this graph, reproduced on the opposite page, shows beyond doubt that the area behind a jet aircraft with its engines running is no place to be walking, driving a vehicle or taxi-ing a light aeroplane, particularly if the jet's engines are operating at any higher thrust than idling power!

Yet despite the accidents that have occurred in the past, despite the publicity they have received, and despite the dangers that should be obvious in themselves to persons accustomed to working in an aviation environment, jet blast accidents continue to occur. Even as these words were being written, an overseas report concerning an Alouette helicopter that was overturned by blast from a taxi-ing DC-8 arrived on the editorial desk.

Coming a little closer to home, a Cessna 205 was blown over recently in Alice Springs, when it taxied behind a Boeing 707 starting its engines on the apron in front of the passenger terminal. Fortunately the pilot of the Cessna, who was the only occupant, was not badly hurt. At the time, the 707 was employing a bleed air starting procedure, which necessitates running at least one engine at high power while the remaining engines are started in turn. The pilot of the Cessna was taxi-ing his aircraft from where it had been parked outside the terminal building, because he believed it would be exposed to jet blast as the 707 turned to taxi out from the apron. He was an experienced general aviation pilot, accustomed to sharing the aprons of major airports with large jets. Commenting on the incident afterwards, he mentioned that he had previously taxied behind Boeing 727's which had their engines running, without "any great effect". What he failed to realise of course, apart from the fact that two of the 707's engine's were being run at high power, is that the engines of the 707 are much closer to the ground than those of the 727. The effect of its jet efflux on a light aeroplane taxi-ing behind it is thus likely to be more serious.

As well as this, at the time the Cessna was overturned, the 707 was facing into wind which, blowing at 15 to 20 knots, was providing a substantial down-wind component to the jet efflux. The effect of wind on jet effluxes has not been fully explored, but practical experience seems to suggest that a downwind or upwind component does not simply add to or subtract from the velocity of the efflux at a particular point, but carries the whole efflux velocity pattern bodily in the direction in which the wind component is acting. This has much the same effect as though the source of the efflux were moved closer to, or further away from, the point affected by the blast. A glance at the graph, as well as at the diagram, also reproduced from our earlier article, will show clearly that this could result in very substantial variations in the expected efflux velocity, particularly as the actual distance from the jet pipe decreases.



BLAST VELOCITIES OF TYPICAL LARGE JET PASSENGER AIRCRAFT.

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.

With jet transport operations becoming increasingly commonplace, particularly at airports in country and outback areas previously served by turbo-prop and piston-engined aeroplanes, the potential for jet blast incidents can only increase. For this reason, pilots who are required to taxi in the vicinity of jet aircraft need to maintain a high degree of vigilance so as to be alert for the signs of danger. There are of course difficulties in the way of doing this. For example, it may not be immediately evident whether or not a parked jet has its engines running. But there are usually some indications which a knowledgeable pilot can interpret.

In the earlier Digest article already referred to, it was mentioned that, as a result of a jet blast accident at Adelaide Airport, the Department was introducing a requirement for civil jet aircraft to have their anti-collision beacons switched on whenever their engines were running. This requirement was subsequently included in the AIP's and is referred to in several places in the VFG. The same VFG reference warns light aircraft pilots to maintain a safe distance from the effluxes of jet aircraft when taxi-ing, and points out that as military jets may not display anti-collision beacons, they should be regarded with even greater caution. Pilots must therefore remember that anti-collision beacons on a jet aircraft do not provide an infallible signal, and must also bear in mind that they can give no indication of the additional danger that exists when a jet aircraft is running its engines at abnormally high power.

Pilots taxi-ing in the vicinity of a jet aircraft should therefore do so with the possibility in mind that its engines not only might be running, but might be operating at high power. Whether or not the jet aircraft is displaying a rotating beacon, astute pilots will be wary of its jet pipes and will watch for signs of other significant activity, such as the position of ground engineers, heat haze emanating from the jet nozzles, dust movement on the apron, and so on. If it is really necessary to taxi close behind a parked jet displaying no anti-collision beacons, it is wise before taking a light aircraft into the danger area, to establish positively that it is safe to do so. Most jet operations take place at aerodromes with radio communication facilities, and pilots should use them to ensure that what they intend to do is safe. At aerodromes where no ground communication facilities exist, pilots should call the jet aircraft itself to establish its operating condition.

For their part also, pilots-in-command of jet aircraft, as well as ground engineers supervising the starting of jet aircraft carry an important responsibility for the safety of other aircraft, vehicles and personnel on the apron, and must always ensure that no danger to others is posed by their starting operations.

There is a long established and well-founded tradition that loaded guns should never be handled in a way that their accidental discharge could do harm or inflict injury. In view of the fact that the equally real danger of jet blast has become so manifest in the comparatively few years that large jet aeroplanes have been in general use, it is surely no more than good sense to regard the jet pipes of these aircraft with a similar philosophy of respect.

Yes—it's a beautiful old aeroplane...

Is YOURS going to enjoy a ripe old age too?

It's largely in your hands!

Colonel L.K.Hatfield's immaculate DH-85 Leopard Moth, first registered on 29th November 1935, photographed recently at Casey Airfield, Berwick, Victoria.

WHAT IF YOU EVER HAD TO DITCH?

It will be the fervent hope of every pilot reading this article, that he will never have to use the advice it contains. It goes without saying that the same response is echoed just as heartily by the Department! But, being realistic, there have been times, even in Australia, when circumstances have compelled pilots to make the best of a ditching.

In recent years, there has been increasing interest evidenced in what a pilot should do if ever faced with such a cheerless prospect, and the Digest now offers this article in response to the many requests we have received for guidance on the subject.

One of the most recent ditchings in Australian waters involved a Cessna Cardinal that was making a scenic flight with three passengers around the bays and islands to the south of Hobart, Tasmania.

About 20 minutes after taking off from Cambridge Airport, the pilot noticed a slight drop in engine RPM and a change in the exhaust note. Quickly checking his engine instruments, he was alarmed to see that the oil pressure gauge was reading zero. Realising he would have to put the aircraft down, the pilot immediately advised another aircraft in the vicinity that he would be making a forced landing. After relaying this message to Hobart, the pilot of the other aircraft remained in the area to report the progress of the forced landing.

Shortly after the pilot first noticed the lack of oil pressure, the engine began to vibrate and, closing the throttle and turning off the fuel and the magneto switches, he attempted to stop the propeller. But his efforts were in vain and, as the aircraft descended, the vibration rapidly grew worse. The pilot's difficulties were further compounded when, at about 1,500 feet, he saw that the only cleared ground within gliding distance was too steep for a forced landing. The only suitable area appeared to be a small curved beach and, deciding that this offered the only chance of a successful landing, the pilot positioned the aircraft for an approach over the sea aiming to touch down at the water's edge.

Late on final approach, the propeller at last stopped windmilling and the vibration ceased, but at this point, the pilot realised that he was not going to reach the shore. Holding the aircraft off the water for as long as possible, he lowered full flap and, after unlatching the port side cabin door, let the aircraft settle on to the calm surface, about 100 yards from the beach. The aircraft pitched slightly nose down, and immediately rolled to starboard and began to sink. Leaving the aircraft through the unlatched door, the pilot then held it open from the outside while the two rear-seat passengers escaped. But before the front passenger could extricate himself, the port wing also settled on to the water, submerging the whole cabin. Quickly, the pilot reached under the wing and, feeling the passenger coming out the door, grabbed him and pulled him to the surface. All four survivors then struck out for the beach where a farmer who had witnessed the accident assisted them from the water. The pilot estimated later that it took only about 30 seconds for all the occupants to leave the aircraft. A few minutes after they had swum clear, it sank in about 10 feet of water.

When the aircraft was later salvaged, the underside of the fuselage, from the firewall to the tail, was coated with a thick film of oil and the engine sump was found to be empty. Further investigation disclosed that the oil pressure gauge line had fractured, allowing the engine oil to be pumped overboard.

* * *

BEING PREPARED

Comparatively few pilots, especially in more recent years, have had to contend with a forced landing; fewer by far have been faced with a ditching. Yet, just as the key to successfully handling an emergency over land lies in planning for all possible contingencies, so the right decision in an emergency over water depends upon all pertinent factors of weather, surface conditions, aircraft characteristics and handling techniques having been considered well in advance.

Before even setting out on an overwater flight therefore, a pilot should allow for the possibility of having to ditch, and plan accordingly. He and his passengers should don life jackets before boarding the aircraft and, if these are of the inflatable variety, familiarise themselves with their operation. The confined area of a light aircraft cabin is no place to be trying on life jackets after the engine has failed! If a life raft is carried it should, of course, be stowed where it is readily accessible.

One aspect of the ditching procedure which is all too easy to overlook is the proper briefing of passengers. Although the pilot himself may be prepared, his passengers will probably have no concept of what to expect during either the ditching sequence or after the aircraft comes to rest. The briefing should be conducted before take-off and, in addition to the fitting and operation of life jackets, should cover such matters as the method of releasing seat belts, protection of the face and head on impact, the sequence of leaving the aircraft and, where necessary, inflation of the life raft and the means of boarding it.

During the flight, the pilot should keep close track of his progress so that, if an emergency does arise, he will be able to transmit an accurate position report. Obviously, if it is possible to attract the attention of a vessel and ditch near it, the chances of a quick rescue will be greatly improved.

Once a ditching becomes inevitable, the pilot should, if possible, put the aircraft down before all engine power is lost. The use of power will give greater control over the aircraft's rate of descent and forward speed, and assist in selecting a touch down point. During the descent, the pilot should ensure that any heavy objects or loose articles in the cabin or luggage area are either adequately secured or jettisoned, and the passengers should collect coats or cushions to hold in front of their faces at the moment of touch-down. On final approach, the cabin doors should be unlatched and, if necessary, held open by a shoe or other object wedged in the door openings, to prevent them being jammed by structural deformation. Opening windows and vents will help flood the cabin quickly after touch down and make it easier to open the doors against the outside water pressure.

SEA CONDITIONS AND WIND

PERHAPS the most important single requirement for a successful ditching is the selection of a touch-down heading that makes proper allowance, not only for the wind strength and direction, but also for the surface condition of the sea. On land, of course, a touch-down direction as near as possible into wind is always used, but where a ditching is concerned, sea conditions must also be taken into account. In some circumstances, they are the main consideration in determining a ditching heading.

Although the sea conditions existing at any particular time are beyond the pilot's control, his correct evaluation of the water surface and the wind is vital in establishing the approach direction. Over the open sea, well away from land, everyday indications of wind strength and direction such as smoke, dust, etc. are not available and in these circumstances, the line of the swell should be used with caution in assessing the wind direction.

Swell, as most readers will know, is an undulating movement of the surface generated by some past or distant wind action. It does not necessarily move with the local wind and it may be affected by landforms or ocean currents. It is therefore possible to have a heavy swell in an area where there is little or no surface wind. If the local wind is blowing across this primary swell, a secondary system is created with waves running on top of the primary. The wind will be blowing at right angles to these waves. Wind lanes also provide a means of determining the wind direction, and appear as parallel strips of light and shade on the water.

The effect of wind on the surface of the sea provides a definite indication of wind strength. Very light winds form ripples on the surface, giving it a scaly appearance. At about five knots these develop into small wavelets. As the wind increases, the wavelets grow in size and length until, at approximately eight to ten knots, small waves are formed. The crests of these begin to break into foam and a few, very scattered white caps appear. More white caps form at 15 knots and the waves become longer until, at about 20 knots, there are moderate sized waves with long foam crests and many white caps. As the wind speed increases beyond 25 knots, the waves grow still larger and, at 30 knots, white foam from breaking waves is blown in streaks along the direction of the waves. When the speed exceeds 35 knots, the edges of the crests eventually break into spindrift and foam is blown in well marked streaks in the direction of the wind.

Except when the surface of the water is smooth or only slightly rippled, in which case a normal, into a wind touch-down may be made, the ditching heading is usually determined by the major swell system, rather than the wind direction. The danger of nosing into a swell is generally greater than that involved in ditching cross-wind and for this reason, the face of any swell should be avoided. In winds up to about 25 knots therefore, it is preferable to head parallel to the major swell, aiming to touch down on the crest (see figure 1). This, of course, gives two possible headings and the pilot should choose the direction along the swell which is the more into wind. Unfortunately, the situation can be complicated by the presence of a secondary system and where this has developed to the extent that it becomes a significant factor in determining the ditching heading, the pilot should aim to touch down parallel to the major swell and down the back of the secondary swell (see figure 2). The selection of a

The Cessna Cardinal in the water moments after it had ditched. A ring of ripples can be seen spreading outwards from the floating aircraft.

touch-down direction can be further complicated by the fact that the smaller, secondary waves tend to obscure or fill the troughs of the primary system, and a heavy swell can be partially hidden beneath a local, wind driven system. While the primary swell is most easily discernible at heights of 2,000 feet or more, it may be necessary to wait until the aircraft descends below 1,000 feet to evaluate the secondary system.

In winds between 25 and 35 knots a compromise heading will probably give the best results, angling slightly into wind across the top of the swell, as far as possible making equal allowance for both wind and swell system. Once the wind exceeds 35 knots however, its effect will probably outweigh the danger of the swell system and it is better to plan the approach into wind. In these conditions, the shortening of the swell combined with the flattening effect of chop will probably make a touch-down into wind less hazardous than attempting to ditch crosswind along the swell, where there is always the chance of a wing dipping under and slewing the aircraft head on to the base of the rising wall of water.

AIRCRAFT CHARACTERISTICS

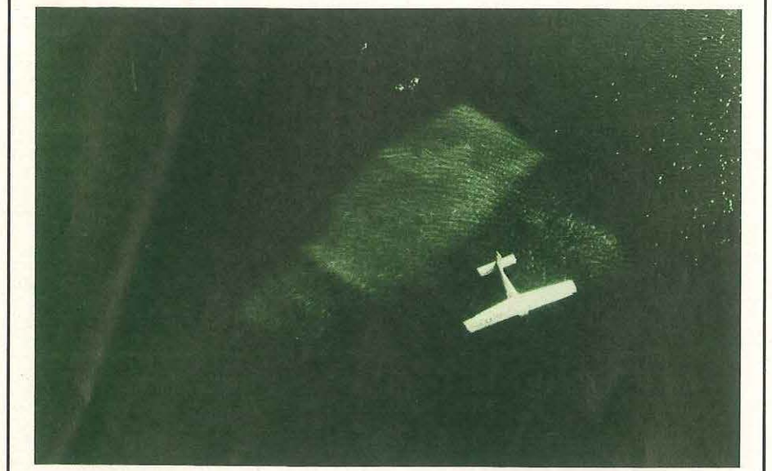
EACH aircraft has its own peculiar ditching characteristics, and any special procedures described in owner's manuals should be strictly observed. There are however, several major considerations that apply in all cases and these must be taken into account together with any specific instructions.

Generally, any projections below the aircraft will increase both the deceleration forces and the tendency to dive on impact. It is for these reasons that ditching a retractable undercarriage aircraft with the undercarriage down is never recommended. On the other hand, unless otherwise specified by the manufacturer, full flap should always be used. The extension of flap will also add to the nose-down pitch effect but this disadvantage is more than outweighed by the reduction in touch-down speed and the consequent lowering of the impact and deceleration forces, not to mention the stopping distance.

HANDLING TECHNIQUES

THE correct technique for ditching a landplane, unlike the normal forced landing training sequence, is obviously something that has to be learnt and remembered without the benefit of regular practice! Generally however, the factors on which a successful ditching depends are not unlike those of a normal landing except, of course, the tolerances are far more critical.

The actual touch-down demands accurate flying and a high degree of judgment. The aircraft must be set down on the correct heading in the right place and at the best possible combination of attitude and speed. Water is an unbelievably "solid" substance when encountered at about 60 knots, and the importance of a low rate of descent and touch-down speed cannot be over-emphasized. It must be remembered that the kinetic energy of the aircraft which must be completely dissipated over the stopping distance, is proportional to the square of the speed!



The sinking aircraft photographed from a lower altitude. At the top of the picture the four occupants can be seen swimming towards the beach. This picture, and the one on the preceding page, were taken by a passenger in an accompanying aircraft.

The pilot should plan to approach at the minimum recommended gliding speed and with the flaps fully extended. He should however, be careful that in his attempt to reduce the touch-down speed to an absolute minimum, he does not allow the final approach to develop into a fully stalled, uncontrolled descent into the water. It is thus important to maintain sufficient flying speed to keep the aircraft fully controllable, with the wings level, right up until the moment of impact; dropping a wing into the water, even at stalling speed, could easily capsize the aircraft – with disastrous results.

Unless some other special technique is recommended by the manufacturer, the pilot should aim to put the aircraft down on the water in a normal tail-low, landing attitude. This applies to most aircraft types, regardless of the undercarriage configuration. The aircraft's nose attitude on impact is even more critical than the speed and rate of descent. If the nose is not high enough, a fixed undercarriage will "dig in", and the aircraft may dive below the surface or even overturn. On the other hand, if it is too high, first the rear fuselage and then the nose will slam down on to the water as the aircraft stalls.

Clearly, when ditching cross-wind along the primary swell, proper allowance must be made for drift and a suitable touch-down technique employed. In these circumstances of course, the hazards of striking the water with a wing tip rule out the side-slipping method of correcting drift and a normal crabbed approach with the wings level is therefore required. The technique to be adopted is in fact, identical to that used for this type of landing on solid earth. Allowance for drift is established on final approach and maintained during the hold-off until just before touch-down. At this point, the aircraft should be yawed straight with rudder and then allowed to settle on to the water without drift. In common with the technique used on land, this type of touch-down requires precise judgment – straightening up too early will allow drift to be picked up again, while waiting too long will result in the aircraft striking the water while still crabbing. Crosswind handling techniques were covered in some detail in the last issue of the Digest, and pilots may refresh their memories on the subject by referring back to this article.

IN THE WATER

If the approach and touch-down have been carried out correctly, there will first of all be a comparatively minor impact as the tail strikes, followed by a second, more severe impact accompanied by violent deceleration. The pilot should expect a lot of spray and a lot of noise as a matter of course. The nose will almost certainly plunge below the surface and heavier aircraft may travel a short distance with the nose submerged before coming to rest.

All occupants should leave the aircraft as quickly as possible; landplanes make poor water craft and can be relied on to float for only a very short time. The pilot will, of course, be more familiar than his passengers with the cabin layout and means of exit, and should provide guidance and assistance wherever he can, especially with the release of seat belts and the inflation of life jackets.

Above all, the temptation to panic must be firmly resisted. If, despite all precautions, a door jams shut, a well-aimed kick at a cabin window or the windscreen should provide an alternative means of escape. Finally, once out of the aircraft, it should not be used as a raft; it is bound to sink before long and everyone should be well clear when this happens.

THEORY INTO PRACTICE!

IT would be difficult to find a better exemplification of recommended ditching techniques than in an account of the ditching of a Beagle Terrier in the English Channel, which appeared recently in Flight Safety Bulletin, published in the United Kingdom by the General Aviation Safety Committee. The Beagle, a high wing, tail wheel aeroplane, was one of a group of three single-engined types on a flight across the Channel from France to England. The pilot-in-command was the chief flying instructor of the club that owned the aircraft, and had over 2,000 hours flying experience. Accompanying him in the aircraft and occupying the left hand seat, was a club member, a private pilot with about 100 hours total flight time. Before taking off from France, both pilots had donned life jackets and, as they found these heavy and complicated, and of a type not normally used by the club, they took the precaution of familiarising themselves with their operation and "all the gadgets stowed in them."

After levelling out at their planned cruising height of 1,000 feet, the pilots found that visibility was only about one and a half miles in thick haze. They therefore obtained a clearance to climb to 3,500 feet and, on reaching this altitude, set out across the Channel, cruising just above the haze in good visibility. Shortly after reaching mid-channel, and just after the pilots had reported their position to ATC, the engine, without any warning, lost all power. The chief instructor immediately took control, and advised one of the accompanying aircraft, and then ATC, of the situation. A detailed cockpit check failed to reveal the cause of the engine failure and, as the aircraft was still more than eight miles from the English coast and was descending at about 1,000 feet per minute, he realised that there was no hope of reaching land.

At 2,500 feet, the aircraft had descended sufficiently through the haze for the chief instructor to sight a ship off to port, heading away from them, and he assessed that the aircraft would be able to overtake the vessel and ditch ahead of it. As this seemed to offer a better chance of rescue than merely heading for the coast

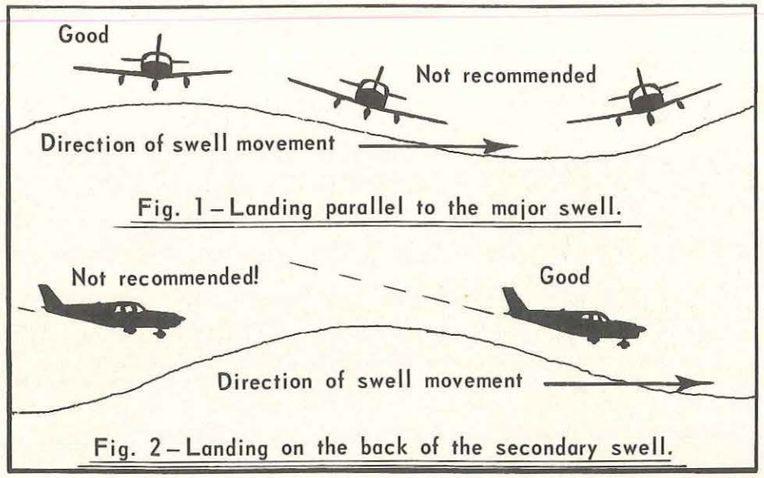


Fig. 1 – Landing parallel to the major swell.

Fig. 2 – Landing on the back of the secondary swell.

in a vain attempt to reach it, the two pilots began preparing for the ditching and the pilot in the left hand seat placed the aircraft's single-seat dinghy on his lap so that it would leave the aircraft more or less automatically as he went out the door. Giving a detailed account of his experience later, the CFI wrote:

"We kept our headsets on and plugged in, so that we could maintain communication with ATC and the accompanying aircraft. We also released the door latches, and my companion was able to put his foot in his door and keep it ajar. We opened the windows in the doors so as to allow the ingress of water and thus help to equalise the pressure so that the doors would open more easily.

"We had no engine to 'blip' in order to attract the attention of the ship so I elected to dive low across the deck at high speed, converting my speed to height again after passing overhead. I then planned on using this height to glide as far ahead of the ship as possible which, in the event, turned out to be about three quarters of a mile.

"The sea was very calm but, by looking along the 'sun path' which was about 45 degrees on our starboard side, I was able to judge quite easily how high we were. I estimate that we were dead into wind which appeared to be about four or five knots. I held-off in a nose high attitude for as long as possible, progressively applying flap until, with the tail wheel in the water and full flap applied, the aircraft stalled and the main gear dropped into the water. The aircraft immediately stood on its nose, the impact being extremely severe, and the cockpit was instantly well under water. To protect his head in the event of his jack-knifing over his lap strap on impact, my companion held the dinghy pack in front of his face.

"The windscreen shattered on impact and the water rushed in with such force that I think this countered the effect of deceleration and stopped us from jack-knifing. However it also tore the dinghy pack out of my companion's hands and swept it into the back of the aircraft. We did not see it again.

"It seemed to us that the aircraft started to sink immediately. I was aware initially of bubbles, then light green water turning, as we sank, to darker green. At the same time I could feel the pressure increasing in my ears. I do not remember undoing my lap strap but I do remember finding that my door had shut and jammed. I assume that I broke the window with my right elbow because this was later found to be lacerated, and I can recollect being stuck momentarily under water when partly out of the aircraft. I do not remember being particularly worried by not being able to breathe. Then I was free and I swam to the surface.

"The tail was sticking straight up out of the water and the whole of the forward section of the aircraft up to the trailing edge of the wings was under the surface and sinking. I could see my companion's coat through the rear part of the cockpit canopy and, because I thought that someone was in it lying face down in the water, I thought momentarily that he was trapped inside the aircraft. Then I saw his head sticking up on the other side of the aircraft and remembered that he had not been wearing his coat. I asked if he was all right and he replied in the affirmative. The aircraft then steadily sank, having floated for what I am informed by the crew of the escort aircraft, was no more than twenty seconds.

"I gathered that although under water, my companion had no difficulty in opening the door, firstly because his foot had kept it open so it had not jammed as had mine, and secondly, the inrush of water when the windscreen had broken helped to open it. But he had experienced difficulty with the lead from his headset which had been drawn tight around his neck and was released only with difficulty.

"We inflated our life jackets and I looked round for the ship. It appeared to be stationary about half a mile distant and, although it was visible to us only when we were on the top of a swell, as far as I could see, no boat was being lowered. I therefore decided to try to swim to the ship. I set off swimming on my back which is the natural position when wearing a life jacket as there is less drag and less likelihood of swallowing water than when swimming on one's front. In this position, however, I did have to keep stopping and looking round to make sure that I was still heading for the ship."

After some twenty minutes swimming in the cold waters of the Channel, the chief instructor reached the side of the ship and was eventually hauled on board. A boat lowered from the ship retrieved his companion from the sea a short time later.

* * *

Despite the fact that the basic procedures for ditching a landplane are relatively straight-forward, and that both ditchings described had "happy endings", the success of a ditching attempt, whatever the circumstances, is not easy to predict. The wind and sea conditions the well known difficulty of judging height over water, the aircraft's configuration, and post-ditching survival are only some of the many complex problems facing a pilot committed to putting a landplane down on water.

A thorough knowledge of the techniques and procedures described is thus vital for any pilot planning an extended overwater flight. But the best possible defence against the undoubted perils of the sea is surely to plan the flight in accordance with the requirements of ANR 249, thus ensuring that the aircraft remains at all times within gliding distance of land!

Pilot Contribution

THOUGHTS ON AN ACCIDENT

The accident review "Too Low, Too Slow?" which was published in Aviation Safety Digest No. 76, has since attracted some worth-while comment from practising light aircraft pilots. Readers will recall that, although the evidence brought to light during the investigation left no doubt that the accident resulted from a loss of control, the reason for the loss of control could not be determined and the discussion in the Digest was accordingly largely speculative.

In this issue's Pilot Contribution, we are glad to include the thought-provoking comments of two pilots, who have been so concerned with the circumstances of that accident, that they have taken the trouble to write to us and put forward some suggestions, based on their own first hand experiences, which they believe could have a bearing on the loss of control that led to the accident.

OUR first contributor is a private pilot who experienced an alarming loss of performance while taking off from the same aerodrome in the identical aircraft some time before the accident occurred:

I read with interest, the report of the accident to the Cessna 177 at Inverell, published in the November Digest. When I subsequently learned the identity of the aeroplane involved, it confirmed my suspicion that the reason for the accident could well have been the same that nearly got me in trouble.

It seems clear from the report in the Digest that the crash resulted from a loss of engine power shortly after take-off. I experienced a loss of power in the same aircraft taking off from the same aerodrome nearly two years before the accident.

During this flight, on which I had one passenger, I took off, after the normal run-up checks, without any obvious malfunction in the aircraft's systems. However, on reaching about 200 feet, I noticed a reduction in airspeed and rate of climb. Fortunately, I also heard a reduction in engine noise and so the first thing I checked was the throttle setting. I saw then that it was nowhere near full power, as of course it had been during the take-off itself. What in fact had happened was that the friction nut had not properly secured the throttle plunger and, due to vibration, it had backed-off, causing the reduction in power. I immediately pushed the throttle control forward and made sure the friction nut was turned hard on, and kept checking to see that it was tight. I subsequently climbed out without any more difficulties.

During further flights in this aircraft over the next few days, I had no more problems with either the throttle control or the friction nut. For this reason, I believe it was a case of my unfamiliarity with this aircraft. It was the first time I had flown this particular aeroplane, and I can only assume that the amount of force that had to be applied to the friction nut was a bit more than to the friction nut of the type I normally flew. (At the time a Cherokee 180).

Whilst I know it would be impossible at this stage to say for certain whether or not the crash of the same aircraft later was the result of a similar set of conditions, my experience may be of assistance.

Our other commentator is an agriculturally rated commercial pilot, who writes from the standpoint of experience gained in agricultural operations in conditions of density altitude and aircraft load, similar to those in which the accident occurred to the Cessna 177:

As an agricultural pilot, I have recently completed a season in this area, working under similar conditions as described in your article, and my experience may throw light on the cause.

I have nearly 4,000 hours experience, but even so was grateful to my chief pilot and fellow pilots for warning me of the dropping wing in a turn. This can occur in the condition in which the pilot of the Cessna 177 found himself.

Flying heavily loaded on a hot day at slow speed and, significantly, in an aircraft with less power than he was used to, he was "set-up" in the turn after take-off, for a spin. The raising of the flaps might have induced it, together with the invisible willy willy or gust. In any event, the result is that a wing will drop viciously, and the aircraft heads for the ground in a most determined manner!

The natural reaction is to try and pick up the wing with aileron and, being low, attempt to apply power that isn't there, and pull back on the control column. Although this is supposition on my part, as I am not an instructor, I think the proximity to the ground was the factor that determined the reaction. I need not mention to you that the correct recovery action is to put the nose down and use what height is available to gain airspeed.

The point I am trying to make is that the fall out of the sky can occur without warning and be very violent and, unless one is used to the conditions and on guard (and even then it gives you a big fright), the result can be very unfortunate.

Although you pretty well say as much in your article, I wanted to confirm that it does happen as you described!

Comment

It is particularly encouraging to the staff of the Air Safety Investigation Branch, when possibilities and theories put forward to try and account for a puzzling type of accident are vindicated by practising pilots.

We are grateful to our two contributors, and believe that their efforts in providing us with further food for thought on this unexpectedly tragic event, might well help to save other pilots from the same insidious aerodynamic snare.

A Hair's Breadth From Disaster

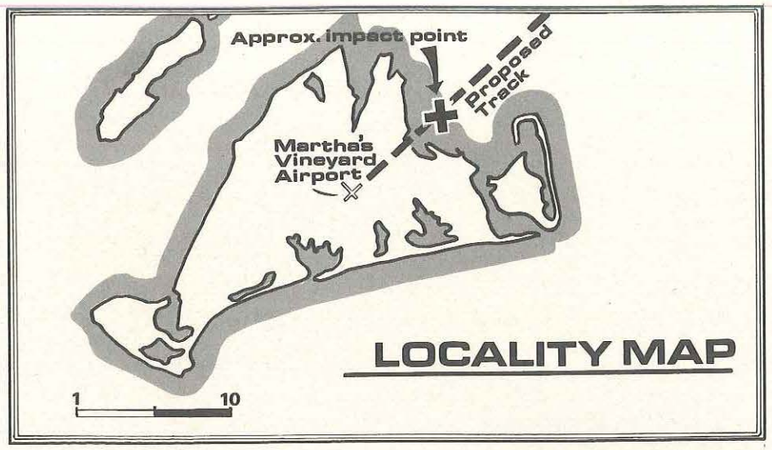
While making an IFR approach to land at Martha's Vineyard, an island a few miles off the coast of Massachusetts, U.S.A., a DC9 struck the surface of the ocean, but remained airborne. The aircraft then diverted to Boston where it made a normal landing. None of the eight occupants suffered injury, but it was found that the aircraft had sustained minor damage.

(Based on a Report Published by National Transportation Safety Board, U.S.A.)

AT the time of the incident, the aircraft was engaged on a scheduled domestic passenger flight from New York to Martha's Vineyard, with an intermediate stop in New Bedford, Massachusetts. The flight from New York to New Bedford was uneventful and the aircraft departed New Bedford again at 0822 hours local time, on an IFR clearance direct to Martha's Vineyard VOR at 3000 feet AMSL. Two minutes after take-off, the aircraft was vectored on to a heading of 110 degrees magnetic and instructed to descend to 1,700 feet, preparatory to being radar vectored for a straight-in VOR approach to runway 24. A terminal weather report for Martha's Vineyard Airport was then passed to the aircraft. The cloud base was reported as indefinite at about 300 feet, with the sky obscured, the visibility was one mile in fog, the wind was blowing from 030 degrees at five knots, and the altimeter setting was 29.81 inches. After instructing the aircraft to turn right on to a heading of 240 degrees, the aircraft, which was then eight miles from the VOR beacon, was cleared for a VOR approach to runway 24.

After lowering the undercarriage and extending the flaps to 25 degrees, the crew completed the "descent" and "before landing" check lists and the captain and first officer each cross-checked their altimeters to ensure that they indicated the same altitude. The captain, who was flying the aircraft, checked the rate of descent as the aircraft was leaving 1,100 feet, intending to level off at 540 feet. Shortly afterwards, he looked through the windscreen and saw the surface of the ocean directly below the aircraft. He immediately applied full power and rotated the aircraft into a climbing attitude but the rear section of the aircraft struck the water before the descent could be arrested. Leaving the undercarriage extended, the captain climbed away and informed the passengers on the aircraft that, "We have struck the water during our approach . . . . I may have misread my altimeter."

The crew then flew the aircraft, with the undercarriage still extended, to Logan International Airport at Boston where they landed normally.



When the aircraft was inspected after landing, it was found that the lower sections of the cowlings of both engines were buckled, wrinkled and torn, with one section of cowling missing altogether. The lower half of the No. 1 engine thrust reverser had been forced back, and the skin fairing was torn with some sections missing. The lower half of the No. 2 engine thrust reverser was also torn and buckled and the underside of the fuselage skin was torn at the aft pressure bulkhead.

Inspection of the airframe, engines, and aircraft systems, and examination of the aircraft's records, indicated that there were no mechanical malfunctions or failures that could have contributed to the incident. Tests of the aircraft's altimeters and static pressure system indicated that at sea level, after a slow descent, there would probably have been an error of minus 30 feet, but this error would have been in the pilot's favour; i.e., the altimeter would have read 30 feet *lower* than the actual altitude of the aircraft.

The aircraft was fitted with both a flight data recorder and a cockpit voice recorder, and the tapes from both these units were removed for analysis. The cockpit voice recorder tape was found to be broken and no information was available from it, but the flight data record showed that the impact with the water had occurred 9 minutes 48 seconds after the aircraft had taken off from New Bedford. One minute 20 seconds after the altitude trace began indicating a final descent at just over 1,000 feet per minute, the trace moved rapidly from plus 125 feet to minus 250* feet. The heading trace showed that the aircraft was in an almost continuous right turn until it struck the water. The indicated airspeed at the beginning of the descent was 135 knots, and had increased to 157 knots at the point of impact. At this point, all four traces on the record showed sudden large deviations which lasted about seven seconds, and the acceleration trace continued to show deviations for a further five seconds.

Both members of the crew were properly licensed and highly experienced. The captain had over 17,000 hours total experience, 3,000 of which were gained on DC9 aircraft. The first officer had almost 3,000 hours, 2,000 of which had been logged in DC9's.

Giving evidence during the investigation, the captain said, "Just prior to executing the approach, while cruising at 3,000 feet and on a heading of 110 degrees, we were flying directly into the sun in a very bright haze approximately 1,500 feet above the overcast. This condition existed until we entered the overcast during the descent phase of the approach. After entering the overcast I would estimate that there was a 50 per cent reduction in outside light.

"During the entire approach, the fluorescent lights under the glare shield were all on full bright .... Neither the first officer nor I was wearing sun-glasses during the approach."

The captain's medical certificate required him to have corrective lenses for near vision while he was flying and although the captain had his glasses with him on this flight, was not wearing them when the aircraft struck the water. The aviation medical examiner who examined the captain, said that under the external and internal lighting conditions which existed at the time, it would have taken the captain's eyes from one to two minutes to adjust to the change in lighting after the aircraft descended into the fog.

Both the captain and the first officer said they had cross-checked their altimeters during their pre-landing checks, and both instruments had indicated the same altitude. During the announcement that he made to the passengers shortly after the aircraft struck the water however, and later during an interview, the captain said that he might have misread his altimeter. The investigation considered that the pilot's visual acuity could have contributed to a misreading of the altimeter in the prevailing lighting conditions.

The airline's operations manual contained a requirement for the pilot not flying the aircraft, to call the aircraft's altitude at five stages during a non-precision approach. The first call was to be made at 1,000 feet above the minimum descent altitude, and thence at 500 feet, 100 feet and 50 feet above this point. Finally, the words "Minimum Altitude" were to be called when the aircraft had descended to this altitude.

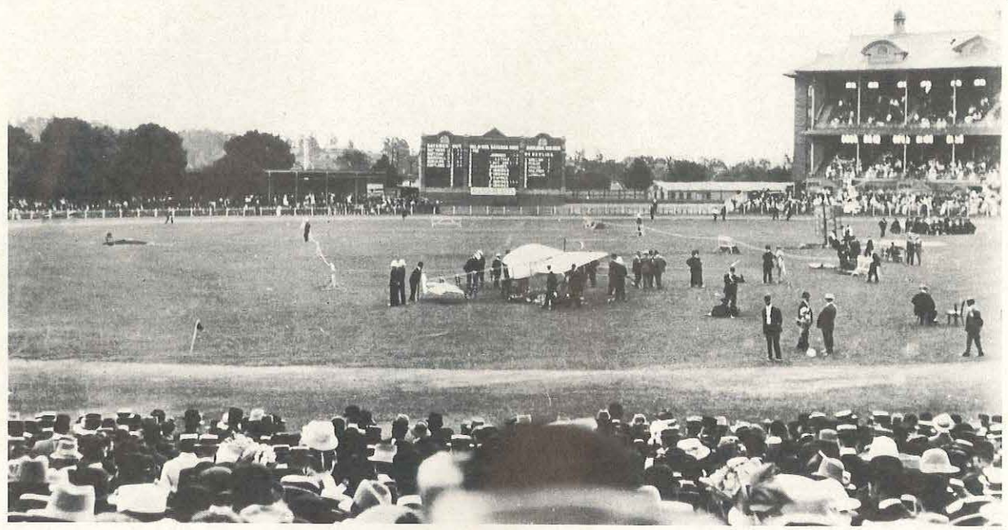
During the approach on which the aircraft struck the water, the first officer did not make the required calls. At the time he should have been making the calls, he was tuning the low frequency radio beacon and, at the captain's instruction, was trying to contact their company by radio to obtain the latest weather report at Martha's Vineyard. Although the difficult lighting conditions, together with the captain's reduced visual acuity, might have contributed to his misreading of the altimeter, it was concluded that the incident could have been prevented if the crew had followed the altitude call-out and co-ordination procedures required by the airline's operations manual.

Probable Cause

The National Transportation Safety Board determined that the probable cause of this incident was the lack of crew co-ordination in monitoring the altitude during the performance of a non-precision instrument approach, the misreading of the altimeter by the captain, and a lack of altitude awareness on the part of both pilots.

* The readings of the flight recorder are based on standard pressure and make no allowance for local variations in altimeter setting.

AIR SAFETY ADVICE - ILLUSTRATED



"Adequate precautions shall be taken to ensure that persons, objects and animals, are kept clear of strips and alighting areas . . . . ." *– Visual Flight Guide*

(Monsieur Gaston Cugnet's Bleriot monoplane at the Melbourne Cricket Ground, December, 1911. – Photograph courtesy R. Heath Esq., Haddon Rig)

ACCIDENT REPORT AVAILABLE

The report on the Departmental investigation into the circumstances of the collision between a Beech Twin Bonanza and a Bell 47 helicopter over Moorabbin, Victoria on 19th October 1970, has now been published as Special Investigation Report 70-6.

Copies of this report, price 30 cents, can be obtained from the Australian Government Publishing Service, P.O. Box 84, Canberra A.C.T. 2600, or from AGPS book centres in capital cities.

After undergoing a little more than an hour's dual instruction in this Piper Colt, a private pilot taxied out to do some solo circuits to complete his endorsement training. At the time, there were a number of rain squalls in the vicinity but the instructor conducting the training did not believe the weather would close in before the circuits were completed and so he authorised the solo flight.
Everything went well until, on the downwind leg of the first circuit, the pilot realised that the squalls were approaching much faster than expected, so he decided to cut the remaining part of the circuit as short as possible. The wind strengthened as he turned on to final approach and he decided to go around again but, just as he was about to do so, it waned again and he continued the approach to land. The aircraft touched down normally but while it was still rolling the wind suddenly increased to more than 30 knots and backed through 90 degrees. Although the pilot tried hard to keep the aircraft on the runway, it drifted off to starboard on to the grass, the port wing lifted digging the starboard wing into the ground and the aircraft was blown over on to its back. The pilot, who was unhurt, turned off all the switches and left the aircraft without assistance. The aircraft was damaged beyond economical repair.

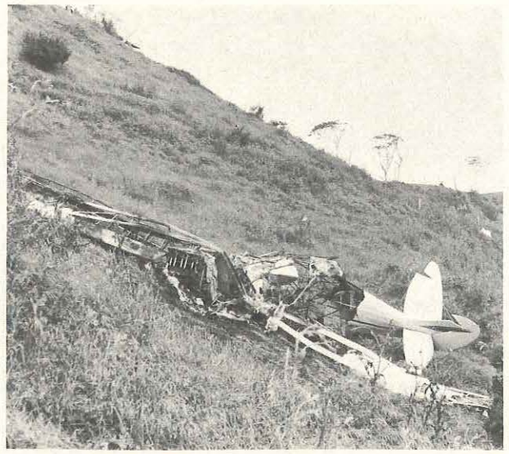
The pilot of this badly damaged Callair was highly experienced in agricultural operations and on the aircraft type, but fell prey to one of the most insidious hazards of aerial spraying operations. After completing a number of spraying sorties in the area, the pilot had found that some of the aircraft's spraying nozzles had begun to leak. To overcome the problem pending the completion of the work, the pilot had adopted the practice of not releasing the fan brake on the spraying pump until he turned on to each run. He would then check to see if the nozzles were leaking before activating the spray.
As he turned on to the run on which the accident occurred, the pilot followed this procedure once more but, on looking up again, he saw a tree immediately in front of the aircraft. Before he could take any avoiding action, the port wing struck its upper branches. The aircraft rolled to the left, striking the ground with the port wing tip, and cartwheeled and slid to a stop as shown in the photograph. The pilot received serious injuries. He commented afterwards, "I made the fatal mistake of burying my head in the cockpit".

In Brief

The experienced owner-pilot of this Tiger Moth, who also had considerable gliding experience, was making a brief local flight from a country airstrip in between glider towing operations.
After climbing to 3,000 feet, and carrying out some aerobatics, he began a gliding descent back towards the aerodrome. Watchers on the ground saw the aircraft make a gliding approach and at about circuit height noticed that the engine had stopped. The aircraft turned downwind and they then saw that the propeller had stopped rotating in an almost horizontal position. The wind had freshened since the aircraft had taken off, and after it had turned on to final approach, it was clear to those watching that the aircraft was undershooting. It touched down in a three point attitude, 40 yards short of the aerodrome boundary fence and at low speed rolled through the fence and came to rest on its nose. The nose cowling and lower wings sustained damage.
The pilot, who was unhurt, said afterwards that he thought he must have accidently knocked the ignition switches off during the glide and that, when he had tried to restart the engine, it had spluttered and died. He had attempted to land on the strip but misjudged the approach because he did not realise the wind had freshened.
No fault could subsequently be found with the engine.

At Jandakot in Western Australia, a student pilot had been briefed to carry out a period of solo circuits and landings in a Cessna 150, finishing off the exercise with a cross-wind landing. The wind was blowing from 030 degrees at five to 10 knots and, operating from the 06 duty runway, the pilot completed the first part of the period without incident. After his last take-off in this direction, he requested a clearance to make a cross-wind landing and, as the wind was blowing virtually at right angles to the other available runway, he was cleared for an approach in the 30 direction.
Using a higher than normal approach speed in the cross-wind conditions, the pilot flared the aircraft for landing at about 65 knots. However, it did not immediately settle on to the runway, but floated for some considerable distance before touching down heavily on the main wheels. Bouncing back into the air, the aircraft drifted down-wind off the side of the runway before striking the ground heavily once again, this time on the nose wheel. The force of this second impact dislodged the nose leg and the propeller dug into the sandy soil, somersaulting the aircraft on to its back. The pilot, who was uninjured, extricated himself from the aircraft without assistance.

A commercial pilot had been engaged to make a charter flight from Launceston to Flinders Island and before departing he completed a flight plan, inspected the aircraft, and physically checked the fuel tank contents which he assessed as being full. The flight proceeded as planned and the aircraft landed at Flinders Island an hour and 20 minutes later. After off-loading his passenger, the pilot took off for the return flight. A little more than an hour later, when only 8 miles from Launceston Airport but over inhospitable terrain, the engine of the Cessna 172 suddenly lost all power. The pilot attempted to restart the engine but then saw that both fuel tanks were empty. Having lost precious time and height attempting to start the engine before he looked for a suitable forced landing area, the pilot found he was left with no alternative but to make a downwind landing in the only suitable field available to him. Unfortunately the length was not sufficient to bring the aircraft to a stop and, even though the pilot deliberately induced a ground loop to the right, the tailplane struck a fence post and was substantially damaged. It was found during the subsequent investigation that the aircraft's fuel tanks were not, in fact, full at the beginning of the flight and that, unknown to the pilot, the aircraft had flown about an hour and 45 minutes before he began the trip.



On the day preceding the accident, the pilot of a Piper Pawnee conducted a ground inspection of a property which was to be sprayed the following day. An adjoining property was also to be sprayed but because darkness was approaching he did not have sufficient time to make a proper ground inspection of this second area.
The next morning, after making an aerial inspection of the second area to be treated, the pilot decided he would fly along the escarpment visible in the photograph. He selected a pull-up point which he thought would enable him to climb over two power lines that ran down the slope across the aircraft's path. The pilot commenced his run, positioning the aircraft to fly parallel with the face of the escarpment and, on reaching his pull-up point, eased back the control column. The aircraft cleared the lower power line, but the port wing struck the upper wire, and the Pawnee crashed to the ground and caught fire. Though seriously injured, the pilot escaped from the burning wreckage.
The pilot had not sprayed this area before, and did not know the exact height of the upper power line above the ground. Not having made a ground inspection of the rather complex relationship of wires and terrain at this point, he had underestimated the climb path necessary to clear the higher set of wires along the face of the escarpment.

Arrangements had been made for a commercial pilot to ferry this Cessna 172 to a property in Victoria. Before taking-off, the Cessna pilot had been briefed by a private pilot on the location and layout of the property's two airstrips, one of which, because of its soft, wet surface, was unserviceable. However, the private pilot neglected to mention that only a short distance from the serviceable strip, which was not marked, there was another area which had been graded some time previously to form a strip, but which had subsequently been abandoned, leaving the surface badly rutted.
Arriving over the property, the pilot made several low inspection runs and, mistaking the graded area for the strip he had been advised to use, he landed on it, fortunately missing the roughest areas. At the end of the landing roll, the pilot turned the aircraft around and began to taxi back along the strip. But when the aircraft had rolled only a few yards, the nose wheel entered a deep hole. The nose leg was torn off and the aircraft came to a sudden stop on its nose.

At King Island, a private pilot decided to make a local flight in a Cessna 150. Accompanied by a passenger, he took off normally from the aerodrome and flew to Grassy, a settlement some ten miles away on the south-east coast.
After flying over the township, the pilot turned back towards the aerodrome, but soon afterwards the engine began to run roughly and lost power. The pilot applied carburettor heat but to no avail and he found that even at full throttle, the engine would not produce more than 2,200 RPM. Unwilling to continue back over the rougher terrain towards the aerodrome, the pilot decided to land and selected a paddock. Closing the throttle at 1,500 feet, he attempted a gliding approach but the aircraft overshot, and after touching down in the adjoining paddock, struck a drain which collapsed the nose leg and the aircraft came to rest on its nose. The two occupants were unhurt but wind later blew the aircraft over onto its back. It was found that the loss of power had been caused by a broken exhaust rocker arm.
It was evident that the pilot had not attempted to use the engine power still available to him to assist his judgement of the emergency landing.