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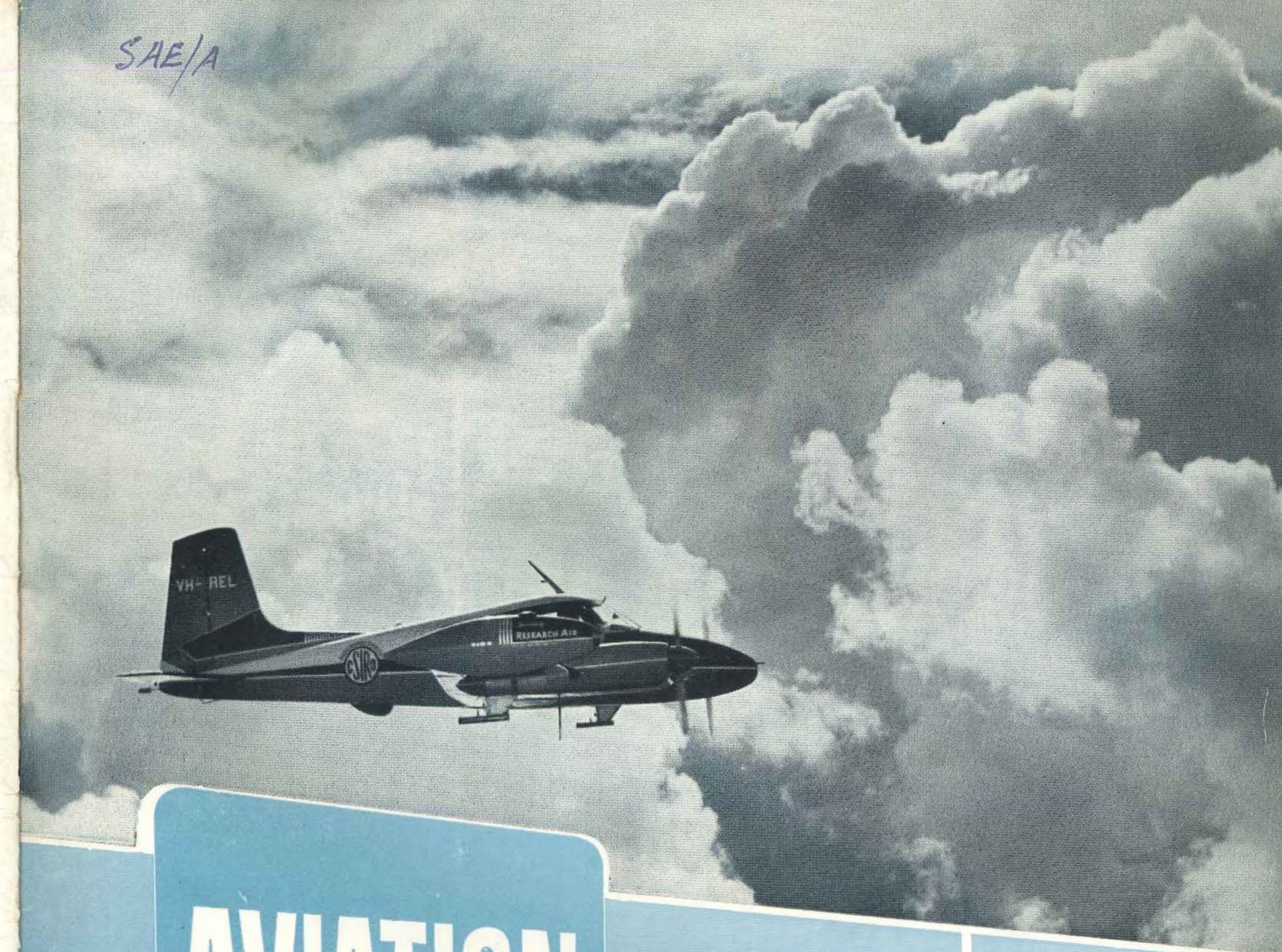


AVIATION SAFETY DIGEST

No. 28, DEC., 1961

DEPARTMENT OF CIVIL AVIATION

AVIATION SAFETY DIGEST

No. 28 DECEMBER, 1961

Prepared in the Division of Air Safety Investigation,
Department of Civil Aviation.

Contents

Rainmaking aircraft flying into a bank of super-cooled clouds during Commonwealth Scientific and Industrial Research Organisation experiments.

Commonwealth of Australia.

It won't happen to Me, Friend.

The article "The Old and the Bold" in the last issue inspired one of our readers to offer his own sorry experience for your benefit. We are pleased to present it here just as received, complete with the above title.

The authenticity of the story is backed by our records and the bare facts of the case which were contained in Digest No. 15 of September, 1958, give little indication of the price that was being exacted from the victim. If this sequel to our earlier story fails to impress those inclined to expose themselves to this particular form of danger they are more than likely beyond any help. To them we say—note well the final five words of this article.

"In 1957 I guess I was little different to many other Private Pilots flying light aircraft in this country. True, I had had the benefit of advanced flying on single engined types with an Auxiliary Air Force Squadron during Korean War time, but since then I had been restricted to Tigers and Austers, flying purely for pleasure, an occasional business trip, and sometimes just to log hours for a licence renewal.

Crash Critique and Aviation Safety Digest were perused, often read, for it is always interesting to see the strife others get into or be told why some poor coot bought it for not sticking to the rules or just generally mucking about. Civil of course was punching the old line at the light aircraft boys trying to make them see a bit of sense and stop pranging up the countryside. Yes I read, or glanced over, these exhortations but took little interest for I knew full well it wouldn't happen to me. I was a reasonable pilot in those days. I knew the book and could fly by it when necessary too; in a Tiger though, it's not always necessary, is it? You know how it is when you're driving about the countryside with nothing definite to do except log a bit of time or maybe chase round a cloud or two — on the clear winter days up here there aren't many clouds however, and if time gets to draw by too much why not get down on the deck for a bit of real flying? And it is real fun too, even the Civil boys will admit it if you get them alone; whizzing along at seemingly greatly increased speeds., a rapidly and continually changing countryside flashing by, the wind screaming in the wires, a hill to shoot round or hop over, high timber to clear, open cultivation to really low fly over, a house to steep turn around while you have another look. . . . Good fun yes, especially if you come back. I've ah done my share of ah indiscreet flying, but then I always keep perfectly alert, weigh the risks in every manoeuvre, and keep wide awake, so you see it won't be me who prangs while low flying. . . .

In 1961 I am still flying; I've renewed my licence, though the medical was a bit hard to pass; I've ridden as a passenger in the Cessna and Piper cabin jobs that were only a dream to us back in '57, in fact I'd really like to get an endorsement on one but I just can't afford it. I'm not complaining, don't get that idea, for I appreciate tremendously how fortunate I am; after all twelve months in hospital plus half a dozen major operations isn't much in a lifetime if you come out of it reasonably fit and with few outward signs bar the odd scar, a not over noticeable limp and a completely empty bank account. I've changed my outlook a bit too since I found it CAN happen to me.

That was in June '57 when I was flying over my property, I'd had a good look at height and was down at 60 feet flying the cultivations — I knew quite well there were no high trees about — that is until I went into one full bore. The Crash Inquiry in a masterpiece of understatement said I was paying insufficient attention to my flight path.

I know a lot of you light aircraft drivers who glance through this won't take any notice of it, you're careful, etc., etc., and it won't happen to you. You probably are like the other pilot from the same Club as I flew with — he crashed a Chipmunk six months after my effort, undoubtedly he was completely confident in his own ability when he went in to beat up a small country town, he knew it wouldn't happen to him — he was wrong, though he never lived to find that out. Had he been able to profit from my unfortunate example he would be alive today; I hope you can profit by it, if you don't the odds are strongly in favour of your not being alive the day you find IT CAN HAPPEN TO YOU.

Up Wind — Down Wind?

On arriving at the destination aerodrome on a private flight, the pilot studied the wind indicator and elected to land on a strip bearing 017 deg. M which he judged to be almost directly into wind.

Four attempts were made to land in the chosen direction each time being forced to carry out a baulked approach because of overshooting. At this stage, if not before, one would expect the pilot to have sought the cause of the persistent overshoots and in doing so, re-checked the wind direction. Instead, yet another similar approach was made and the aircraft touched down on the wheels at high speed halfway down the strip. The remaining distance of approximately 800 feet proved insufficient to stop the aircraft which came to rest in light scrub 60 feet beyond the strip end.

A more critical examination of the wind indicator after the event revealed to the pilot that he had previously misinterpreted the wind direction and had landed with a direct tail-wind of 8 to 10 knots.

This relatively inexperienced pilot was extremely fortunate not to have suffered some physical harm. In other circumstances a lapse of this nature could have had far more serious consequences.

This is by no means the first time that a windsock has been misread by 180 deg. and for those who can't remember or decide whether they should head in or out of the "bag" we suggest they think of it as a butterfly net and aim not to be "caught".

Inviting Collision

Recently the Director-General wrote a personal letter to all licensed pilots stressing the need for awareness of the dangers of entering controlled airspace without notice to A.T.C. and sought co-operation in avoiding a situation which could lead to a mid-air collision. The number of incidents which have occurred since then are sufficient cause to wonder whether the warning has already been forgotten.

In Australia and Papua/New Guinea air traffic control provides positive separation between all aircraft operating within civil control **Areas,** irrespective of whether they are flying IFR or VFR, and within civil control **Zones** except between VFR flights. Civil control areas exist along air routes where the density of traffic makes positive control essential to safety. The lateral boundaries and vertical limits of all civil control areas and control zones and the military control zones under R.A.A.F. control at Amberley, East Sale, Edinburgh, Laverton-Point Cook, Pearce, Richmond and Williamtown are promulgated in A. I. P. and the Light Aircraft Handbook.

The unauthorised entry into controlled airspace is a matter of the greatest importance both to the authorised user and the Department. The nature of recent air safety incident reports indicates that most infringements are caused by a lack of knowledge and understanding rather than any blatant disregard for safety. The requirement to seek an A.T.C. clearance prior to entry has also been overlooked in some cases, but in others there has not been a proper appreciation of the dimensions of these areas in relation to the particular flight.

Pilots should study the lateral boundaries and vertical limits of controlled airspace and its relationship to the intended track before commencing any flight. An air traffic clearance must be obtained from A.T.C. either pre-flight or by radio en route if it becomes necessary to enter controlled airspace at any time. For obvious reasons flight in a control area by non-radio equipped aircraft cannot be permitted and these flights must therefore be planned and undertaken clear of control areas. The entry of non-radio equipped aircraft into control zones is always subject to prior arrangement with A.T.C.

Remember, the "see and be seen" concept is totally inadequate for safe operations in the controlled airspace due to the numbers of high speed aircraft which operate within it. If you are uncertain of the extent of the controlled airspace and its effect upon your flight, consult the nearest A.T.C. or COM Unit for advice prior to departure. The advice is free but extremely valuable to your life and the lives of others.

Lanes of entry are provided for use by light aircraft when proceeding to or from secondary airports so that the control zones of capital airports can be avoided. Pilots are therefore urged to use these lanes and to comply with the altitude restrictions as prescribed in A.I.P. and the Light Aircraft Handbook. Above all, it should be remembered that a mid-air collision will almost certainly reduce to zero the opportunity for excuse and defence.

Mid-Air Collision: Piper PA22 and F84F

NEAR MANSFIELD, OHIO, U.S.A.

(Summary of the report of Civil Aeronautics Board, U.S.A.)

At 14.16 hours on November 7th, 1959, a Piper PA-22 and an F.84F collided in the air about two miles south-southeast of the Mansfield Airport, Mansfield, Ohio. The two pilots of the PA-22 received fatal injuries but the pilot of the F.84F ejected from his aircraft and parachuted to the ground uninjured. Both aircraft were totally destroyed.

INVESTIGATION

The Piper was engaged on a cross-country training flight from Akron to Mansfield and return non-stop. It was conducted according to VFR and no flight plan was filed. The aircraft departed from Akron at 1345 hours and no radio contacts were made with any communications facility thereafter.

The F.84F, a military single-place jet fighter, was one of a four aircraft formation training flight. The formation departed from Mansfield Airport at 1330 hours on a local VFR flight plan. It was to perform various formation tactics and training at high altitude, followed by a formation jet penetration and simulated instrument approach.

After the high altitude portion of the training was completed a descent was made in close formation. Cloud coverage in the area made it impossible to conduct a practice jet penetration and remain VFR as the flight leader made the descent in an area of scattered clouds approximately 15 miles northwest of the airport, then led the flight underneath the overcast back to the field.

About ten miles northwest of the field the flight leader called the Mansfield tower requesting permission to make a low approach across the field with the formation and also requesting landing instructions. He stated that the low approach was part of the instrument training and this pass was required to give the pilot flying the No. 2 position experience in flying close formation at slow speed.

(All times herein are U.S.A. standard)

At this time the formation was on a heading of 170 degrees at 3,500 feet. The flight leader stated that after permission for the pass was received, he descended to 2,600 feet. When approximately one mile from the field he called the tower once more, giving his position and altitude, and again was cleared for the approach. The formation proceeded across the field at 2,600 feet on the 170 degree heading and at a speed of 300 knots.

After passing the southern boundary of the airport the leader said he started a gentle climb and left turn to avoid an area of reduced visibility. About this time, the No. 2 pilot who was flying on the left, called and said that the No. 4 pilot had had a collision. No other members of the flight saw the PA-22 at any time. The flight was then at an altitude of 2,800 feet, indicating 280 knots, and in a left bank of about 30 degrees.

Personnel on duty in the control tower stated that they recalled only one transmission from the F.84F flight. They said this call was when the flight was approximately two miles north of the field. They further stated that they saw the flight north of the field and before clearing it both controllers scanned the entire area for other traffic; seeing none, the flight was cleared. The minimum altitude for an ADF instrument approach is 1,900 feet (600 feet above the ground). The controllers said that, based on previous observations of simulated instrument approaches, the flight appeared to be at this minimum altitude but that the speed was considerably faster than would be normal. They said the normal ADF instrument approach is on runway 13, heading 130 degrees, but that this pass was made from north to south across the airport and not aligned with any runway. Several other witnesses, who were pilots, were in substantial agreement that the F.84's crossed the field at the same approximate altitude as most other aircraft on simulated instrument approaches.

All the witnesses to the accident said that the formation flight proceeded from north to south and after passing the south edge of the field began a turn to the left. The witnesses, some of whom were in the vicinity of the control tower, said the PA-22 appeared to be in straight and level flight on an easterly heading until the collision.

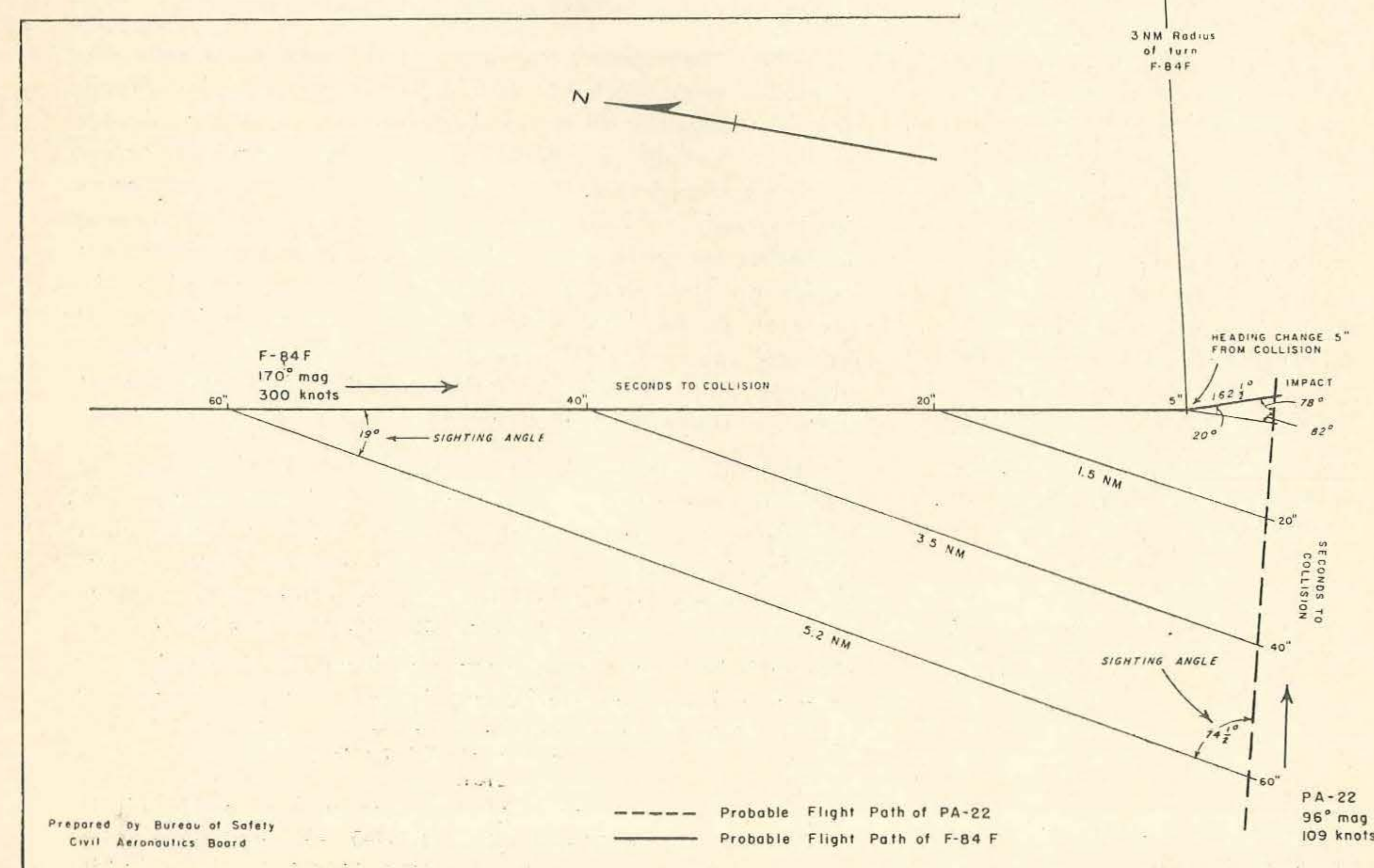
The collision occurred approximately two miles south of the Mansfield Airport, well within the control zone. The PA-22 was proceeding in a north-easterly directon and the F.84F in a southerly direction. The angle formed by the intersection of the flight paths was approximately 78 degrees. (See sketch). In addition, the F.84F was in an angle of left bank approximately 30 degrees relative to the longitudinal axis of the PA-22. These relative angles of impact were determined by evidence of deformation and damage to the PA-22 wings, cabin area, engine, and engine mounts, and the F.84F right wing, pylon tank, aft fuselage, and empennage.

The weather conditions at the time of the collision were: Broken to overcast clouds at 3,500 feet; visibility 12 miles; wind southeast at 4 knots.

In VFR weather conditions, primary responsibility for collision avoidance rests with each pilot, in this instance the pilot of the PA-22 should have notified the Mansfield tower of his position in the control zone. While this is not required by Civil Air Regulations, it is, in the exercise of sound judgement, a good operating practice to follow in an area of traffic concentration.

A study of the angle at which these aircraft approached one another revealed that both pilots of the PA-22 and the leader of the F.84F formation had ample opportunity to see and avoid each other. It was assumed that the PA-22 was on a straight and level course for at least a minute prior to the collision. The sighting angle from the lead F.84F to the PA-22 was approximately 19 degrees to the right of the nose. The sighting angle from the PA-22 to the F.84F formation was approximately 74½ degrees to the left of its nose. These computations are based on relative speeds and the angle of impact and the sighting angle from either aircraft would be constant up to approximately five seconds before impact.

The Board recognizes that each wingman in a formation flight must direct his attention to the flight leader and cannot, there-



fore, maintain a look out for other traffic. Because of this, it is the responsibility of the flight leader to see and avoid other aircraft and effect proper separation for his entire flight.

The Board cannot accept the reasons given for the low pass by the F.84F formation. First, the Board does not believe the practice in slow flight in close formation can be given at speeds of 300 knots. Second, the low pass described by the pilots of the flight could not in any way be considered simulated instrument approach training. Third, the Board believes that the flight descended to the usual altitude at which a simulated instrument approach is discontinued, i.e. 1,900 feet, and not the 2,600 feet alleged by the F.84F pilots.

Another factor considered in this accident was the responsibility of the control tower operators. The controllers testified that before the formation flight was cleared for a low approach the entire area was scanned for unreported aircraft. They said this was required to prevent conflict with other aircraft which might be in the vicinity of the airport. No traffic was noted during this visual search and the flight was cleared.

Comparison of the relative speeds of the F.84F and the Piper indicates that approximately one minute prior to the collision the Piper was approximately three miles from the tower in a southwesterly direction. At that time the formation flight was about 3-½ miles north of the tower.

CAUSE

The Board determines that the probable cause of this accident was the failure of the jet formation flight leader and the pilots of the PA-22 to see and avoid one another.

A contributing factor was the failure of the tower personnel to see the PA-22 and take appropriate action.

HAZARDOUS HOARDING

Surging manifold pressure and fluctuating r.p.m. led to feathering of an engine in an airliner during cruise. The governor was changed in the course of subsequent ground checks and it was believed that the fault had been rectified. On the next flight however, similar symptoms appeared and the engine was removed from service for workshop examination.

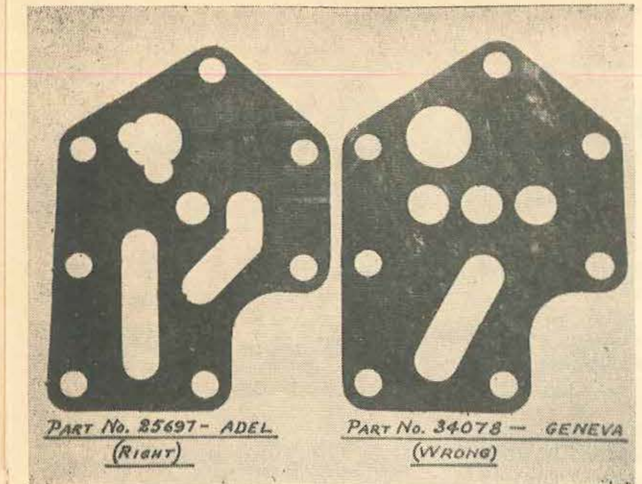
Investigation disclosed that both low ratio supercharger drive clutches were slipping, due to an incorrect gasket having been installed between the clutch selector valve and the engine rear cover. A gasket applicable to a "Geneva" type supercharger clutch actuator had been used in conjunction with an "Adel" actuator.

The incorrect gasket allowed oil pressure to be directed to the low ratio clutches at all times, irrespective of the position of the supercharger drive selector. Consequently, when high ratio drive was selected both the high and the low ratio clutches were engaged causing continuous wear on the low ratio cones and facings. These units eventually reached the stage where they were no longer capable of providing a continuously positive drive, even when the actuator was selected to low ratio. Hence, the surging manifold pressure and the fluctuating r.p.m. whilst cruising on low blower.

The wrong gasket was fitted at the time the engine was assembled after overhaul. It is apparent from the photographs that the physical difference between the gaskets applicable to the two types of actuator may not be recognised, except by direct comparison. In view of this there is some excuse for the engineer who installed the incorrect part, but there is no excuse for the wrong gasket being readily available to the engineer. The "Geneva" actuator was no longer used by the operator, having been superseded some years previously, yet by some unaccountable oversight the gaskets applicable to the obsolete unit remained available together with the correct parts, at the workshop store.

It is appreciated that isolation of redundant parts is not a simple matter and that there must occasionally be an overlapping period during which parts applicable to two slightly differing installations must be held available. Good housekeeping, however, will ensure that this overlap is kept to controllable proportions. Haphazard control of a progressive change is bad housekeeping and will inevitably leave the way open to another slant on Murphy's Law — "If a wrong part can be made to fit, sooner or later someone will fit it."

It seems to us that somewhere along the line when the time comes for a clear cut-off to only one type of unit in service the risk of Murphy intruding should no longer exist.



Surely it is reasonable to expect that the person ordering the disposal of the obsolete unit should also order the disposal of other related items that are no longer useful. We believe that this is an inescapable responsibility of supervisors and inspectors — particularly those directly connected with the movement of spare parts or the planning of progressive changes. The consequences of installing a wrong part in an aircraft can be just as drastic as the effects of an exploding time-bomb and it is of little consolation to the victims to know that the natures are different.

SCUBA FANS!

SCUBA diving (diving with Self-Contained Underwater Breathing Apparatus) is fast becoming a popular method of getting away from it all . . on a temporary basis, of course. But if you are a pilot or a member of a flight crew (or even a passenger), it would be a good idea to acquaint your flight surgeon or medical department with your SCUBA hobby, and get expert opinion on it and your flying.

We have an incident on record where a crew, flying a pressurized aircraft in the late afternoon following a day of diving at depths of only 20 to 30 feet, became incapacitated in flight. Fortunately the flight engineer proved to possess a greater tolerance for diving and, luckily for all, was rated in the aircraft.

Here are the why's of what happened.

It is generally concluded that for the average individual, submersion to depths of 30 feet or less can be tolerated indefinitely without the necessity of decompression. The deeper one dives or the longer the exposure however, the more excess nitrogen is released from solution in the form of bubbles. The greater the difference between the partial pressure of the gas dissolved in the tissues and the atmospheric pressure, the larger and more numerous the bubbles of escaping nitrogen. From sea level each 1,000 - foot increase in altitude reduces atmospheric pressure by .49 lb. per square inch. Conversely, each foot of descent in sea water increases pressure by .445 lb. per square inch. Thus, we see that for the crew in the incident, flying at a cabin altitude of 8,000 to 10,000 feet was in effect the same as submerging another four or five feet during their diving fun, under which conditions slow decompression was the mandatory if no symptoms of "the bends" were to appear.

Individual tolerance to Decompression Sickness (bends) varies widely. After sufficient exposure to pressure, symptoms will always appear within 24 hours; in 85 per cent of those who suffer the bends, symptoms will appear within four to six hours, and the remaining 15 per cent will show symptoms within 12 to 24 hours.

In the incident mentioned, the pilot and co-pilot were incapacitated within four hours after their SCUBA diving session, whereas the flight engineer remained "untouched" until some 12 hours had passed — time enough to put the plane and its ailing pilot and co-pilot safely on the ground.

If you count SCUBA diving as a hobby, or are thinking about it, consult your flight surgeon. As one business operator suggests in its Operations Manual, SCUBA or "skin" diving may dissolve enough nitrogen in the diver's body to produce bends during pressurized cabin flight undertaken within 24 hours after surfacing. Flight personnel are urged to discuss all such possible hazardous activities with the company medical department or flight surgeon.

(Flight Safety Foundation Bulletin)

Comment

Our Division of Aviation Medicine recommends that you don't fly over 2,000 feet cabin altitude within 12 hours of SCUBA diving.

LOSS of CONTROL in I. F. R.

McGRATH, ALASKA

(Summary based on the report of the Civil Aeronautics Board, U.S.A.)

A Beechcraft model C-18-S crashed near McGrath, Alaska at 22.14 hours on 1st September, 1959, killing all eight occupants.

FLIGHT

The aircraft was engaged on a charter flight from Kotzebue to Anchorage, Alaska. Prior to departure the aircraft was fuelled to its capacity of 206 gallons of gasoline and 7½ gallons of oil. Upon departure from Kotzebue at 1315 hours the gross weight of the aircraft was approximately 8,600 pounds whereas the maximum permissible gross weight is 7,850 pounds. Intermediate stops were made at Kiana and Tanana but no fuel was added although it was available at both places.

After receiving the existing and en-route weather forecasts, the pilot departed from Tanana at 1957 hours, about an hour before dark, on a VFR flight plan in which the pilot estimated a flying time of 1½ hours to McGrath, 166 miles to the southwest (see sketch) and estimated fuel for 2½ hours.

Nothing was heard from the Beechcraft after leaving Tanana until approximately 2128 hours when an Air Force reconnaissance flight intercepted a MAYDAY call from it on the emergency frequency of 121.5 mcs.

McGrath radio were immediately notified of the MAYDAY call which they had not heard. Attempts were then made to contact the Beechcraft on all frequencies available but without success. At 2135 hours McGrath heard the Tatalina Aircraft Control and Warning Site (about 12 miles west-southwest of McGrath) call the Beechcraft on 121.5 mcs. Tatalina was asked whether they had established contact with the aircraft transmitting the MAYDAY call, to which they replied that they were unable to establish two-way communications and did not have the aircraft on radar.

At approximately 2145 hours the aircraft appeared on the Tatalina scope and Tatalina began broadcasting the bearing and distance of the aircraft to McGrath. At this time on their radar the Beechcraft was 54 miles north-northwest of McGrath on a southwest heading. McGrath began broadcasting on 350 kcs. range frequency and 122.2 mcs.. the headings being given by Tatalina on 121.5 mcs.

At 2157 hours McGrath established two-way contact with the Beechcraft and continued to give bearing and distance position reports as intercepted from Tatalina, starting at the time the aircraft was 110 degrees and 49 miles from McGrath. McGrath then requested the nature of the emergency and the pilot replied that he was low on fuel and in rain showers.

At 2207 hours McGrath advised the pilot to maintain a heading of 100 degrees and informed him that he was 32 miles from McGrath. The pilot stated that he then had the field in sight and requested terrain information between his aircraft and McGrath. He was advised that his aircraft was believed to be in the vicinity of Cloudy Mountain, which is 4,200 feet above sea level, and that to the south Takotna Mountain and the Kuskokwim Mountains rose to approximately 3,100 feet and 2,300 feet altitudes, respectively, also to the north of Cloudy Mountain the terrain was slightly higher. The 2155 hours weather report was then given to the aircraft and the pilot was requested to confirm that he had the field in sight. He replied, "Roger, have your field in sight."

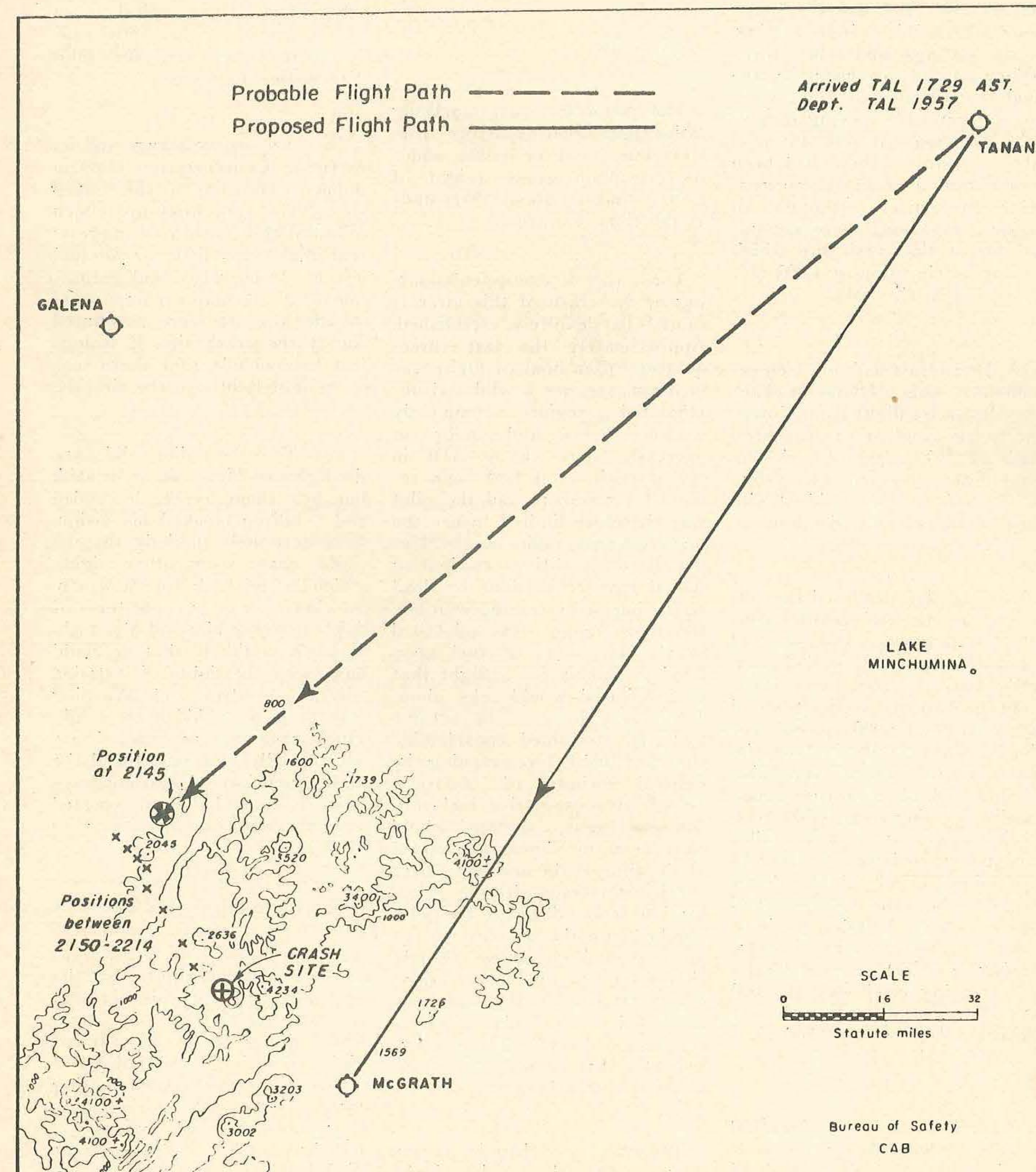
At 2211 hours the pilot requested the height of Cloudy Mountain and McGrath replied. "Approximately 4,200 feet" and inquired if the pilot had a chart. He replied, "Yes—what is the altimeter?" The altimeter was given as 29.84, after which the pilot replied, "Boy, I need some altitude." At Tanana, the last stop, the altimeter setting was 29.70.

At 2214 hours McGrath, using information obtained from Tatalina, advised the pilot that his heading to McGrath was 100 degrees and that he was now 26 miles from the airport. His present altitude was requested to which the pilot replied, "At 5,000 feet, in the soup, boy I am really in it. Radar will have to get me down".

This was the last radio contact between McGrath radio and the Beechcraft and at this time Tatalina lost radar contact wth the aircraft. McGrath attemped repeatedly to re-establish contact without success.

The Beechcraft wreckage was located at 0742 hours on the following day by Air Force Search and Rescue aircraft 26 miles north-northwest of McGrath at the approximate location the air craft had disappeared from the

(All times herein are Alaska standard)



Tatalina radarscope. The aircraft wreckage was confined to a small area. At the time of the impact the nose was down sharply, the right wing was down appreciably; the direction of the impact was 227 degrees magnetic. Propeller pitch setting, power settings, and other information needed to reconstruct the final few seconds of flight were not determinable. Owing to severity of impact it was not possible to learn if there had been a malfunction of any component prior to impact, although all major components were accounted for at the crash site which was at an elevation of 1,800 feet above sea level.

As the aircraft had not been refuelled at either Kiana or Tanana, the entire flight from Kotzebue to the accident site had been made on 206 gallons of fuel. The total flight time from Kotzebue to Tanana to the accident site was five hours and 36 minutes.

Investigation disclosed the following, relative to weather condition: Between Tanana and McGrath, during the period from 1900 hours to 2300 hours, there were broken to overcast cloud layers based at 3,000 to 4,000 feet above mean sea level along the entire route. There were also patches of broken stratus occasionally forming near 1,500 feet. Visibility was at least ten miles except when briefly restricted to two miles, in very light rain or drizzle. The tops of the cloud layers were at 14,000 feet above mean sea level over Tanana, sloping to 6,500 over McGrath. The freezing level was at 5,000 feet above mean sea level over Tanana, sloping to 3,500 feet over McGrath.

The pilot had more than 100 hours experience flying this model aircraft and had a total of approximately 6,500 hours, much of it over Alaskan wilderness. He held a commercial pilot licence with multi-engine land and sea ratings but he did not hold an instrument rating.

ANALYSIS

The aircraft was markedly overweight upon departure from Kotzebue, however it was under its maximum gross weight of 7,850 pounds by about 450 pounds at the time it crashed.

The series of events culminating in the crash of this aircraft cannot be definitely established. Approximately the last three-quarters of an hour of flight was in darkness, over a wild and uninhabited region completely without lights, and under an overcast. There was no ADF in the aircraft as it had been removed for repairs and the pilot was therefore limited to use the low-frequency radio ranges. Under these conditions navigation would have to be done by dead reckoning or by reference to low frequency ranges. The pilot had nearly 2-½ hours of fuel upon leaving Tanana for a flight that he estimated would take about 1-½ hours. However, he became lost and consumed considerable time and fuel before reaching the general vicinity of McGrath. Based on conservative fuel consumption figures the fuel would have been, or almost, exhausted at the time of the accident. After receiving terrain altitude information from McGrath the pilot climbed into the overcast to ensure ground clearance. Shortly thereafter he gave the message, "At 5,000 feet, in the soup, boy am I really in it. Radar will have to get me down." This message indicates that he had climbed into adverse weather.

The pilot was then in a very dangerous position. Although the record indicates he had some practical experience with instrument flight, he obviously was not able to cope with existing circumstances. Accordingly, the Beechcraft was shortly in a tight, fast, steep spiral from which, because of his limited instrument experience, the pilot was unable to recover.

The localised wreckage and its extreme disintergration confirm impact following a fast steep spiral. The very brief fire which followed the crash also suggests that there was little or no fuel left in Beechcraft's tanks. Inasmuch as all major components of the aircraft were accounted for at the crash site, it is logical to conclude that there was no inflight failure to the aircraft.

Possibly the pilot did see the lights of McGrath, as he said, but lost them as he descended and a hilltop blocked his vision. It is extremely unlikely that he could have seen other lights which he mistook for McGrath, as there were no clusters of lights between him and McGrath. It is also unlikely that he could have seen the lights of Tatalina Aircraft Control and Warning Site as it was hidden by a hill. The weather he encountered was substantially as forecast and the flight, therefore, should not have been hampered by unexpected weather conditions upon nearing McGrath.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was the pilot's loss of control while flying under instrument flight conditions, and failure to recover control. Contributing factors were poor flight planning, possible fuel exhaustion, and the pilot's lack of instrument proficiency.

INSTRUMENT ACCURACY?

Most aircraft instruments are subject to two deficiencies—instrument errors and system errors. The first are controlled to acceptable limits by the requirement that instruments conform to approved specifications. System errors are more difficult to control because they can be introduced by incorrect installation and/or by faulty maintenance techniques.

Airspeed indicators and altimeters are probably the most susceptible to system errors, because their operation is dependent upon the measurement of pressures sensed externally to the aircraft by the pitot head and static source. The pitot senses the dynamic pressure of the air brought about by the forward motion of the aircraft whilst the static source senses the ambient pressure of the outside air. Anything which causes incorrect pressures to be measured will obviously result in erroneous indications even from perfect instruments.

The pitot is an open ended tube facing forward and is generally installed so that it is horizontal and parallel to the aircraft centre line when the aircraft is in the normal attitude for cruise flight. Therefore, if the pitot is bent away from its original position or the entrance hole is restricted in any way the pressure applied to the airspeed indicator could be incorrect.

The static source may consist of two or more vents mounted on the fuselage or it may be a tube closed at the forward end but having a number of holes or slots around its periphery. This latter type may be mounted parellel with the pitot tube or may form part of a combined pitot-static head. Whatever type is used its location is determined after flight tests, thereby ensuring that the lowest possible instrument errors are induced throughout the range of operating speeds of the aircraft. Any disturbance which varies the airflow about the area of the static vents will almost certainly cause errors in both airspeed indicator and altimeter. Where the static source is mounted with the pitot head, the static as well as the pitot pressure will be affected by incorrect alignment or any other irregularity. Static system errors can also be caused by the static source holes or slots themselves becoming blocked or slightly damaged; by roughness due to damage, distortion or even careless painting of the skin around static vents.

No doubt these errors are known to and are recognised by the majority of maintenance engineers. So too, are the very significant effects produced by leaks in either the pitot or static lines which are situated within the pressurised areas of a modern aircraft. It appears however, that some engineers may not be aware that significant errors can result from leaks in the static lines or instrument cases even in non-pressurised aircraft.

The in-flight static air pressure within the cabin of a non-pressurised aircraft may be considerably below the outside ambient pressure, due to the venturi effect produced by the outside airflow passing over small openings in the aircraft cabin. Any leak in those parts of the static system situated within the cabin can, therefore, result in a lower than ambient pressure being sensed at the instruments, causing both the altimeter and airspeed indicator to read higher than the actual values. Though it may appear that the reduction in cabin pressure would be small, it is still sufficient in some circumstances to create instrument errors beyond the accepted tolerances. For example, a pressure difference of 0.04 lbs. per square inch between outside air pressure and cabin air pressure would produce errors of the order of 10 knots and 100 feet.

It is, of course, inevitable that some leaks will develop in the pitot or static system lines during service. However, provided the system is tested regularly for such leaks and these are within certain limits, the errors induced will not be significant. Details of the test requirements and the specific limits are prescribed in A.N.O. 108.5.3.3.

Beware of Brute Strength

Aerobatic Break-up, D31 Turbulent

CUDHAM, KENT. U. K.

(Summary based on the Report of the Ministry of Civil Aviation, U.K.)

A Druine D31 Turbulent took off from Biggin Hill Aerodrome at 15.23 hours on 6th December, 1960, and about 35 minutes later, while performing aerobatic manoeuvres in the vicinity of Cudham, Kent, the starboard wing broke off. The aircraft fell to the ground and the pilot was killed instantly.

FLIGHT

The Druine D31 Turbulent is a French designed ultra light aircraft of wood construction with an open cockpit. It can be purchased in kit form or fully constructed and has been adopted as suitable for amateur construction. In the United Kingdom the aircraft has not received a Certificate of Airworthiness but a permit to fly is issued to individual aircraft subject to the following conditions: the aircraft must not be flown unless it is in a state of adequate repair and in sound working order, nor must it be used for aerobatic flying. A notice displayed in the cockpit reads "This aircraft is non-aerobatic and must not be flown at speeds in excess of 107 knots."

The pilot obtained permission from the owner to fly the aircraft subject to it being serviceable and the weather suitable. Preparatory to the flight he visited the air traffic control tower and booked out for local flying.

At 1523 hours, the aircraft took off and approximately 20 minutes later was observed performing a succession of aerobatic manoeuvres at an altitude estimated to have been between 5,000 and 6,000 feet. The aerobatics, which included loops and steep dives, continued for some 10 to 15 minutes and terminated only when the starboard wing broke from the main structure. The aircraft spiralled towards the ground and further disintegration occurred as it descended.

The pilot fell clear of the main wreckage and was killed instantly.

(Times herein are local time)

INVESTIGATION

The pilot aged 37 years held a private pilot's licence. His total flying amounted to 80 hours of which 16 hours had been flown in the Turbulent.

Inspection at the scene of the accident confirmed that the aircraft had disintegrated before striking the ground. It had broken into four major sections which, with smaller pieces, were dispersed over a wide area of mainly farmland and woods. The starboard mainplane was located in a field approximately 600 yards from the main wreckage. The fuel tank, although considerably distorted was found to be half full. There was no evidence of failure or malfunctioning prior to the final structural collapse.

A detailed inspection of the wreckage, which was reassembled as far as possible after removal to a hangar, showed that the detachment of the starboard wing resulted from a fracture of the main spar near its root end.

The main spar was made the subject of material tests and the report of the specialist examination confirmed that:

(a) The starboard wing main spar had fractured at the root end.

(b) The ply webs had failed first followed by the fracture of the top boom and then the bottom boom independently under positive "g" loading.

(c) The failure of the webs did not occur until the booms had been severely overstressed.

(d) The materials and glued joints were of a satisfactory standard.

ANALYSIS

The structural failure of the aircraft was due to the pilot imposing through the use of the controls, "g" loading exceeding the strength limitation of the aircraft. A report by a qualified test pilot who conducted trials in a D31 Turbulent showed that such loads may be readily imposed due to the light stick forces of the Turbulent. His report disclosed — inter alia — that at 90 m.p.h. in a 30 deg. dive made at one-third throttle a stick force pull of 5 lb. attained the design maximum permitted "g" of + 3.8. He also found that a 2 lb. stick force pull was sufficient to maintain a constant + 2.0 "g" when in a 60 deg. banked turn. His overall tests showed that the stick force per "g" was, on an average, little over 1 lb.

CAUSE

The accident was caused by a structural failure of the starboard wing. This was due to the pilot overstressing the wing structure while performing aerobatic manoeuvres.

Familiarization

With considerable frequency the professional pilot is inclined to ask himself, "What would happen if . . . ," the "if" followed by any one of a number of possibilities that would require instant and, perhaps, emergency action. His answers, if checked out by a supervisory pilot, would indicate he either knew his particular aeroplane, or he needed refresher training or familiarization time to up-date him on equipment he hadn't flown recently. Business pilots who embody the full professional approach to flying know the value of familiarization, of refresher training and emergency drills. They never procrastinate on this score because their lives and the lives of their passengers depend on it. They know too, that in the event of a mishap the accident investigators ask a lot of questions, and procrastination will be as obvious as Long John underwear amid bevy of bikinis. Procastination is embarrassing, and when it affects pilot proficiency it can be deadly. Don't put off until tomorrow — there may not be any.

If anyone needs proof of the wisdom of familiarization or emergency drills, consider the following from an official accident report:

"At the completion of an instrument flight, an ATR pilot, with over 6,500 hours and 9 in type, initiated an ILS approach with the ILS coupled to the autopilot. During the approach, the pilot reported the ILS signal seemed unreliable, so he discontinued the approach. He stated he remained in the area, making 'semi-holding turns' while he studied the approach charts. He requested a VOR approach; however, he could not hear and/or understand the VOR approach clearance given. Shortly thereafter the aircraft struck trees and the side of a mountain 38 miles northwest of the airport.

"Investigation showed the pilot had only two hours instrument time in the subject aeroplane and was not fully familiar with the use of the instrument flying equipment installed in the aircraft. Also, he obviously was preoccupied with charts and navigational equipment after discontinuing the initial approach.

With more thanks to luck than to wisdom, this pilot did not suffer fatal injuries. Fortunately, too, he was not carrying passengers aboard his aircraft.

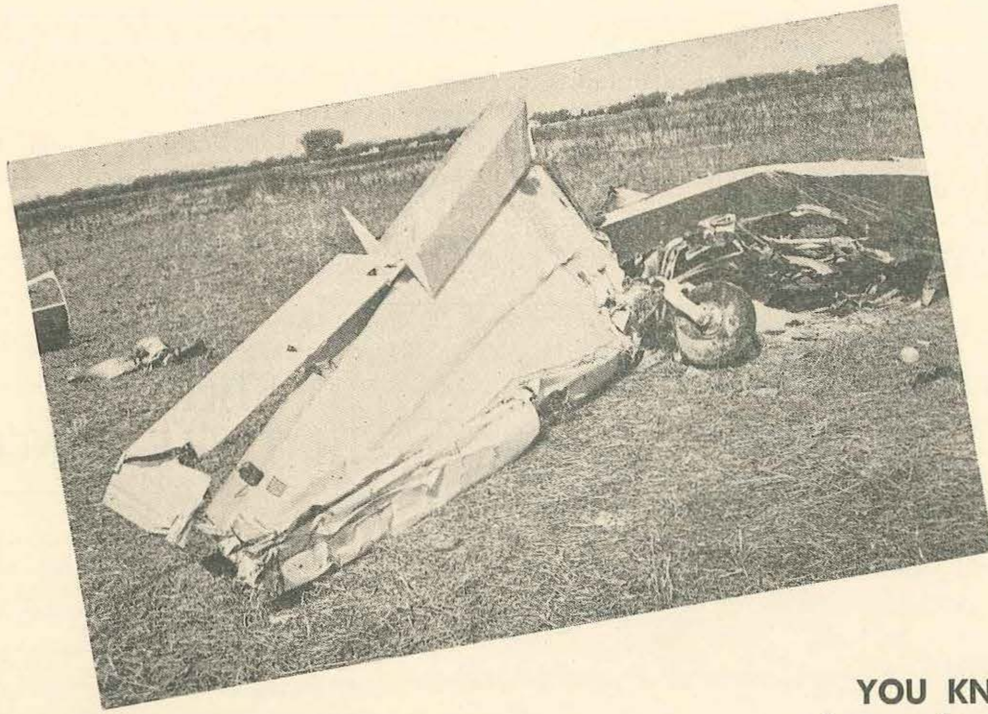
(Extract from Flight Safety Foundation Bulletin)

STICK TO THAT CLEARANCE

The use of surveillance radar by Air Traffic Control at Sydney has been the means of detecting a number of aircraft which have not complied with A.T.C. clearances during either an arrival or departure procedure.

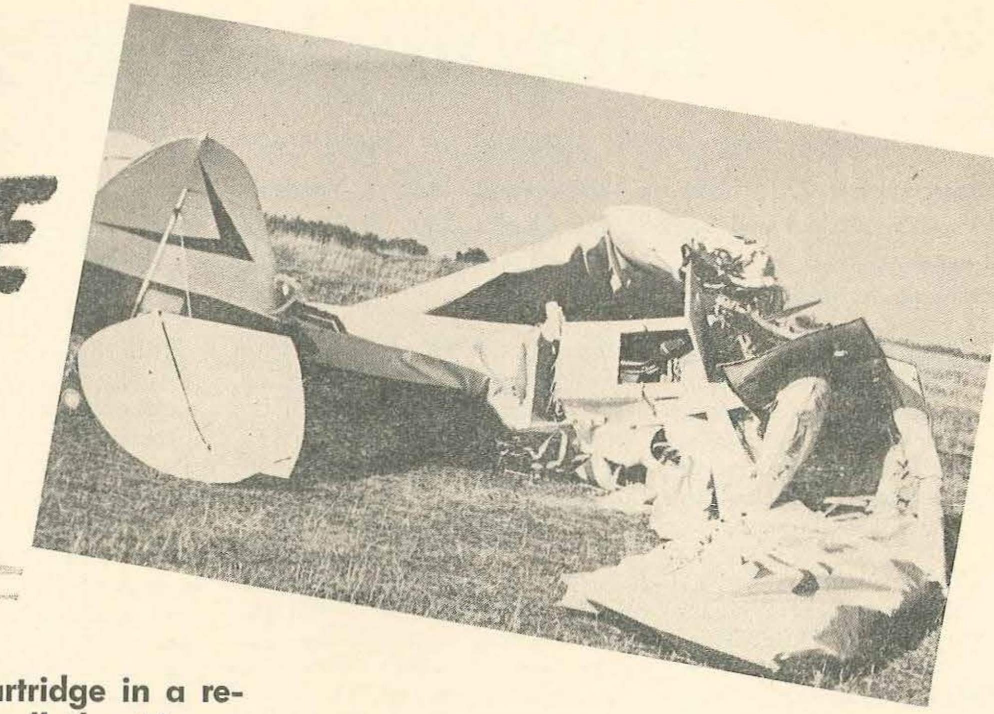
There are numerous Danger and Restricted Areas as well as the Richmond Military Control Zone in the vicinity of Sydney and these, together with the high traffic density in the area, call for careful compliance with all A.T.C. clearances and accurate track keeping.

It seems unnecessary to state the danger potential in any non-compliance with a traffic control instruction. At the best it can cause the hair to stand on end, at the worst it can amount to a thunderous clash of metal with disastrous consequences.



RUSSIAN ROULETTE

... "AERIAL AG." STYLE



CROPMASTER. Forgetting flight time and ignoring the presence of fuel gauges, the pilot carried on until all fuel in one tank was exhausted. When the engine failed the aircraft stalled, crashed and burned. The pilot lost all in the gamble of being able to switch to the other tank.

PIPER "PAWNEE". This aircraft was wrecked when the pilot attempted a forced landing, brought about by fuel exhaustion during the 24th flight after refueling. He forgot to consult the fuel gauge, which was tantamount to pulling the trigger. The rest was left to pure chance.

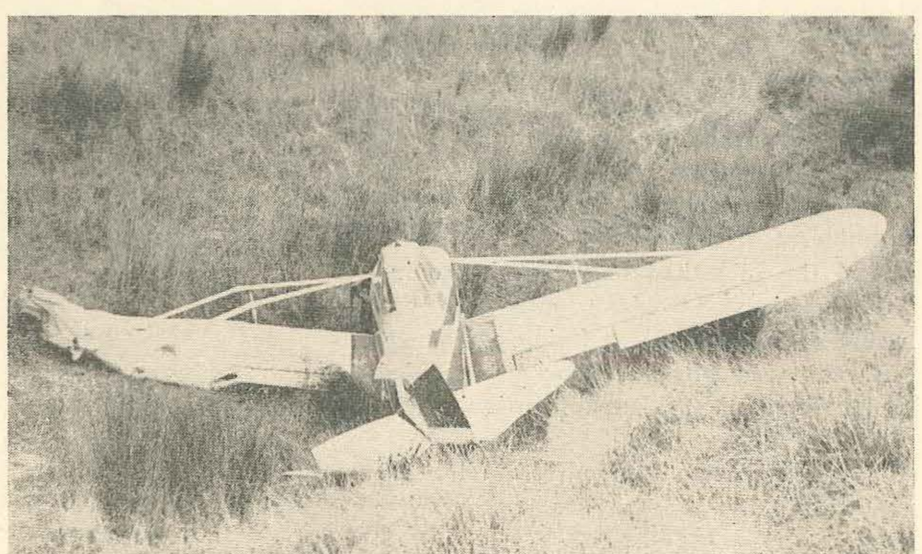
YOU KNOW ABOUT Russian Roulette. You put one live cartridge in a revolver, spin the cylinder, point the muzzle at your head and pull the trigger. There is no prize for not killing yourself.

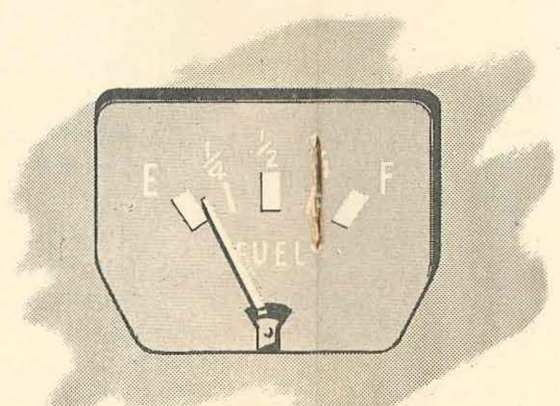
There is an aerial agricultural variation of this. You spring into the aircraft—don't ask if its been refuelled, don't look at the fuel gauges, don't drain tanks for water, select a tank at random and away you go. Keep up the devil-may-care spirit by not checking the fuel gauges in flight—if a tank runs out there's fully one chance in five you can switch to another before you hit the ground, and the new tank might even have fuel in it.

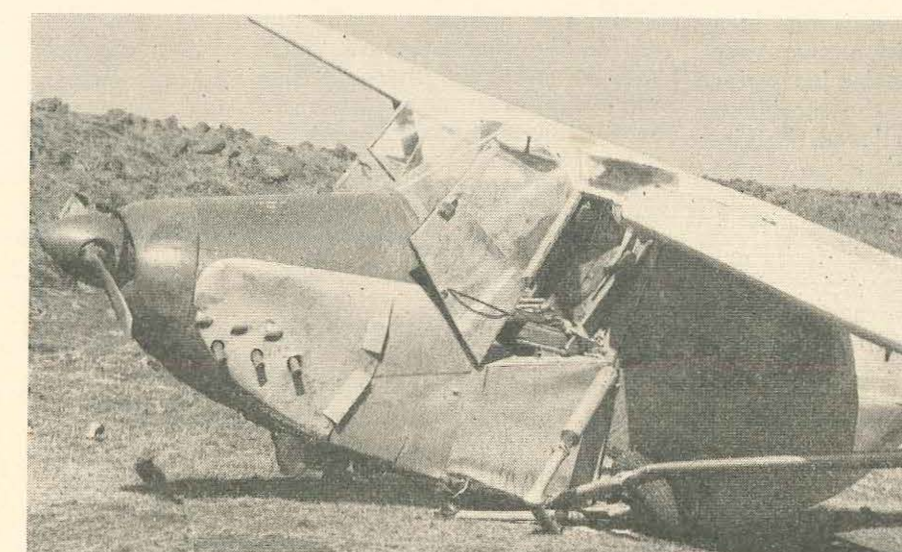
HERE IS A PICTORIAL RECORD OF SOME LOSERS IN THIS CHANCY GAME.

PIPER PA18A. The pilot of this aircraft was the loser when the engine cut out during the turn at the end of a spreading run. One fuel tank was empty—the other full. He, too, lost the tank switch gamble.

EP.9. Making a guess at the fuel distribution was equivalent to loading the gun. An attempted tank change at a critical stage of the approach led to confusion in the manipulation of engine controls and a premature landing on rocky ground.







Engine Icing - Fatal Accident In Viscount

(Summary based on the report of the Civil Aeronautics Board, U.S.A.)

CHARLES CITY, VIRGINIA. U. S. A.

At approximately 22.19 hours on 18th January, 1960, a Viscount en route from Washington D.C. to Norfolk, Virginia, crashed and burned near Charles City, Virginia. All 46 passengers and the four crew members received fatal injuries. The aircraft crashed in a wooded area striking the ground in a level attitude with no forward velocity.

At 2135 hours, the flight received its IFR clearances from Washington airport to Norfolk airport via Springfield, and five minutes later the aircraft took off and immediately switched to departure control frequency.

The flight was routine and at 2205 hours the aircraft was cleared to the Norfolk ILS. Outer Marker via Victor Airway 213, then via the Hopewell 140 degree radial direct to Norfolk Outer Marker, to maintain 8,000 and to contact Norfolk Radar on frequency 118.5 over Hopewell. The crew's acknowledgement of this clearance was the last radio contact with the flight. All radio communications were normal, the pilot was making good his calculated groundspeed up to this time, and there was no indication of any difficulties.

Witnesses stated a low flying aircraft executed two circles at increasingly lower altitudes in a left pattern within a two mile area of the impact site just prior to the time of the accident. Many witnesses believed the aircraft was experiencing some type of engine difficulty. Application and removal of power, or cutting on and off of the engines, occurred at least three times. There was a final roar of power just before impact which occurred at approximately 2219 hours.

INVESTIGATION

The wreckage area was located 8.4 nautical miles on a bearing of 067 degrees from the Hopewell VOR station, and 6.3 nautical miles east of the centreline of Victor 213 airway. The wreckage was confined to the immediate area of impact and no damage to the trees in the surrounding area could be found. All trees that did show impact damage were within the normal dimensions of the aircraft.

The aircraft struck the ground on a heading of 182 degrees magnetic, wings approximately level, and in a pitch attitude of about eight degrees noseup.

The wreckage was impaled on five trees, two through each wing and one through the tail cone. Sixty to 75-foot high trees also bracketed the nose wings and tail. Most of these trees showed no impact marks.

Shortly after impact fire consumed the wreckage and caused considerable damage from the nose to the rear pressure bulkhead, as well as through the centre wing section to just outboard of Nos. 1 and 4 engines.

There was no evidence of any structural failure prior to impact, and all wing failures and separations were due to ground conformity of the structures from impact and damage by intense and prolonged heat. The primary flight control surfaces were in good condition and operable, although damaged by heat and impact. The gust locks were found in the "OFF" position.

(All times herein are U.S.A. eastern standard)

All four powerplants were partially or completely buried in mud or water and were found in their correct positions in relation to the wing. Investigation revealed significant differences in the damage to engines Nos. 1 and 2, as compared with damage to engines Nos. 3 and 4. Engines Nos. 1 and 2 had few impact rotational rub marks appearing on the turbine and compressor assemblies. There were no bent or displaced vanes on the first and second stage impellers of these engines. However, these engines did have static press marks on reduction gearing made at impact by the transfer housing retaining studs. Impact damage occurring in the compressor sections of these engines was very light, and the eye casings were not damaged by rotational forces. The torsion shafts of the compressors had not failed.

Investigation of Nos. 3 and 4 engines revealed significant radial rub marks on reduction gearing and transfer housing retaining studs. The impact damage occurring in the compressor sections of these engines was very heavy. The impellers had some rotational damage. The eye casing had been rubbed by the rotating guide vanes. Both torsion shafts and both second stage impeller shafts had failed. There was also evidence of radial rub marks on the face of the turbine discs, and metal spatter was present on the nozzle guide vanes and turbine blades of Nos. 3 and 4 engines.

Upon departure of the flight from Washington National Airport, the local weather was reported as: measured 600 feet broken, 7,000 feet overcast; visibility five miles in fog. Ground stations nearest the proposed route reported ceilings ranging mostly from 100 to 400 feet and visibilities from five miles to less than one mile in light rain or drizzle and fog. Conditions during the flight changed very little with the ceiling measured at 200 feet and the visibility two miles in light rain and fog. Conditions at Norfolk were improving. At 2131, Norfolk reported an estimated ceiling of 700 feet broken, 6,000 feet overcast; visibility four miles in fog. At 2231, there were scattered clouds at 700 feet and 1,600 feet, and an overcast at 6,000 feet with visibility of six miles in fog.

The captain was briefed by the company despatcher via telephone on the weather conditions between Washington and Norfolk. He was given the 2030 amended terminal forecasts, the Washington Flash Advisory No. 6 valid until 2210, and four pilot reports.

ANALYSIS

Shortly after departing from Washington, the flight would have been in the clouds and would have remained in the clouds during a substantial portion of its climb to the cruising altitude of 8,000 feet. While the aircraft probably was out of clouds a portion of the time en route, it is considered that it was in clouds more than half of the time. During this period and prior to descent near the accident site, the aircraft would have been experiencing subzero temperatures. At the same time, the flight would have encountered light and occasionally moderate showers.

Cloud tops along the route were generally from 10,000 to 13,000 feet and could well have been lower locally. Ceilings ranged mostly between 100 and 400 feet with visibilities five miles or less in fog. Clouds were layered with the base of the upper deck about 6,000 feet and the tops of the lower deck between 3,000 and 4,000 feet. Drizzle was associated with the fog at a number of locations, while rain showers of varying intensity occurred along the route.

A small but intense low-pressure system and its associated frontal structure moved northeastward from south of the accident site to a location about 35 miles east-southeast of the site at the time of the accident. This system was accompanied by high gusty winds, heavy showers, turbulence, and some thunderstorm activity and hail. Pilot reports, radar reports, and groundwitness statements indicated quite clearly that the latter weather conditions affected neither the immediate area of the accident site nor the route from Washington to the accident site.

The freezing level in the Washington area was near 5,000 feet, while the temperature at 8,000 feet was minus 8 deg. C. The temperature at 8,000 feet over the accident site was approximately minus 4 deg. C, and the freezing level was near 6,000 feet.

Upon descending below 6,000 feet near the accident site the flight would have encountered temperatures above freezing. The aircraft would have broken out of the upper cloud deck at this altitude and would have entered the lower clouds at about 3,000 to 4,000 feet. From this altitude to ground impact the aircraft would have been in clouds with the possible exception of the final 100 to 400 feet. Light-to-moderate turbulence would have been encountered en route.

An analysis of the weather indicates the temperature and moisture content of the air at 8,000 feet, the flight's assigned altitude, were conducive to icing to the extent that ¼ to ½ inch of airframe ice accumulation could have built up on the portions of the airframe of the aircraft while en route to the accident site.

All refuelling activities of the flight were investigated and found to be negative as far as contamination of fuel was concerned. The investigation also revealed that the hot-air gate valves of the four engines were in the closed position at the time of impact. Had a blockage in the fuel lines existed due to ice, the hot-air gate valves would have automatically opened to permit the hot air to pass to a heater in the fuel supply line.

Since there appears to be no evidence of fuel starvation or fuel contamination the Board's investigation directed careful scrutiny to the possibility that the flight experienced flameout of a sufficient number of its engines to preclude flight.

To avoid excessive accumulation of ice on the power units of the Viscount, the power unit ice-protection system should be switched "ON" during every flight at all times when the indicated outside air temperature is below plus 10 deg. C, except when it is certain that icing conditions will not be encountered. One of the first visual indications of ice is its formation on the windshield wipers. By the time this is apparent, a fair amount of ice could have accumulated on the engine cowls. The anti-icing system should be turned on well in advance of anticipated icing conditions in order to allow the inlet duct to warm up enough to prevent excessive ice from forming. If ice has been allowed to accumulate and the system is armed late, heating underneath the ice formation is quite rapid since the ice acts as an insulator. If ice has formed and the iceprotection system is turned on, sufficient heating occurs in approximately 30 seconds and de-icing will result. Under these circumstances, there is a good possibility that the entire ice accumulation around the inlet duct circumference will slip off and go through the engine en mass. The release of a large amount of ice from the inside part of the nose cowling, due to the late warming of the engine ice-protection system, would have been sufficient to flameout any of the engines.

The Board is aware that it has no factual information as to the precise sequence of events which occurred at 8,000 feet when the flight began to sustain difficulty. However the facts the Board does have support a probable sequence of events.

The flight reported over Tappahannock low-frequency range at 2201 hours, at 8,000 feet, and estimated Hopewell VOR at 2212 hours. At this time the Norfolk ARTC Centre transmitted a clearance to the flight, clearing it to the Norfolk ILS Outer Marker from over Tappahannock. This transmission was completed at approximately 2205 hours, at which time nothing of an unusual nature was reported aboard the aircraft. The accident site is approximately 40 nautical miles south of Tappahannock, and approximately 14 minutes elapsed between the completion of the transmission and impact, which occurred at approximately 2219 hours. During this period of night flight the crew was confronted with a sudden emergency which required their complete attention, to the extent that no attempt was made to contact anyone by radio for the purpose of either declaring an emergency or requesting descent to a lower altitude.

The Board believes that at some period of time between 2205 hours, and 2219 hours, all four engines of the aircraft ceased to deliver power and their propellers feathered. The Board believes that this was due to the late arming of the ice-protection system. The first flameout could have been followed immediately by other flameouts or there could have been an undetermined period of time between the flameouts. The delay in arming the ice-protection system was probably due to one or more of the following factors:

(1) The captain was apparently not aware of Change 15 of the ARB Manual, stipulating that "the ice-protection systems for all four engines must be switched 'ON' during every flight at all times when the indicated outside air temperature is below plus 10 deg. C, except when it is certain that no icing will be encountered";

(2) late anticipation, i.e., the captain may not have taken action to arm the system until he observed visible indications of ice accretion;

(3) variations in the outside air temperature gauge and the anti-icing thermostatic probe indications due to variations in compressibility e.g., with indications of plus 5 degrees C, the actual temperatures could have been as low as plus 2 degrees C.

Prior to July, 1958, the operation of the ice-protection system of the Viscount was initiated or armed when the outside air temperature was at plus 5 degrees C. Because of the experience of several operators of Viscount aircraft, and because the temperature sensing on early aircraft was located in the aircraft nose section and was subject to compressibility error, temperatures at which the system would be armed were changed in July of 1958. After that date the prescribed procedure was to turn the system "ON" whenever the outside air temperature dropped to below plus 10 degrees C. This modification, known as Change 15 of the Air Registration Board (ARB) Manual, had the sanction of the United Kingdom ARB and became a mandatory change for all United States air carriers using Viscount aircraft.

Change 15 also established the following procedure should icing conditions be encountered before the ice-prevention system could be switched "ON".

"1. Switch 'ON' ice-protection systems on Engines 1 and 3.

"2. Observe that the cycling lights indicate correctly.

"3. If both engines run normally for three minutes, switch 'ON' the ice-protection systems on Engines 2 and 4.

"4. If descending into air conditions where the temperature is above 0 degrees C indicated, it is advisable to discontinue the descent until all four engines are running normally, i.e., for six minutes".

When the flameout occurred, the crew would presumably have followed their current Viscount emergency checklist which called for an immediate relight or a descent to below the freezing level to allow the engine to de-ice naturally. During this time, attempts might have been made to start the flamed out engine or engines. The board believes that more than one engine must have flamed out before the descent was begun. Had only one engine flamed out, the crew would most likely have continued their flight at the assigned altitude.

Prior to beginning the descent, the aircraft would have been operating near Vno—the normal operating limit speed of 237 knots. During the descent, the throttles of any remaining engines could have been moved toward the closed position and to below the auto-feather arming position. This throttle reduction might also have been required if the aircraft had penetrated an area of light to moderate turbulence en route.

During the descent, the aircraft would be entering progressively warmer air. Any remaining engines would have been operating at a low r.p.m. JPT, and thrust setting, and could have flamed out either because of ice ingestion brought about by the warmer air, or because the anti-icing system was left "ON" during descent to warmer air. Additional drag would have been experienced by the windmilling of the remaining propellers since they would not auto-feather until the throttles were advanced to above 13,400 r.p.m.—the auto-feather range.

Having followed the then used checklist by descending to a lower altitude, the crew could level off after reaching an altitude where the outside air temperature was above freezing and go through the standard drill for relighting without further loss of altitude. As the throttles of the engines that had been operating at the beginning of the descent were advanced, the propellers would auto-feather if they had flamed out due to ice-ingestion during the descent. By this time, the complexity of the situation would have magnified itself to extreme proportions. The airspeed would drop off rapidly and the aircraft would continue to lose altitude.

The crew would then try jointly to restart any of the engines and to keep control of the aircraft, sacrificing speed for altitude. It is estimated that considerable altitude would have been lost and that three or more minutes would have elapsed since the emergency occurred. During this time numerous efforts would have been made to restart the engines. However, battery energy would have fallen below the required voltage necessary to successfully unfeather a propeller and relight an engine.

A study of numerous Viscount flights operating at night disclosed that the electrical load being used aboard the aircraft at the time of the emergency was from 500 to 600 amps. If the electrical system were not switched over to the emergency bus system during an emergency in which several engines cease to operate and their propellers automatically feather, all the electrical units in use would continue to draw their energy from the battery. The flight test demonstrated that under similar flight conditions using approximately the same electrical load, the battery energy would fall within 1—1½ to 2 minutes to below the required voltage necessary to successfully unfeather a propeller and relight its engine. One or more engines running with generator "ON" would supply sufficient electrical energy to feather or relight any of the Viscount Engines. A fast windmilling propeller would also furnish enough rotational motion and, in turn, sufficient electrical energy to accomplish propeller unfeathering or engine relight.

If the engines could not be started, efforts could be made to drive the propellers out of feather by windmilling. The aircraft would have to be dived at approximately 150 knots to drive the outboard engines, Nos. 1 and 4, out of feather. Approximately 180 knots of airspeed would have to be attained to drive the inboard engines. Nos. 2 and 3, out of feather.

The fact that Nos. 3 and 4 engines were found to be developing power at impact indicates that these engines were successfully started at some time before impact. If two of the engines were operating continuously, it is doubtful that the aircraft would have lost altitude since it is certificated to maintain altitude at a maximum gross weight with two engines inoperative. Since the investigation revealed power was available on Nos. 3 and 4 engines at impact, and something adverse occurred between 8,000 feet and impact, it is logical to assume if the crew had available to them energy to relight, then relight would have been experienced and sufficient altitude would have been maintained.

No. 4 engine was successfully driven out of feather position and relit. During this time, relighting attempts caused an accumulation of fuel to be deposited in the burners, so that explosive relights occurred, bringing about the noises of engine surging and backfiring heard by the witness.

The crew now used full power on the No. 4 engine to assist in checking the severe settling of the aircraft, causing the aircraft to turn to the left. During the last circuit, and as No. 3 engine started, the aircraft was probably operated with full cross controls and was settling rapidly. In order to stop the unwanted turn, it is probable that the crew reduced power on No. 4 engine, with the thought of advancing power on Nos. 3 and 4 engines together after the turn was stopped. Such a reduction of power at a time when full opposite control was being used would arrest the turn but cause greater settling of the aircraft. An application of power was made at or about the time of tree contact. However, it was too late to develop power on No. 3 engine or to supply sufficient power for a climbout. It is possible the crew observed the ground just before impact and applied back elevator pressure on the control column, causing the aircraft to whip-stall. The aircraft then struck the ground before it whipped into the steep nose-down attitude characteristic of the whip-stall.

Flight tests disclosed that with three engines inoperative and full power on No. 4 engine, full right rudder and full right aileron, much difficulty was experienced in the attempt to maintain directional control and the result was a slow turn to the left. When power was removed from No. 4 engine, the aircraft would enter a high rate of descent.

The Board believes that the most likely sequence of events, based on the reported engine sounds and the known procedures for accomplishing a relight of Dart engines, consisted of an attempt to drive the propellers out of feather by windmilling, followed by multiple attempts to relight one or more engines. Successive relights were interrupted by auto-feather action initiated by premature advancing of the throttle prior to complete lightup.

CAUSE

The Board determines the probable cause of this accident was the delayed arming of the ice-protection systems while flying in icy conditions, resulting in the loss of engine power and attendant electrical energy required to unfeather propellers and relight sufficient engines to maintain flight.

Watch that A T A!

In Australia and Papua/New Guinea, flights during the hours of darkness are classified as IFR flights. Except for the purposes of flight training, night flying is not permitted unless the pilot concerned holds an instrument rating. Furthermore, the aircraft is required to be fitted with suitable flying instruments, radio navigation and communications apparatus and lighting.

During recent months there has been a significant increase in the number of light aircraft arriving at aerodromes after last light. The investigation of these incidents invariably results in a statement from the pilot that the breach was unintentional on his part. When all the facts are assembled however, it is found that in most cases poor flight preparation was the basic cause.

The most common factors contributing to these incidents are failure to check the time of last light, failure to check the time and time-piece for accuracy, failure to allow a margin for unforecast headwinds and possible diversions due to unforecast weather conditions en route, failure to use the correct cruise speed of the aircraft when calculating the estimated elapsed time for the flight, and failure to plan for an alternative course of action to permit a landing en route in the event of being unable to arrive at the planned destination before last light. It is apparent that there are pilots who are prepared to gamble on reaching their destination in daylight without making any allowance for the above factors. Gambling in matters concerned with aviation safety can prove to be extremely expensive to life and property.

Before attempting any VFR flight involving the possibility of a landing after dark, consider the inconvenience and cost your action may involve. Search and rescue facilities will be alerted to trace the progress of the flight. This process often involves public authorities and numerous private individuals in widespread communications checks, by telephone, radio, etc. Extraordinary measures may be necessary to provide emergency flare path lighting, sometimes with the aid of motor vehicles called up at short notice. Ground staff at aerodromes may be required to remain on duty outside their normal working hours. All this inconvenience and expense is clearly avoidable and what is perhaps more important to the pilot, all the necessary assistance may not be available when required.

Because of the frequency of these incidents, consideration is being given to amending the Regulation defining "Night" so that it means, for civil aviation purposes, that period between sunset and sunrise, thus disallowing the 20 minutes twilight period, as an additional safeguard against inadvertent arrivals at destination aerodromes in conditions necessitating the provision of a flare path.

The only sure solution to this problem however, must remain largely with the pilot who is responsible to ensure that he does not commence a flight without due consideration of all the factors likely to cause a late arrival.

Pre-Departure Checks

About a year ago, in Aviation Safety Safety Digest No. 24, we drew attention to a number of minor accidents in which persons suffered injury or aircraft were damaged during ground handling. It is discouraging to find that not only has there been no reduction in the frequency of these avoidable accidents but also that on at least two occasions aircraft damage sustained during ground handling remained undetected during the pre-departure inspections. The seriousness of this sort of situation must surely be obvious to all.

Both cases involved regular freighter flights, operating at night, from Melbourne to Hobart via Launceston. Soon after arrival at Hobart the crews discovered that an aileron had been damaged. In one case the outboard rib of the starboard aileron was broken and the tip was bent upwards, whilst in the other case the trailing edge outboard of the second hinge point was buckled and two ribs were damaged. A smear of "foreign" paint at the point of contact on the undersurface of the aileron concerned in the latter case suggested that the damage had probably been inflicted by a surface vehicle.

In one of these cases the damage was discovered immediately after the aircraft taxied into the Hobart unloading area, hence it is obvious that the aileron must have been damaged whilst loading or unloading at Launceston or Melbourne. In the other case an engineer and the captain had both completed their pre-departure inspections and both believed the aircraft to be airworthy. Fortunately the engineer noticed by chance the damaged aileron at the time the captain was boarding the aircraft for departure and the flight was then delayed until a serviceable aileron was installed.

These incidents highlight the need for thorough inspection of the exterior of the aircraft, particularly in circumstances where vehicles are manoeuvring in the vicinity because it is possible for a heavy vehicle to inflict serious damage to a vital part of the aircraft without the driver becoming aware of the contact.

We have no doubt that the pilots concerned carried out the usual pre-flight inspections in both of these cases, but it seems that, either the damage occurred after the inspections were made or that the location of the damage, together with the fact that the inspections were made where the lighting was probably inadequate, led to the damage being missed during the normal inspection. As it is not unusual for aircraft to be parked in positions where there is insufficient lighting to properly inspect control surfaces, pilots are urged to make use of a torch as an aid to thorough visual examination of vital surfaces. UNLESS THIS INSPECTION IS THOROUGH, AND PROPERLY TIMED, THERE IS ALWAYS THE POSSIBILITY OF AN AIRCRAFT DEPARTING WITH DAMAGE WHICH COULD CAUSE NOT ONLY DIFFICULTY IN MAINTAINING CONTROL, BUT EVEN A COMPLETE LOSS OF CONTROL AFTER BECOMING AIRBORNE.

Should Pilots Donate Blood?

In PSEB 61-100, Dr. Bernard cautioned pilots against flying following blood donations. The following was received from Charles A. Berry, Lt. Col., UASF—MC Aerospace Medicine Division: "Aircrews of high performance (jet) or combat aircraft, and persons occupying cockpit positions on an on-call status to perform essential flight duties, will not donate blood. Individuals on flying status assigned to other duties will not be encouraged to donate blood, except in emergencies or unusual circumstances. In no event will personell perform flying duties for 72 hours following donations of blood."

(Extract from Pilots Exchange Bulletin)

Comment

The Australian Aviation Medical viewpoint is that Airline and Commercial pilots should not donate blood except in real emergencies when no other source of blood is available. Any pilot who does donate blood SHOULD NOT FLY FOR A PERIOD OF 72 HOURS.

OPEN DOOR POLICY

Recently, FSF issued a "Special" on aircraft doors, but other aircraft closures such as battery covers, inspection plates, tank filler neck caps, etc., also deserve close attention. Any of these left open, or that are not securely fastened and come open in flight, can create aerodynamic disturbance and even airframe damage which gives rise to some hairy situations. Here are a few examples that have come to our attention:

An operator of a twin-engine business plane reported recently that he had been unable to maintain flight at airspeeds below 110 mph. Buffeting and vibration became so severe that he immediately returned to the airport. A close check revealed that the battery cover, located on the upper surface of the wing inboard of the left nacelle, had not been properly closed and fastened, and had come off in flight.

In another instance, a pilot reported severe buffeting in flight which also necessitated his returning to the airport. Several walk around inspections of the aircraft showed nothing amiss . . . apparently. However, a particularly alert mechanic, when told of the problem checked the fuselage access door located directly in front of the leading edge of the left elevator, and discovered the Dzus fastener had not been secured properly. To the eye, the access door had seemed closed and flush with the fuselage. However, in flight and agitated by the air flow, the door had opened enough to disturb the flow of air and create buffeting. With the doors properly fastened there was no more trouble.

The moral of all this is, on that walk-around inspection, a really detailed, close and careful look is a must.

(Extract from Flight Safety Foundation Bulletin)

Comment

Our own records contain a number of incidents of inadequate security of doors. This matter was high-lighted in Digest No. 13 with an article entitled "Door Check," and "Forgotten Something" in Digest No. 16 also contained further evidence of failures to ensure that all doors were secured.

Don't Jeopardize Your Profit

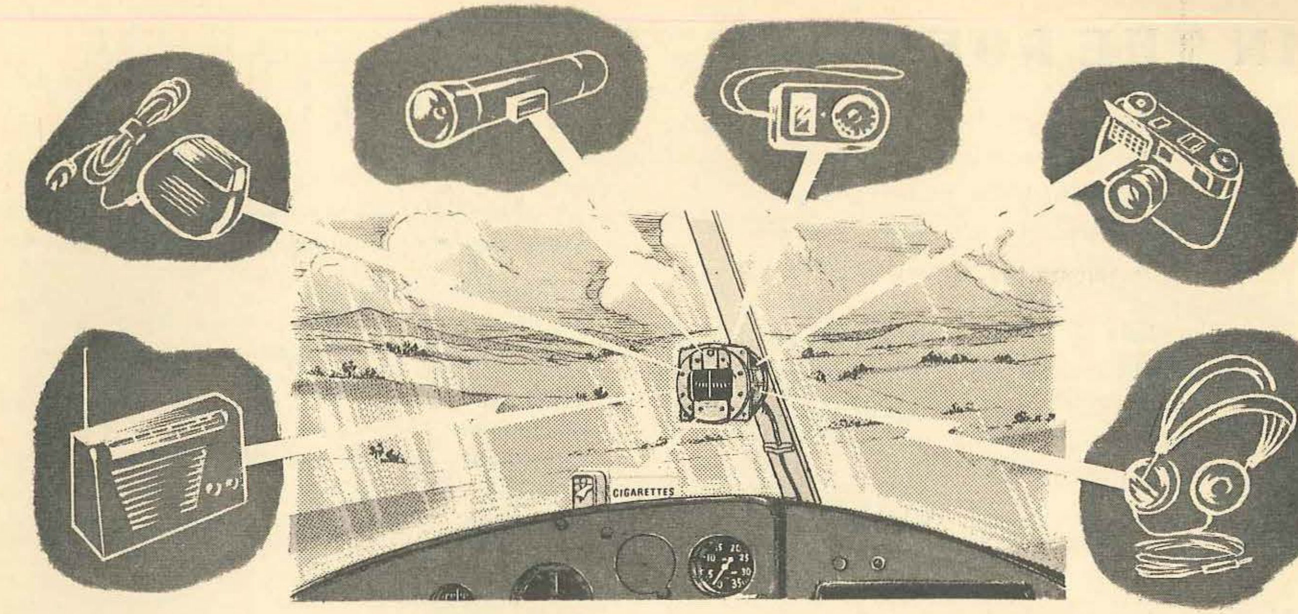
A DH.82 was engaged to spray weedicide on a property near the shore of Lake Corangamite in the Western District of Victoria. Before commencing the operation the pilot inspected the site from both the ground and the air. He noticed telephone wires at the boundary on three of the four sides and because of this decided to conduct the spraying run toward the clear side.

As the aircraft reached the boundary of the field on the approach for the initial spraying run, it collided with a power cable situated ten feet above the telephone wires. After continuing for a further 420 feet with the cable entangled in the undercarriage it struck the ground and eventually came to rest inverted.

Although the pilot was not injured he found the safety harness release catch extremely difficult to operate when suspended in the straps and made his escape from the aircraft only a few seconds before it caught fire and was destroyed. In view of this unfavourable release-under-load characteristic, instructions have been issued for the withdrawal from service of this type of harness.

It was established that the all up weight of the aircraft was 100 pounds in excess of the permitted maximum at the time of take-off, and when this was brought to the pilot's notice he stated that he had omitted to compute the load. The aircraft was also being flown without a current maintenance release, it having expired two days before the accident. These two aspects may have had no bearing on this particular accident but they are indicative of a careless attitude. The failure of the pilot to detect the power line when carrying out the site inspection could have stemmed from this attitude or perhaps it was the urge to gain the most for the least outlay?

The extra time and, consequently, money that would have been involved in making SURE that all hazards were detected during this inspection would be small compared to the time and costs involved in the accident. IT PAYS TO TAKE THE LONG RANGE VIEW. SMALLER PROFITS ARE SURELY BETTER THAN A "DEAD" LOSS.



More On
Hazardous Influence

The response to our plea in these pages for material on personal experiences has been encouraging and as a result we are able to give the following story submitted by a private pilot:

"Last May I was negotiating my solo cross-country flight as part of the Private Pilot's course and had cause to re-fuel at Maitland about mid-day. I was flying a Piper Tri-pacer and after take-off attempted to set a heading for Denman (i.e. straight up the Hunter River Valley). After a few minutes erratic behaviour of the compass, I decided to check by other means and discovered that I was most certainly heading in the wrong direction — the valley was to my left and the sun was way out of position. It was then that I noticed the headphones which had been used on the first leg whilst maintaining a listening watch. On landing at Maitland the magnetic compass served as a perfect hook for the head-set. Luckily my training had emphasised that careful map reading and constant checking were essential, to ensure that everything was, in fact, where it was expected to be."

The photograph which accompanied our original "Hazardous Influence" article (Aviation Safety Digest No. 22 of June 1960) illustrated that a head-set was one of the things which could seriously upset magnetic compasses, although we did not make more than passing reference to its powerful influence in the text of the article. We are grateful to this pilot for his contribution.

It is interesting to note a further comment from this same correspondent. As a final check on his map reading before being convinced that his compass was presenting incorrect information, he applied the well known Boy Scouts method of pointing the 12 of his watch to the sun and established the north position as midway between 12 and the hour hand (southern hemisphere). He does not, of course, suggest that this method should supersede the compass, but it goes to prove that common sense is a great help in sorting out a confusing situation when things go wrong.

The experience of this pilot once again shows that it is not sufficient to know WHERE YOU WANT TO GO. You must know WHERE YOU ARE at all times in the process of going. In pilot navigation there is no substitute for constant accurate map reading, applied with plenty of common sense.

IN THE ROUGH —

When attempting to take-off on a travel flight in Northern Queensland, a DH.82 agricultural aircraft struck the ground and overturned. The pilot was not injured but the aircraft sustained substantial damage.

The pilot held a senior commercial pilot licence and had almost 3,000 total flying hours which included 1,075 hours on DH.82 aircraft and extensive experience on agricultural operations. The aircraft is to have been airworthy and it was loaded within the prescribed limits.

The strip along which the take-off was attempted consisted of a partly cleared area, 1,950 feet long and 15 feet wide situated in a field covered with dense wet grass up to 2 feet 6 inches in height.

Take-off was commenced near the beginning of thte strip and direction wes accurately maintained for a distance of 561 feet after which the aircraft veered left into the grass and became airborne. After flying for a short distance it settled back on the ground.

The pilot persisted with the take-off and managed to regain the strip a little beyond the mid point from where a further run of 645 feet along the strip brought the aircraft to within 30 feet of the boundary. At this point the aircraft once again left the ground possibly due to the effects of the undulating surfaces, but after flying for a distance of 180 feet it struck the ground and overturned.

The foundation of this accident undoubtedly lay in the attempt to take-off from a strip having an unsuitable surface and insufficient width to accommodate the deviations in heading which can occur. These basic erros were compounded when the pilot ignored the degree to which the long grass was retarding the aircraft and thus failed to abandon the take-off while sufficient stopping distance remained.

They ! They ! THEY !

The following editorial taken from the Flight Safety Foundation "Aviation Mechanics Bulletin" is well worth repeating. The tendency to think that the something wrong is for somebody else to put right is not isolated to areas of maintenance. In every sphere of life this tendency is constantly at work to produce a standard of efficiency much lower than could be obtained if everyone made it HIS BUSINESS to report observed wrongs to the right people.

"Why don't they clamp these wires correctly and stop this chafing?"

"When are they going to get us some decent ladders?"

"Why don't they fix this test equipment?"

These aren't questions, but alibis. "They" is the most overworked alibi in the language. Unless we want to be considered alibi artists, forever explaining and excusing our failures, advertising our shortcomings and shifting to others the blame for our lack of achievement, we had better drop the word from our vocabulary.

When we ask why "they" haven't corrected a situation that disturbs us we publicly announce that we haven't done anything about it either. The proverb, "The Lord helps them who help themselves," may have originated in the horse and buggy days, but it is still true. We can never expect either "they" or the Lord to help very much until we have exhausted our own capabilities.

To get personal, take that installation you have found cumbersome, or hard to reach or subject to frequent failure. What have you done about it? You have figured out how it could be improved, but have you sent your solution and a sketch to Engineering? Or have you shown your foreman what is needed? "They" may not even know the installation is giving trouble.

Have you tagged the ladder that is unsafe so "They" can order the repair?

Have you stopped alibiing that the test rig is a job "they" will have to do and analysed the trouble yourself? Have you even recorded just how it acts, so "their" job will be simplified?

And about your wages. Are you waiting until "they" revise the scale, or are you qualifying yourself for a better job?

The way to achievement is to assume responsibility for getting things done.

MERCY FLIGHT REPORTING

There are indications that some pilots who are engaged in carrying out "Mercy Flights" are not aware of the reasons underlying the requirement for the submission of air safety incident report in respect of these flights. Many of the reports received from pilots are so sketchy as to barely fulfil the legal obligations.

Any flight undertaken for the purposes of urgent medical or flood relief or evacuation when there is no satisfactory alternative means of meeting the situation and when the operation will take place under circumstances such that full compliance wtih Air Navigation Regulations and Orders is not possible, is a "Mercy Flight".

The purpose behind the requirement for a pilot of an aircraft engaged on a "Mercy Flight" to submit an air safety incident report, is to permit a subsequent analysis of the degree of reduction in safety occasioned by the departure from the normal standards for aerial work or charter operations.

It is in the pilot's interest to provide the answers to the items listed at AIP/OPS-3-8 paragraph 13.3 and LAH/GEN-8-1 and any other details considered significant and useful, so that the procedures for the pilot and the ground organisation may be checked for adequacy. This can only be achieved by knowing the facts behind each "Mercy Flight" as seen by the pilot.

The investigation of some disastrous "Mercy Flights" undertaken prior to the implementation of the requirement for pilot reports, indicated a tendency for pilots in command to be unduly influenced by the humanitarian aspects to the exclusion of all other considerations. We have on record, accidents which have needlessly claimed the lives of all who were intent upon giving succour as well as that of the patient, simply because the risks involved were not carefully assessed at the outset.

The pilot is solely responsible for the final decision as to whether a "Mercy Flight" should be commenced or continued; but he should never allow himself to be placed in a position where human life is being exposed to danger by accepting an assignment which is clearly beyond the level of his own or the aircraft's capabilities.

The air traffic control and communications organisation is ready and willing to provide pilots with all assistance possible and the maximum efficiency in this direction can only be achieved by continual study of the circumstances under which these flights are conducted. No two "Mercy Flights" are undertaken in precisely the same circumstances and therefore complete recording by the pilot on each occasion offers a positive form of self help.

A's and N's or N's and A's

Occasionally reports are received indicating that, when flying Visual-Aural Ranges, A's have been received in the N sector or vice-verca. Investigations in each case have not revealed any defect in either the airborne or ground equipment. During our general study of these incidents, however, it has been noticed that in aircraft fitted with Voice-Range filters mal-operation of the assorted controls can cause a condition where the normal signals appear transposed. For example, with the Voice-Range filter in the "Voice" position and with the receiver audio volume control turned excessively high, a distorted tone can be heard which gives the reverse sector identification. This is immediately apparent, however, by the rough tone of the signal and the high background noise. Reversed sector identification is not apparent on aircraft not fitted with Voice-Range filters.

When flying the VAR avoid confusion by selecting "RANGE."

Fast Landing — Divided Crew
Fatal Constellation Accident

CHARLESTON, WEST VIRGINIA, U. S. A.

(Summary based on the report of Civil Aeronautics Board, U.S.A.)

At 15.29 hours on May 12, 1959, a Constellation L-049 following a landing on a wet runway was intentionally ground looped and during the manoeuvre skidded and slid down a steep embankment beyond the boundary of the airport at Charleston, West Virginia. One of the 38 passengers and one of the six crew members died in the fire which followed; one passenger was seriously burned and all others on board the aircraft escaped with little or no injury; the aircraft was destroyed.

FLIGHT

The aircraft was engaged on a regular transport flight from Washington, D.C., to Atlanta, Georgia, with intermediate stops. The flight was routine to Pittsburgh Airport arriving there at 1347 hours, after a scheduled crew change had been made at Buffalo, New York.

At 1433 hours, the aircraft departed Pittsburgh and was cleared to Charleston on an IFR flight plan to the Kanawha County Airport. At the time of take-off the aircraft weighed 81,253 pounds, which was 4,284 pounds under the maximum allowable gross take-off weight at Pittsburgh for an intended landing at Charleston.

At 1518 hours, the flight reported that it was in range and had 1800 gallons of fuel, and was estimating Kanawha Airport at 1525 hours. At that time the weather report was given to the flight as follows: cloud 600 feet scattered, higher clouds 1,500 feet scattered, estimated overcast 3,000 feet, visibility 5 miles, light rain showers, ground fog, wind east-northeast 3 knots; ground fog rising from the valleys. At 1522 hours the Charleston tower cleared the flight to make an ILS approach to runway 23 and upon reaching the outer marker to circle visually to runway 32, the wind was given as north-northwest 3 knots, and the flight was advised to report when reaching the outer marker and that it was cleared to land. This clearance was acknowledged. In a short time the flight advised the tower that the approach was being abandoned and seconds later the crew advised that it was in the clear and would cross the airport, make a left turn, and would again report on downwind leg. The captain who was seated in the left pilot's seat, took control of the aircraft at this time. A normal downwind leg report was made and the flight was again cleared to land on runway 32. Tower personell said the flight disappeared from their view momentarily behind scud or ground fog when turning to base leg but, following this, remained at all times in clear sight.

According to eyewitnesses, the approach appeared to be normal and the aircraft touched down 800 to 1,000 feet from the approach end of runway 32 and within the first third of the runway distance. The aircraft did not appear to decelerate and just before it approached the intersection of runways 32 and 23 it veered to the left; a blast of engine power was heard at that time. It continued across runway 23 and left the paved surface at the far left side of the intersection. The aircraft continued a left ground loop as it crossed the sodden area. At the edge of the embankment it crossed a ridge two feet high then disappeared from sight over the edge of the steep embankment. When it went over the embankment it appeared to do so right wing first and then the tail section, almost as if it were travelling backwards. As the aircraft came to rest it immediately caught fire and was destroyed.

INVESTIGATION

An airport weather observation made one minute after the accident indicated an estimated ceiling of 4,000 feet with scattered clouds at 600 and 1,500 feet; visibility 6 miles; light rain showers; ground fog; temperature 68 degrees; dewpoint 62 degrees; and a wind of four knots from the east-southeast. Rain was falling during the approach and touchdown and had been for some time previously; the runway was thoroughly wet with localized areas of standing water. The Kanawha County Airport is built on the top of a mountain. Runway 32 is 4,750 feet long and paved with surface consisting of an asphalt and concrete mixture. The terrain at the end of the runway slants downwards abruptly.

The Civil Air Regulations require that transport aircraft in scheduled service can be landed within 60 percent of the effective length of the runway on a dry runway in still air. The effective length of runway 32 is approximately 3,830 feet, 60 percent of which is 2,300 feet. According to the F.A.A. Approved Airplane Flight Manual the stopping distance for a Lockheeed L-049 aircraft weighing 78,700 pounds when landed on this runway is 2,300 feet.

The first tyre marks were found 3,450 feet from the approach end of runway 32. These marks were made by the tyres of both the main landing gear and nose gear wheels, and their relation to each other indicated that the aircraft was skidding with the nose gear slightly to the left. Additional tyre marks were found 200 feet farther on. At approximately 3,730 feet down the runway more tyre marks were found. These marks indicated a slightly more pronounced skid and the beginning of a left turn. From this point to where the aircraft went over the embankment, tyre marks were continuous. Tyre tracks made by the nose gear and the left main gear wheels crossed each other at a point where the aircraft entered runway 23. The main gear tyre marks crossed each other 70 feet from the edge of the bank. All of the tyre marks were merely a whitish discoloration on the runway surface and definitely not the dark marks usually found on a dry runway under similar circumstances.

It was found that the nose of the aircraft was turning as in a left ground loop; however, the forward movement of the aircraft was a gentle left curve from the paved runway surface to the edge of the embankment. This is best illustrated by the fact that when the aircraft went over the embankment the nose was heading 180 degrees; however, the direction of travel was 290 degrees. The distance from where the aircraft left the runway to the boundary of the airport is 286 feet.

The main aircraft wreckage was found 200 feet down the 32-degree slope. The vertical depth from the surface of the airport to the wreckage is 95 feet. It was determined that the right main landing gear collapsed when the aircraft struck the ridge at the top of the hill.

During the slide down the slope the No. 3 engine was torn from its mounts and completely reversed its position. When this occurred, a portion of a broken propeller penetrated the left main fuel tank, and the fuselage broke open on both sides just aft of the forward bulkhead in the forward lounge.

Except for the empennage surfaces, outer wing panels, and the nose gear, the entire structure was destroyed by fire. All powerplants had been subjected to such intense fire that most of the magnesium casings completely burned out. Each engine, with the exception of the No. 3, was found on the ground in its correct position with relation to the wings and fuselage. All propellers had broken blades and all blades were bent forward and counter to rotation. Because of the severe damage to these engines and the fact that the crew said they were functioning in a normal manner when the accident occurred, a teardown examination was not made.

The crew said the approach was made in a normal manner and that the flaps were extended late in the final approach and were fully down at touchdown. They also said that during the final portion of the approach an airspeed of 105 knots was carried. Witnesses said the flaps were completely down at or just after touchdown. According to the company's flight manual for this type aircraft, the approach speed when crossing the airport boundary (fence speed) is 95 knots.

The crew said further that touchdown was made within the first third of runway distance and that the brakes were applied immediately. Although the brake system appeared to be functioning in a normal manner, with brake pressure normal and hard pedals, the aircraft failed to respond to all efforts to slow it down. The captain said that he ordered the first officer to raise the flaps early in the landing roll to put weight on the wheels and increase traction; the first officer

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(All times herein are U.S.A. Eastern Standard)

did not hear the command. When it became evident that the aircraft could not be stopped within the limits of the runway and that it also could not be flown out safely, the captain decided to make a left ground loop and called for full power on No. 4 engine. The flight engineer misunderstood this command and applied power to all four engines. When the aircraft did not respond as the captain wished, he glanced quickly at the control pedestal and, recognising that all throttles were forward, quickly closed throttles one, two and three. The aircraft then began the left turn but too late to remain within the airport boundaries.

ANALYSIS

The Board has determined that this aircraft did not aquaplane throughout a portion of the landing roll. The white tyre marks found on the runway are the color of tyre marks definitely associated with aquaplaning. The Board also believes that the approach speed of the aircraft was faster than the recommended approach speed and that this extra speed was partially caused by the lowering of the landing flaps on the final approach. It is further believed that although the aircraft was landed within the first third of the runway, under the conditions which existed, namely a wet runway and without a headwind component, a landing should have been made closer to the approach end, in the interest of safety. Coupling these conditions with the first officer's failure to hear and comply with the captain's order to raise flaps in order to put weight on the wheels, it is easy to understand why an early deceleration was impossible.

The above facts, however, are not the complete story. At some point in the landing roll the captain realized that something must be done immediately or the speed of the aircraft would take it over the embankment at the end of the runway. At that time he was faced with a real emergency and it does not seem in keeping with the gravity of the situation that he would delegate the handling of the power controls to the flight engineer. Recognizing that the power to delegate is discretionary with the captain, the Board nevertheless believes that in this instance this was not optimum procedure and that instead the handlng of the throttles by the captain may well have resulted in less disastrous results.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was the pilot's action of landing the aircraft too fast on the wet runway under conditions conducive to aquaplaning, making early deceleration imposible. An additional factor was the poor co-ordination of the crew throughout the approach and landing.

Eliminate The Guesswork

In western New South Wales recently a charter flight terminated approximately 500 feet distant from the point of becoming airborne, leaving the four occupants seriously injured and the aircraft damaged beyond repair.

As the aircraft neared the upwind end of the strip it became airborne but failed to maintain height and struck the boundary fence, dislodging the port elevator. The aircraft dived into the ground, the impact folding the engine back over the top of the cabin, damaging the fuselage to such an extent that it was necessary to cut away portions of the wreckage to permit rescue of the occupants.

The aircraft, a Cessna 170, is considered to have been airworthy and correctly loaded.

The pilot, who was also the owner of the aircraft, held a commercial pilot's licence and was in current flying practice. He had a little over 1,000 total flying hours, 300 of which had been flown on the type.

The strip from which the take-off was attempted had a smooth surface, was substantially level, and had ample width but was only 1,300 feet in length.

The cause of this accident became evident when calculations showed that, in the conditions prevailing, a strip length of 2,400 feet was required; also there was an excessive crosswind component which fluctuated between three and eleven knots above the permitted maximum for the type and this fact may have played some part in the accident.

A moment's thought is surely all that is required to see that a professional approach could have prevented the great deal of suffering and financial loss evident in this case. Take-off performance data for your aircraft is provided so that you can eliminate guesswork. Why not use it?