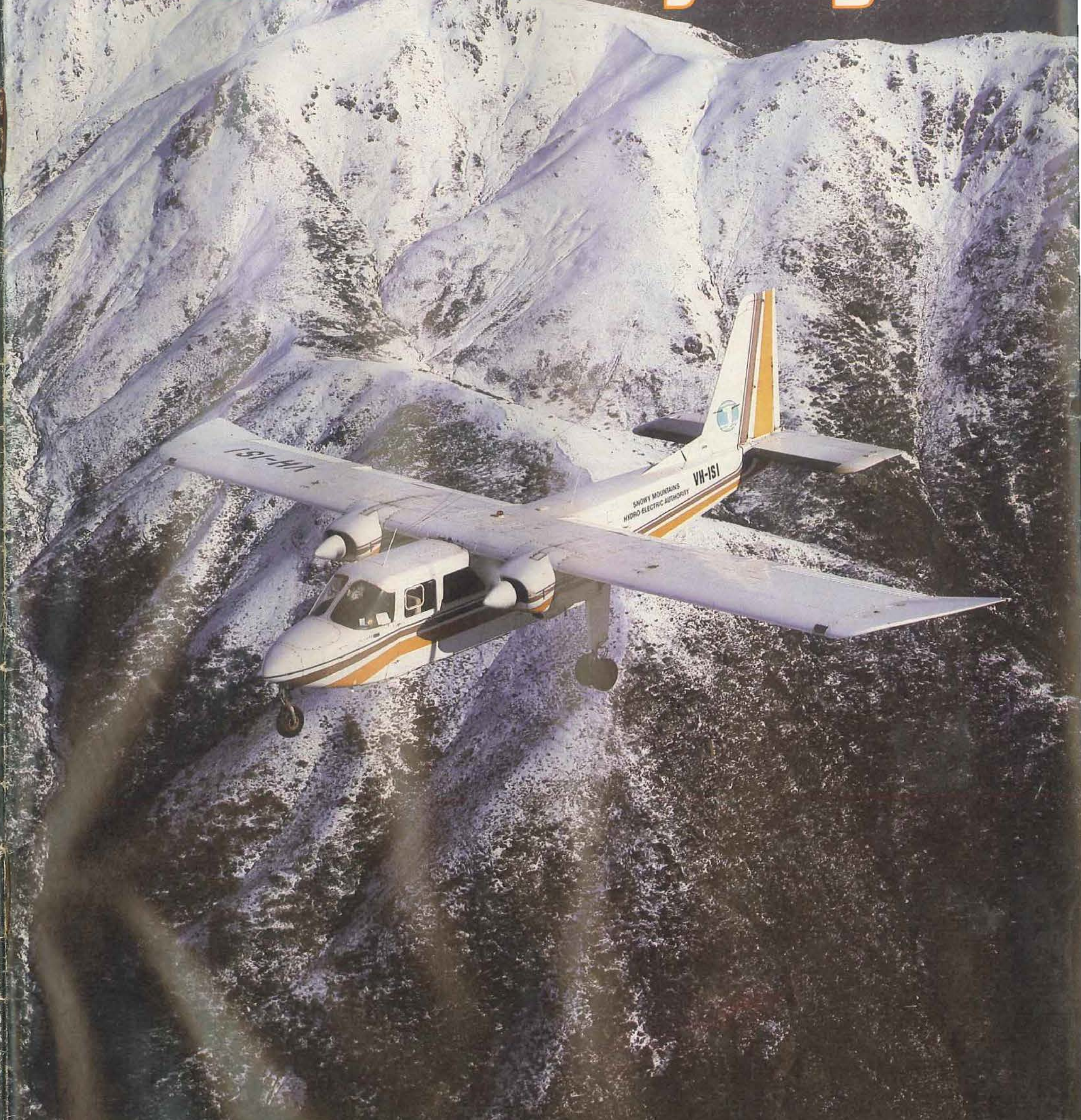
Aviation Safety Digest



BUREAU OF AIR SAFETY INVESTIGATION

118/1983

Contents

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Covers

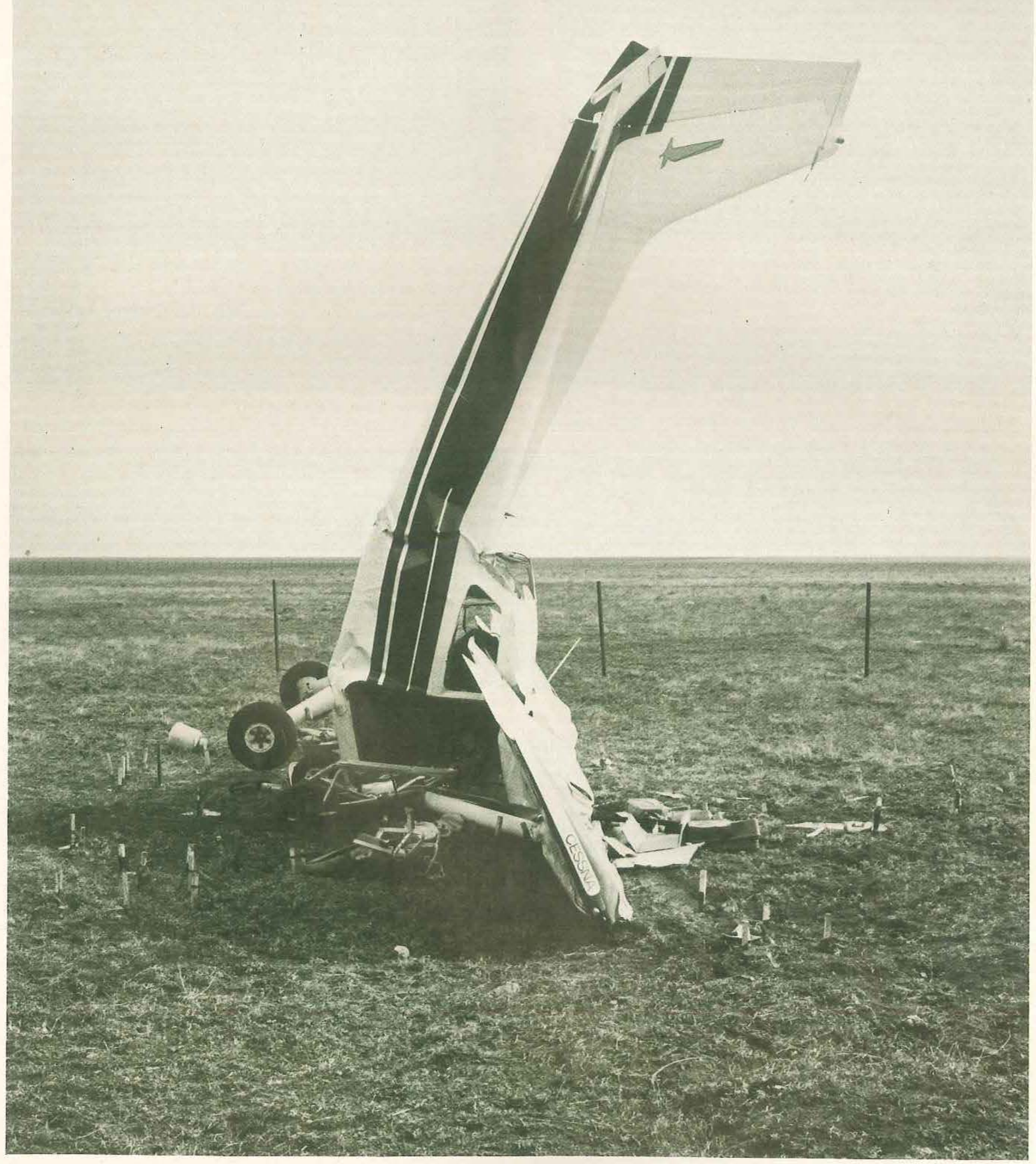
The Snowy Mountains Hydro Electric Authority has been operating the Britten-Norman Islander featured on the covers for seven years. Since 1958, the Aircraft Branch of the Authority has ferried personnel, stores and equipment throughout the Snowy Mountains area. Bushfire spotting and SAR operations have also been conducted.

Aircraft operated by the Authority have included the Beaver, Aero Commander, Grand Commander, Piaggio, Comanche and Porter. By the time this issue of the *Digest* is distributed, the Islander should have been replaced by a GAF Nomad N22B.

The Aircraft Branch is based at Polo Flat airstrip, near Cooma.

(Photograph by Kevin Ginnane)

High-wing aircraft and stall/spin accidents



Aviation Safety Digest 93 contained an account of an accident in which a Cessna 150 dived near vertically into the ground during mustering operations. A pilot contribution in the same issue referred to two other accidents under similar circumstances. All of the accidents followed a steep climb from a low pass, with the aircraft apparently flicking into a dive off the top of the climb or out of a wingover or similar manoeuvre.

Up to the time this article was written six more accidents had occurred under similar circumstances. All were fatal but only one occurred during mustering operations. The others were, however, associated with low flying. It seems significant that all of the aircraft involved in the accidents were high-wing types. An examination of the Bureau of Air Safety Investigation's computer records for a 10-year period revealed that only high-wing types were involved in this sort of accident during that period.

(continued overleaf)

In one of these accidents, of which the accompanying photographs show the final disastrous result, the aircraft had several times overflown a group of stockmen at a water bore, at a height of about 50 feet. On what turned out to be the final pass, the aircraft flew over the bore at a low height, the engine power was heard to increase and the aircraft started to climb. The nose rose sharply and the aircraft climbed steeply to almost 250 feet. The left wing then dropped and the aircraft dived vertically, spiralling to the left. It struck the ground nose first, crushing the forward sections of the cabin and wings and, after impact, remained poised in a vertical attitude. The reason for the flight is not known, although it does seem as though the decision to overfly the stockmen was taken on the spur of the moment.

Two aspects of this type of accident are significant: only high-wing aircraft have been involved, and the impact with the ground has often been near-vertical. These factors suggest the following explanation for such accidents:

With a high-winged aircraft a pilot flying close to the ground often has to 'lift' a wing with aileron to maintain or regain visual contact with a ground feature. During either steep turns with a high g-loading or wingovers, this 'lifting' of the wing will involve a height gain and speed loss which could place the aircraft in a potential stall/spin situation. The danger inherent in this will be exacerbated if the pilot is still concentrating on looking for ground features.

In analysing an accident of this type, an experienced mustering pilot postulated the following sequence of events:

> A steep climbing turn was probably commenced with a nose-up attitude of about 15 degrees. I believe that instead of allowing the nose to drop away, the pilot, who almost certainly would have been looking back at the ground, continued to hold on back elevator until, at about 40 knots and with a steep angle of bank, the aircraft stalled. The upper or outside wing would have stalled first and the aircraft would have flicked out of the turn into a 90-degree bank in the opposite direction. The nose would then have fallen away to the vertical and, in this attitude, the aircraft would have struck the ground.

The crucial factor here is that, in the first instance, the aircraft stalled. All stalls do not culminate in spins, but an aircraft must be stalled before it will spin. All pilots must be aware of the factors associated with stalling, so the discussion below addresses the most pertinent of these. Note that although this article had its origin in relation to accidents involving high-wing aircraft, the discussion of the factors inherent in stalling and spinning are valid for all aircraft types.

The aerofoil

Most of today's General Aviation aircraft have aerodynamically efficient, high-speed wing sections with nearly identical curvature on both upper and lower surfaces. This means that a zero angle of attack may give zero lift. Aircraft with such a wing must be flown at a positive angle of attack at all times to maintain positive lift. For any aerofoil the lift produced increases with the angle of attack until the critical point is reached, at which stage separation of air from the upper surface results in the wing stalling and a drastic reduction in lift.

At high cruising speeds, the positive angle of attack required is quite small, but as airspeed is decreased, the angle of attack necessary to provide lift increases rapidly towards the critical point.

Angle of bank and load factor

Stall speed, of course, is always raised when the aircraft wing is banked, since banking increases the total load factor of the aeroplane. (The load factor is the result of gravity forces plus any centrifugal forces acting on the aircraft.) In shallow turns of 30 degrees or less, the additional load factor imposed by the centrifugal force of the turn is almost negligible — only 0.154 at a 30-degree bank angle. Any steeper bank raises the load factor from centrifugal forces very sharply. At 45 degrees the total load factor is 1.414 and at 60 degrees it is 2.0. This is illustrated in Figure 1.

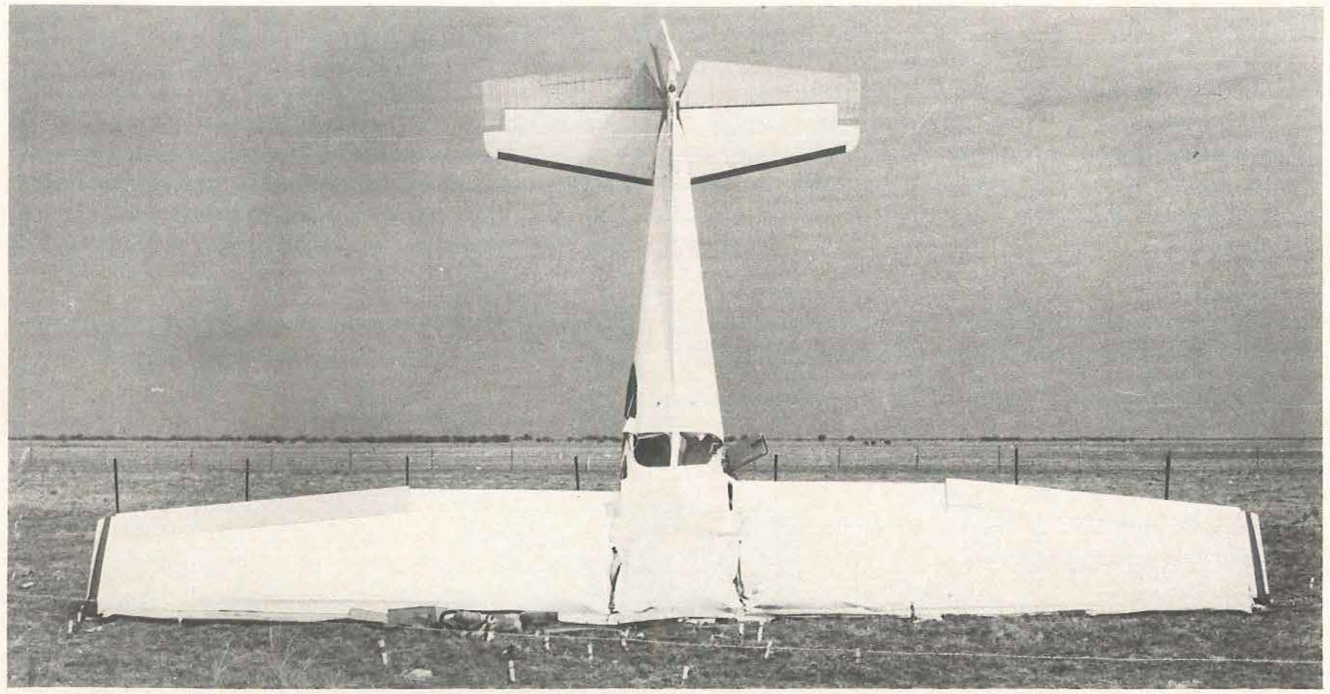
The load factor for any aircraft maintaining level flight with a constant angle of bank is the same, regardless of airspeed; for example, the load factor in a 60-degree bank is always 2g regardless of airspeed or aircraft type. You can calculate the stall speed for any aeroplane at any degree of bank if you understand that normal stalling speed increases always in proportion to the square root of the load factor. In the 60-degree bank angle cited above, the load factor is 2g, the square root is 1.415: if the aircraft has a normal stalling speed of 48 knots, it will stall at 68 knots in a 60-degree bank.

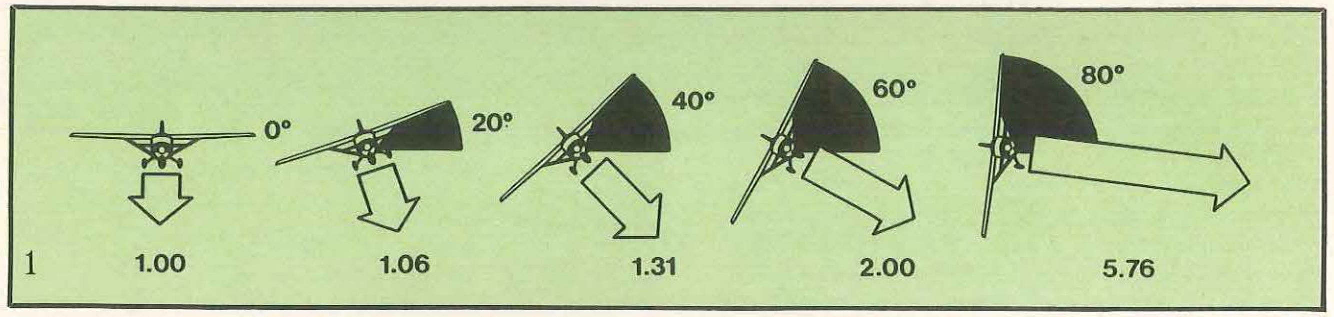
In simpler terms, it may help to remember that a 60-degree bank will raise your stalling speed by nearly 50 per cent. Careful pilots carry a safe-over-stall margin of airspeed whenever executing turns, especially near the ground. A table of typical stalling speeds for a single-engine GA aircraft is at Figure 2. Note the effect of flap.

Angle of attack

Some of the more common misconceptions about stalls involve a confusion of the two terms, pitch attitude and angle of attack. Pitch attitude is the angle formed by the longitudinal axis of the aircraft with respect to the horizon — when the nose of the aeroplane points at the horizon, the pitch attitude is always zero, regardless of which direction the aircraft is moving, whether it is climbing or descending, etc. The angle of attack is 'the acute angle between the chord or an airfoil (essentially the wing) and the relative airflow'. This has nothing necessarily to do with the horizon. It is possible, by the application of back pressure on the elevator, to produce a high angle of attack in an aircraft in any attitude. An aircraft may be stalled at any attitude if the critical angle of attack is exceeded. See Figure 3.

(continued on page 6)





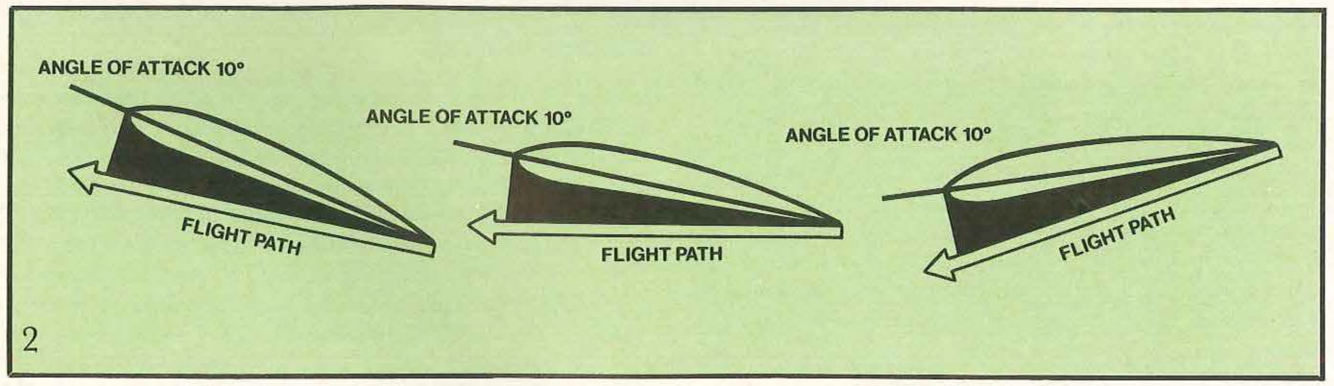


Figure 1. Size of arrows and figures beneath show how wing load factor increases with bank angle.

Figure 2. The angle of attack is the angle between the wing chord and the flight path (not the ground).

Figure 3. Stall speed varies with flaps and bank angle. (Speeds are representative only.)

3

Power Off STALLING SPEEDS KTS–IAS

Gross Weight 1600 lbs	ANGLE OF BANK			
CONDITION	0°	20°	40°	60°
Flaps UP	48	50	55	68
Flaps 20°	43	44	49	61
Flaps 40°	42	43	47	58

Pilot quiz

Listed below are six questions related to stalling which all pilots should be able to answer. Read the questions and determine your response before checking the answers at the end of the article.

Questions

1: Must an aircraft be flying at a relatively low airspeed in order to stall?
2: How does weight and balance affect stalling speed?
3: Can turbulence affect stall tendencies?
4: Unco-ordinated flight does not affect the stalling speed of an aircraft — true or false?
5: Can the buildup of foreign matter (e.g. mud or ice) on a wing affect stalling speed?
6: Does the indicated airspeed at which an aircraft stalls vary with altitude?

Maintaining currency

All pilots practise recovery from stalls when training for a private pilot's licence, but how many ever continue this practice on their own? When did you last spend half an hour at it? The operations that a pilot conducts routinely in the course of flying his aircraft increase his skill and awareness, but those which he merely keeps in the back of his mind, like stall recovery, grow rusty with time. The argument is sometimes made that since most fatal stall accidents occur near the ground, there is no point in maintaining skill at recovery from a stall with minimum loss of altitude. The fact is that the difference of a few feet in the altitude lost in a stall recovery can make the difference between a safe landing and a disaster. It is hard to think of a better argument for practice.

Most passengers are not over-enthusiastic about sitting through stall recovery practice, but it is a good idea for a pilot to get the feeling of an aircraft in stalled conditions with a full load on board. Properly secured ballast in the rear of the cabin can simulate full occupancy. The difference in the aircraft's behaviour at minimum slow speed operations may be surprising, especially with regard to stall speed and loss of altitude. Ensure that there are no loose objects of any kind in the cabin before you take off intending to practise stalls, as a sharp stall may turn such objects into serious safety hazards: they could injure people, damage the cockpit, become jammed in flight controls, etc.

The stall warning horn

Some pilots develop the habit of turning off the stall warning horn or other warning devices when practising stalls, operating at slow speeds for protracted periods, or even when landing, because they find it distracting. This is a dangerous habit. Most experienced pilots can tell — most of the time — by the 'feel' of the controls if their aircraft is on the verge of stalling, but if they are preoccupied this may not be the case. In those circumstances the warning horn can be a lifesaver. It should never be turned off.

Comment

Many air safety investigation reports include the statement that an accident occurred because the pilot 'failed to maintain airspeed and the aircraft stalled'. Pilots need to understand the factors affecting stalling speed and to conduct regular stalling practice in a range of aircraft configurations. Only by doing this are they likely to be able instinctively to avoid or compensate for situations, conditions and attitudes which may lead to a stall — even under the stress and duress of the additional problems that we all invariably encounter on some occasion in flight. This requirement is particularly important for pilots of high-wing aircraft involved in low-level operations. Training is extremely important, as low-level manoeuvring even by a pilot trained for the task contains an element of risk, but for pilots with little experience at low flying it often ends tragically.

For a concluding comment, the experienced mustering pilot mentioned earlier offers some sound advice to those involved in low-level operations.

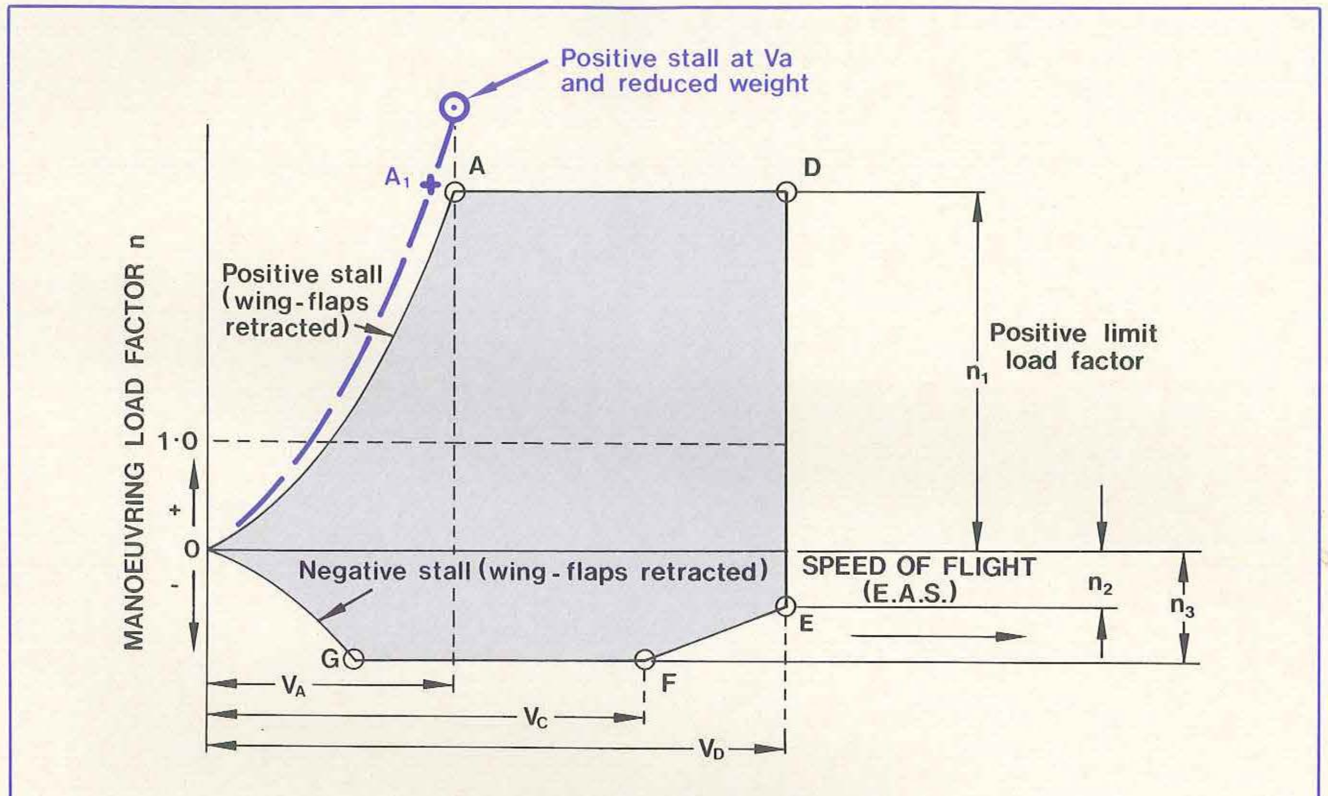
Turning quickly is frequently necessary in mustering but I would stress that the safest way to fly under these exacting conditions is never to pull unnecessary g forces. Flying an aircraft fitted with a g meter I have found that it is not necessary to pull more than 2g in normal mustering operations. It is a very steep dive and recovery indeed that will pull 3g. Pilots engaged in mustering operations need to be very careful in applying back elevator. Many will argue about other factors, but it is the heavy-handed use of back-stick which produces high g forces and the situation which leads to an 'outside flick' in a steep climbing turn. Unfortunately there are no pilots who have experienced this particularly deadly manoeuvre under 300 feet and lived to tell about it ●

Answers to quiz

1: No. An aeroplane can be stalled at any airspeed if the critical angle of attack is exceeded.
2: The stall angle of attack for a given aerofoil will always be the same regardless of weight. However, if an aircraft's weight is increased, a higher airspeed will be needed to support that weight for any given angle of attack. Therefore, the critical angle of attack, or point of stall, will also occur at a higher airspeed. When the centre of gravity (CG) is moved forward in the aircraft the stall speed is increased; when the CG is moved aft, the stall speed decreases. Exceeding the CG envelope in either direction will create serious stability problems.
3: Yes. Encountering a vertical gust can bring about an abrupt increase in angle of attack, which could result in a stall.
4: False. Slip or skid creates turbulence in the airflow over a wing, thus reducing lift and increasing stalling speed.
5: Yes. Any buildup of foreign matter on either surface of a wing disrupts the smooth flow of air over it, and so necessitates a higher angle of attack to maintain altitude and increases stalling speed.
6: No. An aeroplane will stall at the same indicated airspeed regardless of altitude.

Va and aircraft weight

An article in *Aviation Safety Digest* 116 discussed airspeed limitations for flight in turbulence. Among other things, that article briefly discussed the relationship between an aircraft's speed and weight. The *Digest* has received a considerable number of inquiries concerning the statement in the article that Va decreases with aircraft weight. The following more detailed account of the Va/aircraft weight relationship is printed in response to those queries.



MANOEUVRING ENVELOPE

By definition the Design Manoeuvre Speed (Va) is the aircraft speed at which abrupt or full control deflections will not overstress the aircraft at the Design Maximum Weight. This means that the wing must stall at or below the Design Limit Load Factor (n_1) at Va. This is shown as point A on the manoeuvre envelope (see diagram). Hence at the maximum weight at airspeeds less than Va the wing will stall before limit load is reached and therefore the aircraft will not be overstressed even with coarse control inputs.

However, at lower weights and the same airspeed, coarse control deflections will not result in the wing stalling until load factors greater than the design limit load factor (n_1) are reached. As the primary wing structure is designed to support its maximum aerodynamic lift at Va it may not be overstressed under these conditions. However, certain other components — for example, engine mounts — would be overstressed because the weight they support is constant.

To avoid the possibility of overstressing some components of the aircraft at the lower aircraft weights, manufacturers therefore recommend reduced manoeuvring speeds at these weights. A stall line has been sketched at a reduced weight on the manoeuvre envelope and, as can be seen, the wing will develop enough lift to exceed n_1 at Va. In this case the recommended manoeuvre speed would be at point A_1.

Some elaboration is needed on the comment made above that the primary wing structure may not be overstressed at Va even at reduced aircraft weights. This is only true if the wing weight is constant, i.e. if fuel tanks, baggage, etc. are in the fuselage. Under positive load factors any mass in the wings provides an inertia load in the down direction. These loads are in the opposite direction to the lift forces and therefore *reduce* the resultant load that the wing structure must carry. Without going into a lot of detail regarding the location of fuel tanks it can be seen that, as the wing weight decreases, the inertia relief provided also decreases and hence at the same aerodynamic lift the net load the wing structure must carry is *increased*.

Thus if the aircraft weight reduction is due to the usage of fuel from the wing tanks, the net load on the wing may increase as the aircraft weight is reduced. The variation will depend on the precise location of the fuel tank in the wing.

These factors plus a number of others are considered by the designer in determining aircraft limitations, which include the manoeuvre speeds. The crucial fact as far as pilots are concerned is that which was highlighted in *Digest* 116; namely, as aircraft weight decreases, so too does Va ●

Out of trim leads to out of control

At some stage during the preflight, before start and before takeoff checks, all aircraft checklists stipulate that pilots must complete certain checks on the aircraft's trim system. Just when these checks are carried out varies slightly depending on the aircraft type, but they invariably include two essential elements:

- **a full functional test of the trims, and**
- **positive confirmation that all trim controls are set to the takeoff position.**

As the pilot of a Beech 36 found out, these vital actions are prescribed for very good reasons, and if they are not completed thoroughly, the consequences can be disastrous.

The accident

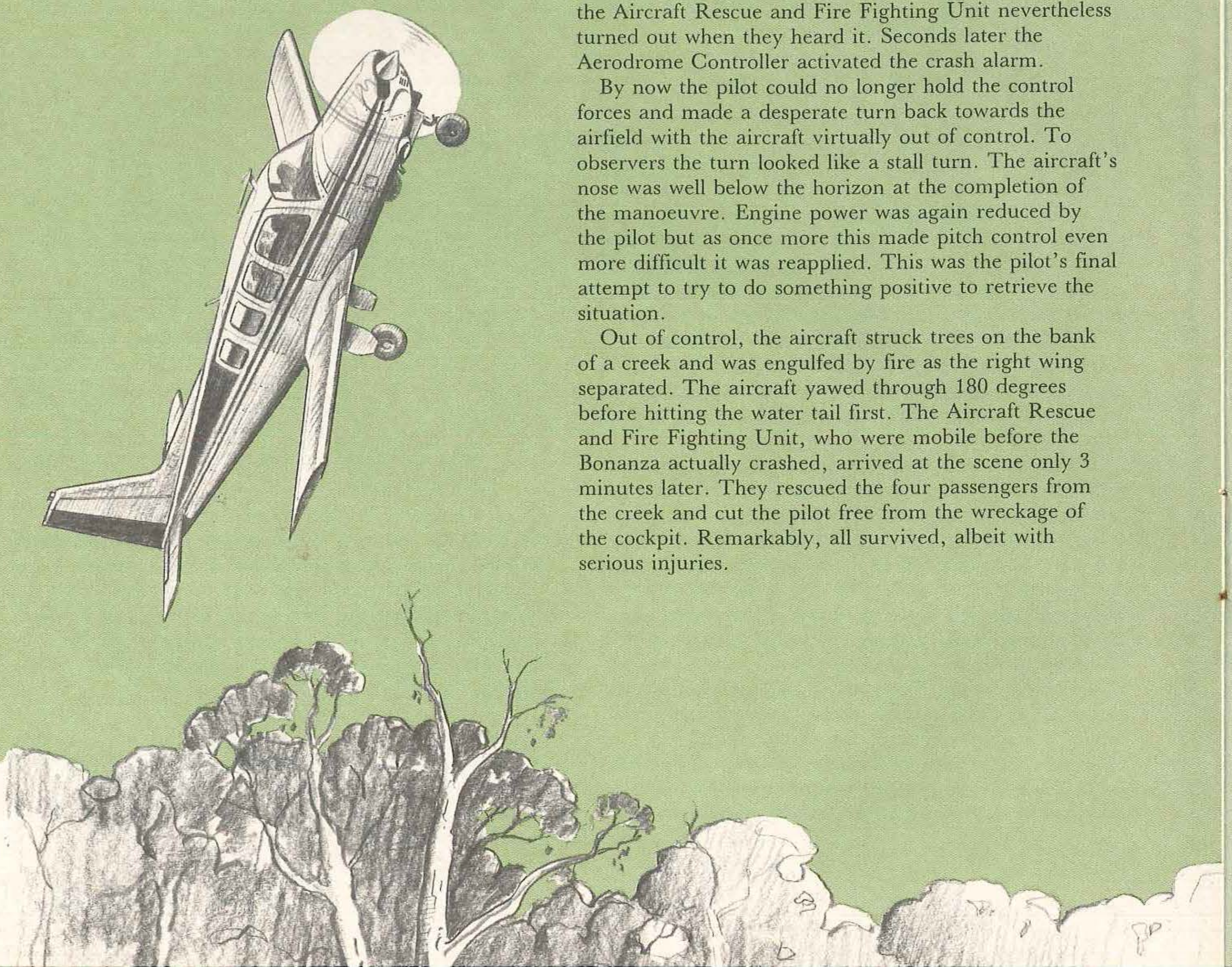
The Bonanza was to convey the pilot, four passengers and their luggage to a seminar. Some difficulty was experienced in starting the engine but this was overcome and the aircraft eventually taxied for an engine run-up. The pilot then performed the before takeoff checks without using a written checklist.

The aircraft commenced its takeoff roll and became airborne at about 60 knots. The nose rose higher than normal and the stall warning horn started blowing. Pushing the nose down against considerable 'backstick' pressure, the pilot tried to trim out the forces but was unable to move the trim wheel. The aircraft began to experience pitch oscillations and, as the airspeed increased, the force on the control column became heavier, which in turn made the pitch oscillations more pronounced. Power was reduced, but this appeared to make the back pressure on the controls worse, so it was reintroduced. The pilot asked the passenger in the right-hand pilot's seat (the holder of a restricted private licence) to retract the undercarriage and to trim the aircraft's nose down, but the passenger was unfamiliar with the aircraft and was unable to assist.

Realising that the situation was becoming desperate the pilot grabbed the microphone and tried to transmit a distress call. While the transmission was unintelligible the Aircraft Rescue and Fire Fighting Unit nevertheless turned out when they heard it. Seconds later the Aerodrome Controller activated the crash alarm.

By now the pilot could no longer hold the control forces and made a desperate turn back towards the airfield with the aircraft virtually out of control. To observers the turn looked like a stall turn. The aircraft's nose was well below the horizon at the completion of the manoeuvre. Engine power was again reduced by the pilot but as once more this made pitch control even more difficult it was reapplied. This was the pilot's final attempt to try to do something positive to retrieve the situation.

Out of control, the aircraft struck trees on the bank of a creek and was engulfed by fire as the right wing separated. The aircraft yawed through 180 degrees before hitting the water tail first. The Aircraft Rescue and Fire Fighting Unit, who were mobile before the Bonanza actually crashed, arrived at the scene only 3 minutes later. They rescued the four passengers from the creek and cut the pilot free from the wreckage of the cockpit. Remarkably, all survived, albeit with serious injuries.



Analysis

Post-accident investigation revealed that the Bonanza's elevator trim was set to the full nose-up position. The system was fully serviceable. As the pilot had not been able to alter the setting of the elevator trim in flight, it is apparent that she must have taken off with full nose-up trim set.

Further investigation brought to light the fact that the pilot who had flown the aircraft on its previous sortie usually landed with full nose-up trim applied and was not in the habit of re-setting the trim to the takeoff position after landing. Indeed, both he and another pilot who flew the aircraft frequently had on different occasions taken off with excessive nose-up trim set, but both had been able to maintain control by rapid application of nose-down trim.

In this case the pilot was unfamiliar with the Bonanza: she had only 21 hours on type and had not flown it for six months. Subsequent discussions with her made it clear that, because of her lack of recency on the Bonanza, when she tried to apply nose-down trim she in fact attempted to rotate the trim wheel in the wrong — that is, the nose-up — direction. However, full nose-up trim was already set; hence her inability to move the trim wheel.

Beech Aircraft Corporation completed a computer profile on the Bonanza's expected takeoff performance and an assessment of control column forces to be expected when full nose-up pitch trim is selected. They found that 55 pounds force were required at 70 knots and 97 pounds force at 90 knots, with the force required increasing rapidly with increased airspeed.

Rudimentary tests showed that an adult male experiences considerable difficulty in holding 55 pounds force for any length of time, let alone a rapidly increasing force. The pilot in this case simply was not physically capable of controlling the aircraft long enough, particularly when she was unable to relieve the trim forces. While reducing engine power would have alleviated some of the forces, it seems probable that when the pilot removed one hand from the control column to operate the throttle, the extra load her other arm then had to cope with initially gave her the erroneous impression that reducing power was exacerbating her problem; therefore, she reapplied power.

Adding to the pilot's difficulties was the aircraft's loading. It was calculated that the aircraft took off 38.3 kilograms over the allowable maximum takeoff weight (MTOW), and that its centre of gravity was 6.35 millimetres aft of the rear limit allowable at MTOW. When combined with the out-of-trim takeoff, these factors became significant. None of the luggage was tied down or restrained.

Comment

The prime cause of this accident was the pilot's failure to positively check the trims, for both function and correct setting, prior to takeoff. The possibility was raised that the letter 'U' (for UP) on the elevator trim position indicator may have been mistaken by the pilot for a zero if the lubber line happened to be superimposed over the 'U' (see photograph). Even if this were the case, it was a mistake which would have been realised had a full functional check of the trims been completed. A written checklist may have helped in this regard.

The habit of the other pilot in leaving the elevator trims set in the full nose-up position was poor airmanship. This practice had in fact been discussed with him on occasions but nothing had been resolved; as a consequence, the practice ultimately contributed to a major accident. While light aircraft checklists vary in content and quality, it remains good airmanship to 'clean up' the cockpit after flight by switching off all equipment and resetting controls — including the trims.

A final word on rescue services is warranted. This accident proved yet again the value of letting someone know about your emergency. While the pilot's radio transmission may have been unintelligible, the tone it obviously conveyed was sufficient to 'scramble' the airport rescue services, and as a result those services arrived at the crash site within minutes, thereby greatly increasing the accident victims' chances of survival ●

Incorrect glider launch

At a height of about 300 feet during a winch launch, an ICA IS-29D glider was observed to be experiencing instability in pitch, yaw and roll. The winch operator, considering that the pilot was in difficulty, closed the winch throttle and applied the cable brake.

The cable was seen to release and fall away to the airstrip. The glider stalled and entered a rapid spin to the right. It briefly recovered from the spin at a very low height but then entered a further spin to the left. Ground impact was in a steep nose-down attitude, 72 metres north of the airstrip and about 430 metres from the point where takeoff had commenced. The glider was destroyed and the pilot killed.

Background

The pilot had travelled to the scene of the accident to participate in a gliding competition. He brought the glider with him.

This glider was constructed with two towing hook attachment points: a forward point for aero-tow launching and a rear point for winch or auto-tow launches. The glider's flight manual states that if winch or auto-tow launches are made utilising the forward tow point, and full elevator deflection is applied during launch, then pitching instability (porpoising) may occur. To counter this a reduction of airspeed or elevator deflection is recommended. At its home base this particular glider was normally operated by an aero-tow launch, and only the forward hook was fitted. A cover plate had been fitted over the rear attachment point.

The pilot was familiar with winch and auto-tow procedures but had not used either for several years: all his recent flying had been associated with aero-tow procedures. To refresh himself on winch launch procedures he carried out a dual flight with an instructor in a two-seat glider shortly after his arrival at the competition airstrip. On the same day another pilot made two flights in the IS-29D. Auto-tow launches using the forward hook were made for these two flights and minor porpoising was experienced.

The following day the visiting pilot made a brief flight in the IS-29D. A winch launch was carried out and he experienced porpoising during the launch. He returned for landing via a low right-hand circuit pattern, instead of the normal left-hand pattern, and during the landing roll experienced directional control difficulties. A collision with a parked vehicle was narrowly avoided. Shortly afterwards the pilot undertook a second flight. Once more porpoising occurred during the winch launch and on the return to land the pilot forgot to lower the landing gear, even though the gear warning horn sounded, until reminded of his oversight by a radio call from an observer on the ground.

After this flight the pilot advised his companions that he was unhappy with his performance and would not fly solo again that day. He expressed the intention of arranging a check flight with an instructor.

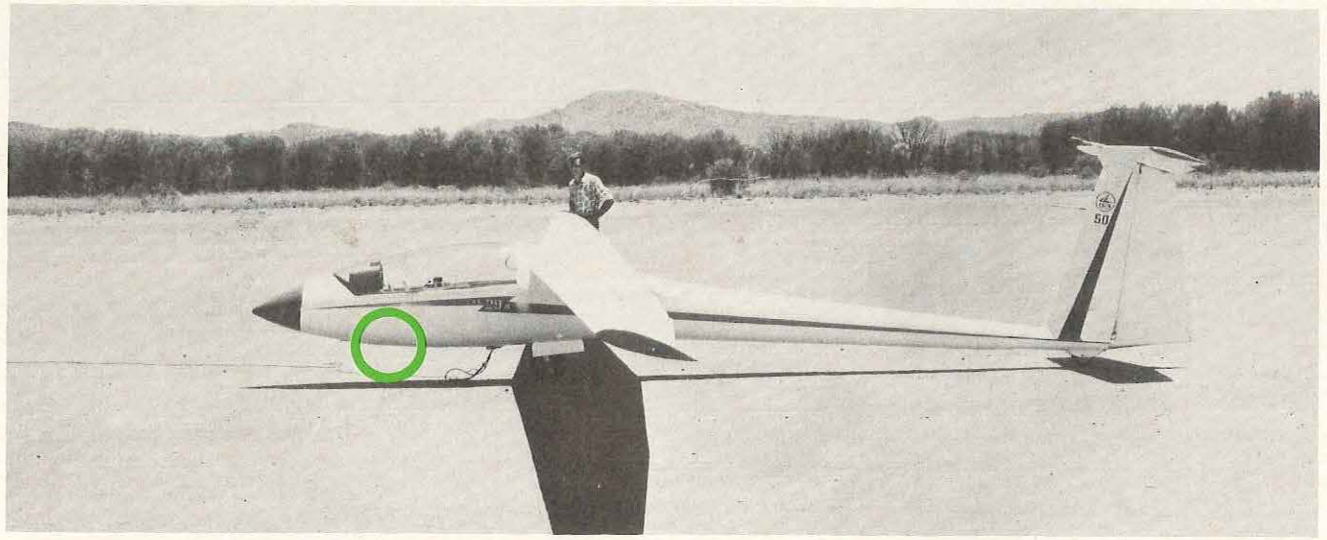
Another pilot then flew the IS-29D and experienced porpoising during the winch launch. He considered it was caused by excessive speed on launch. He also thought that a takeoff without flaps might reduce the porpoising.

At this stage the pilot who was subsequently involved in the accident decided that, contrary to his previous decision not to fly solo again that day, he wanted to undertake a third flight. The other pilot agreed, and passed on his assessment of the cause of the porpoising.

The glider was prepared for a launch into a headwind of about 10 knots. After boarding the glider the pilot spoke by radio to the winch operator and asked that the launch be made at reduced power. A member of the local gliding club who heard this exchange then intervened to advise that the standard procedure was to call 'slower, slower' on the radio if the launch was too fast and 'faster, faster' if it was not fast enough. The pilot acknowledged this advice.

The ground roll and initial climb appeared normal to ground observers. As requested by the pilot, winch

(continued on page 11)



Glider being towed by belly hook position. Forward hook is circled.

Keeping out unwelcome visitors

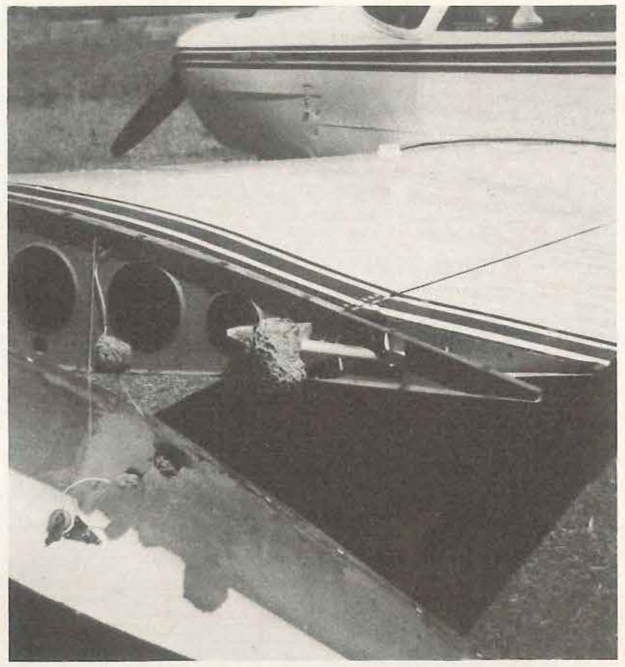
Frequent publicity is given to the attempts — many of which are successful — of aviators of the feathered variety to set up house in the vehicles of those who wish to emulate the birds. In other words, we all know that birds build nests in aircraft. On occasions these nests have posed serious safety threats by jamming flight or engine controls or by providing flammable material where none should be. The propensity of some insects to build homes in pitot heads is also well known: hence the pitot cover.

A reader recently discovered another type of unwelcome construction activity going on in his aircraft. It is probably not as well known as the others but it could pose just as great a threat to flight safety.

The pilot had not flown his aircraft for one month and during his daily servicing found that there was very little movement in the ailerons. He traced the problem to the port wingtip where he found that mud-dauber wasps had built a nest on the balance arm (see the photographs). The nest was a very solid construction and required considerable effort to remove it. The pilot believed he could not have operated the ailerons simply by using the control column.

Research by the *Aviation Safety Digest* staff came up with the following information. A number of species of wasps belonging to the family Sphecidae are likely to be involved in incidents of this type. All of the species are active in nest building during the warmer periods of the year.

The application of insecticides to discourage mud wasps is unlikely to be successful, for the only suitable chemicals would degrade, and lose their effectiveness, if exposed to the elements. The best deterrence is provided by the regular use of physical



barriers such as netting, covers, caps and plugs. Good housekeeping around hangars and parking areas is also important: not allowing taps to drip, for example, will deny the mud-daubers one part of their building material.

There is more to keeping out unwelcome visitors than pretending you are not at home when your relatives arrive unexpectedly. For pilots and aircraft mechanics, the little bit of extra effort involved in adopting an active preventive maintenance program against the kind of hazard discussed in this article can be repaid many times over in terms of flight safety ●

Incorrect glider launch *(continued)*

power was applied slowly and then reduced when the glider was airborne. After reaching a height of approximately 300 feet above the ground, the pilot called 'slower, slower' over the radio and the winch operator reduced power even further. The disastrous sequence of events detailed at the start of this article then eventuated.

Analysis

The main factor which emerged during the investigation into this fatal accident was that the glider was configured for aero-tow launching with the tow-hook on the forward attachment point, and the hook was not repositioned to the rear attachment point for the winch operations. Because they did not check the flight manual, the pilot involved and his companions were not aware of this requirement. They were also not aware that the flight manual stated that porpoising could occur if winch launches were made using the forward attachment point.

Thus, when porpoising did occur, attempts were made to overcome it by experimenting with flap settings, winch power and airspeed. Eventually, the experiments went too far and the glider stalled and spun, from which dire situation the pilot was unable to recover. The fact that the glider initially spun to the right, recovered briefly and then spun to the left, suggests that the pilot's spin recovery technique may have been faulty.

It seems likely that a second factor was the psychological condition of the pilot. For reasons which remained undetermined, he had experienced difficulties during his two earlier flights: he almost collided with a vehicle on his first sortie and almost landed wheels-up on the second. Possibly he had been unsettled by the porpoising.

In view of these occurrences, his initial decision not to fly solo again that day was prudent. Regrettably, he subsequently changed that decision, with disastrous consequences ●

Hearing conservation

The noise levels associated with aircraft operations have been a cause of concern for many years. Any hearing loss which may result from an individual's exposure to excessive noise is undesirable in itself; while in relation specifically to flying, a satisfactory level of hearing is obviously essential for a pilot to operate safely. An intensive effort has been made by manufacturers of Regular Public Transport (RPT) aircraft to reduce noise inside those aircraft. However, the same effort has not been applied to light aircraft because of technical and economic constraints.

The Standards Association of Australia (SAA) has recommended a program which is designed to protect people who are occupationally exposed to noise. As far as pilots are concerned, an important element of this program is the formulation of an acceptable Daily Noise Dose (DND). An individual will sustain a DND to the value of 1.0 if he is exposed to a noise level of 90 decibels (dB) for eight hours. A DND of 1.0 is considered to be acceptable. Pilots are, of course, subjected to noises other than those from aircraft during the day, all of which add to their DND.

A DND of 1.0 is predicted to cause 46 per cent of the population 'significant hearing loss' by the age of 65 years after forty-five years of five days a week in the workforce. Noise is the decisive factor in determining this degree of impairment in the majority of cases. 'Significant hearing loss' is identified as the point at which speech comprehension in a quiet environment is impaired and is defined as 25 dB Average Hearing Loss. One hundred and fifteen decibels is generally accepted as the maximum allowable noise level for any duration of exposure, however short.

It was against this background that the Department of Aviation initiated a survey to provide data and to establish what hearing or operational problems may arise as a consequence of noise levels inside light aircraft. This survey, conducted by the Department's Advanced Planning and Technology Branch at the request of the Aviation Medicine Branch, was designed to cover the following classes of aircraft and operations applicable to the Australian environment:

- General Aviation aircraft
- aircraft types involved in lengthy flights
- agricultural aircraft
- helicopters
- Departmental aircraft

Measurements were taken next to the pilot's ear and at selected passenger positions. The measurements were taken in straight and level flight during climbing steps to the normal cruise altitude, and repeated on the descent leg. Noise levels during takeoffs and landings were also recorded. Thirty different aircraft types were used to produce the data.

The survey

As was mentioned above, an individual who is exposed to 90 dB for eight hours will sustain the acceptable upper limit DND of 1.0. In general, most of the aircraft tested (single engine, light twins and helicopters) produced levels of 90 dB, thus allowing an occupant to sustain a full eight-hour day exposure throughout a working life span with acceptable hearing loss. This situation is further eased by the restriction on pilot's flying time to 900 hours per year, an average of 2½ hours per day.

It was found that the noise produced by multi-engine, propeller-driven aircraft can be substantially reduced through engine speed and propeller synchronisation. This can contribute significantly to the conservation of hearing.

There were some aircraft types or operations which exceeded the acceptable noise levels.

The Pitts S1 aircraft tested poses a very real risk of hearing damage since at takeoff with full engine power applied it registered 114.25 dB. This is very close to the level commonly accepted (115 dB) as the threshold for the onset of permanent damage. As high power settings are frequently used during aerobatic manoeuvres, immediate damage is inevitable unless good ear protectors are used.

Agricultural aircraft also were found to pose a risk. During the spraying seasons pilots tend to work long hours in aircraft which produce a cabin noise in excess of 100 dB. This noise level results in a DND of 1.0 within about thirty minutes. Although agricultural pilots wear helmets the sound attenuation produced is unlikely to be very high. Pilots involved in agricultural operations are likely to regularly exceed a DND of 1.0 with consequential hearing loss.

Two aircraft, a Piper Super Cub and an Auster Aiglet, belonging to a gliding club and used for towing, were tested and were also found to present a risk due to the nature of the operation. An individual pilot could be exposed to the high noise levels (105 dB and 118 dB for the respective types) for long periods in a busy day. Saving factors are short recovery periods between tows and, usually, weekend activity only.

Summary

Of the aircraft tested, the Pitts S1 and the agricultural and glider towing types pose an immediate hearing risk if operated without ear protectors. The helicopters and light-to-medium aeroplanes tested represent a noisy but acceptable environment. They do, however, contribute significantly to a pilot's total DND, bearing in mind that pilots are exposed to other noise sources in addition to their flying activities.

Operators requiring information on the effectiveness of various hearing protectors should consult the National Acoustic Laboratories' booklet *Attenuation of Hearing Protectors* (3rd edition), which is available at Australian Government Publishing Service Bookshops in all capital cities. Specialist advice is also available from the Department of Aviation, Aviation Medicine Branch, P.O. Box 367, Canberra City, A.C.T. 2601 ●

Aircraft accident information reports

SECOND QUARTER 1983

Prepared by the Bureau of Air Safety Investigation

The following information has been extracted from accident data files maintained by the Bureau of Air Safety Investigation. The intent of publishing these reports is to make available information on Australian aircraft accidents from which the reader can gain an awareness of the circumstances and conditions which led to the occurrence.

At the time of publication many of the accidents are still under investigation and the information contained in those reports must be considered as preliminary in nature and possibly subject to amendment when the investigation is finalised.

Readers should note that the information is provided to promote aviation safety — in no case is it intended to imply blame or liability.

Note 1: All dates and times are local

Note 2: Injury classification abbreviations

C = Crew	P = Passengers	O = Others	N = Nil
F = Fatal	S = Serious	M = Minor	

e.g. C1S, P2M means 1 crew member received serious injury and 2 passengers received minor injuries.

Note 3: The format of record numbers has been changed.
Preliminary report number 210013 from the previous Summary will become final update number 83 21001 in this issue.

PRELIMINARY REPORTS (The following accidents are still under investigation)

Date / *Time*	*Aircraft type & registration* / *Location*	*Kind of flying* / *Departure point/Destination*	*Injuries* / *Record number*
01 Apr / Unknown	Piper 23-250 VH-DCQ / Brisbane, Qld.	Non-commercial—pleasure / Unknown/Unknown	Unknown / 8311022

During investigation of a malfunctioning undercarriage-indicating light, the aircraft engineer discovered unreported damage to the wing in the vicinity of the undercarriage leg.

Date / *Time*	*Aircraft type & registration* / *Location*	*Kind of flying* / *Departure point/Destination*	*Injuries* / *Record number*
01 Apr / 1405	Piper 32 R300 VH-EMD / Lismore, NSW 4N	Non-commercial—pleasure / Schofields, NSW/Coolangatta, Qld.	C1N, P5N / 8321034

The pilot decided to divert to a nearby aerodrome because the fuel gauges indicated low. Shortly after commencing the diversion the engine failed. During the ensuing forced landing, the aircraft struck a fence post, overturned, and slid inverted for 100 m.

Date / *Time*	*Aircraft type & registration* / *Location*	*Kind of flying* / *Departure point/Destination*	*Injuries* / *Record number*
01 Apr / 1500	Beech A36 VH-EUM / Nundroo, SA	Non-commercial—pleasure / Ceduna, SA/Coorabie, SA	C1N, P5N / 8341012

The pilot had previously discussed the strip with the station owner but had not ascertained its length. On overflying, the pilot assessed its length as 600 m, and after checking the P-chart he calculated that 500 m was needed for a landing. The pilot stated that he crossed the threshold at 65-70 kt with full flap selected. Ground marks indicated that the aircraft touched down 195 m past the threshold and bounced twice before overrunning the strip.

Date / *Time*	*Aircraft type & registration* / *Location*	*Kind of flying* / *Departure point/Destination*	*Injuries* / *Record number*
04 Apr / 1444	Piper 24 VH-KLM / Parafield, SA	Non-commercial—pleasure / Parafield, SA/Parafield, SA	C1N, P3N / 8341011

During the circuit when the gear was selected down it failed to extend. The gear circuit breakers were reset and the gear extended normally. On the following circuit, the pilot was unable to establish two-way communications with the tower. Pre-landing checks were completed after turning back, however the pilot still concentrated on establishing contact with the tower. The aircraft landed with the gear retracted.

Date / *Time*	*Aircraft type & registration* / *Location*	*Kind of flying* / *Departure point/Destination*	*Injuries* / *Record number*
05 Apr / 1750	Partenavia P68 B VH-PFQ / Karumba, Qld.	Charter—cargo / Normanton, Qld./Karumba, Qld.	C2N / 8311020

In an attempt to avoid a flock of birds on short final, the pilot sideslipped the aircraft. Both main wheels struck the underrun heavily, bending the left main gear, and the pilot carried out a go-around. When the left main wheel contacted the runway on the landing roll, the tyre deflated and the aircraft veered to the left of the runway before coming to rest.

PRELIMINARY REPORTS (The following accidents are still under investigation)

Date / Time | *Aircraft type & registration / Location* | *Kind of flying / Departure point/Destination* | *Injuries / Record number*

08 Apr | Piper 30 VH-DRD | Non-commercial—pleasure | C1N
1328 | Coolangatta, Qld. | Archerfield, Qld./Coolangatta, Qld. | 8311021

The aircraft touched down normally, however during the landing roll the landing gear collapsed. Examination has indicated that the nosewheel retract mechanism failed to lock down at the completion of the extension cycle prior to landing. The gear down light micro switch had activated.

08 Apr | Piper 25 235/A5 VH-WSM | Commercial—aerial agriculture/baiting | C1N
0830 | Foster, Vic. 12S | Foster, Vic. 12S/Foster, Vic. 12S | 8331011

The strip used for takeoff was located in a large paddock in which a herd of Hereford steers was grazing. Because of a hump in the strip, the full length was not visible from the takeoff end. As the aircraft passed the hump the pilot saw a steer on the strip ahead. He continued the takeoff and at about lift-off the right wing struck the steer. The pilot dumped the load and, after checking the handling of the aircraft, continued to a safe landing at Latrobe Valley.

09 Apr | Beech 95 B55 VH-FDG | Non-commercial—pleasure | C1N
1250 | Maitland, NSW | Bankstown, NSW/Maitland, NSW | 8321036

The pilot stated that he selected the landing gear down during the pre-landing checks and obtained a down and locked indication. However, the aircraft contacted the runway with the landing gear retracted.

09 Apr | Beech 58 VH-EZB | Charter—passenger | C1N, P5N
1330 | Wyndham, WA | Kununurra, WA/Wyndham, WA | 8351013

Attempts to lower the undercarriage by both the normal and emergency systems were unsuccessful. The undercarriage was observed to be partially down and could not be raised. On landing the undercarriage collapsed.

10 Apr | Romainian IS-28B2 VH-CQD | Non-commercial—pleasure | C1N, P1N
0956 | Bathurst, NSW 7NW | Bathurst, NSW 7NW/Bathurst, NSW 7NW | 8321035

Just after takeoff the engine cowl on the tug aircraft opened. At 100 ft agl the tug pilot signalled the glider pilot to release the tow. The tug pilot reduced airspeed and landed the tug without further incident. The glider was turned to the right for a landing in an adjacent paddock. The glider touched down heavily, short of the paddock boundary, bounced and struck the fence with the left wing. The glider came to a stop after a ground loop.

11 Apr | Cessna 310 R VH-DVN | Charter—passenger | C1M, P3M, P1N
1235 | Canberra, ACT | Canberra, ACT/Cudal, NSW | 8321037

Moderate rain was falling at the time of the occurrence. The takeoff run was commenced but at a reported speed of 80 kt the pilot considered that the aircraft was not accelerating and he decided to abort the takeoff. The aircraft overran the runway, became airborne for 120 m in order to clear a ditch, then collided with the airport boundary fence before stopping on a road.

14 Apr | Partenavia P68 B VH-IYL | Charter—passenger | C1M, P5N
1312 | Mary Kathleen, Qld. | Longreach, Qld./Mary Kathleen, Qld. | 8311023

After touchdown the pilot applied light braking, but when he realised the aircraft would not stop before the end of the strip he applied heavy braking. The aircraft overran the strip and continued for a further 50 m before coming to rest.

18 Apr | Piper 28 R180 VH-CHI | Instructional—solo—supervised | C1N, O1N
1642 | Cessnock, NSW | Sydney, NSW/Cessnock, NSW | 8321038

The pilot of the first aircraft was returning from a solo navex. He cancelled SARWATCH and reported entering the circuit on downwind. The pilot of the second aircraft was carrying out solo circuit practice; he heard the first pilot cancel SARWATCH but not the downwind report. The first aircraft completed a normal circuit and as it touched down the second aircraft, having completed a glide approach, landed on top of the first. They continued for 140 m before coming to rest.

21 Apr | Mooney M20 J VH-MOP | Non-commercial—pleasure | C1N, P1N
0821 | Alice Springs, NT | Alice Springs, NT/Leigh Creek, NT | 8341013

When taxiing for takeoff, the aircraft nosewheel ran over a taxiway centre light and the nosegear collapsed.

22 Apr | Piper 28 235 VH-EVL | Non-commercial—pleasure | C1N
1745 | American RVR, SA | American RVR, SA/American RVR, SA | 8341014

The pilot landed long on his property strip to avoid some sheep grazing on the approach end of the strip. During the landing roll the starboard main landing gear was torn off when it struck a sheep. The starboard wingtip contacted the ground and the aircraft slewed to rest.

23 Apr | Beech A36 VH-DAJ | Non-commercial—pleasure | C1F, P4F
0927 | Mt. William, Vic. | Moorabbin, Vic./Sydney, NSW | 8331012

The pilot submitted a VFR flight plan indicating that the first leg, Moorabbin/Mangalore, would be OCTA below 5000 ft. Some 24 minutes ater departure the pilot reported poor weather in the Kilmore Gap area and advised he would return to Moorabbin. He also reported unsure of position and requested a bearing. Attempts to assist the pilot were unsuccessful and the aircraft struck the cloud-covered slopes of Mt. William at about 2000 ft amsl. Fire broke out on impact.

26 Apr | Cessna 182-R VH-PJV | Non-commercial—pleasure | C1N
1740 | Glenmore Stn., Qld. | Vanrook Station, Qld./Charters Towers, Qld. | 8311026

The pilot made a precautionary landing on a road because of deteriorating weather. During the landing roll the starboard wing was damaged when it struck a sapling on the edge of the road.

PRELIMINARY REPORTS (The following accidents are still under investigation)

Date / Time | *Aircraft type & registration / Location* | *Kind of flying / Departure point/Destination* | *Injuries / Record number*

02 May | Cessna 172 N VH-WXK | Non-commercial—business | C1F
1832 | Narrogin, WA 10S | Katanning, WA/Jandakot, WA | 8351015

After diverting from track because of deteriorating weather, the pilot was unable to locate a suitable landing area. End of daylight was approaching and after being advised of the nearest aerodrome with runway lighting, the pilot diverted to that aerodrome. The aircraft was later observed operating at low level in the vicinity of the aerodrome. It was then observed to climb slightly from 50 ft agl, turn abruptly to the right and impact the ground in a nose down attitude.

03 May | Hughes 269 C VH-CHN | Commercial—aerial mustering | C1M, P1M
0920 | Comet, Qld. 10NE | River-Lea Station/Riverside Station | 8311027

The helicopter was weaving back and forth driving cattle. Height was about 30 ft and airspeed about 25 kt. The pilot heard a loud bang and believed the engine had failed. An auto-rotation was carried out into trees.

05 May | Beech 95 C55 VH-FDT | Charter—passenger | C1N, P4N
1714 | Beermullah, WA | Geraldton, WA/Perth, WA | 8351016

Whilst cruising at 7500 ft, the pilot became aware of a fire behind the throttle quadrant. An immediate descent was commenced and attempts by passengers to extinguish the fire were unsuccessful. After landing the occupants evacuated the aircraft and were again unsuccessful in extinguishing the fire.

07 May | Cessna 210 L VH-BEV | Non-commercial—pleasure | C1N, P1N
1500 | Tumut, NSW | Tumut, NSW/Tumut, NSW | 8321039

Aircraft was landed with the undercarriage retracted.

08 May | Cessna 150 G VH-RZS | Non-commercial—pleasure | C1F
0730 | Dunedoo, NSW 4E | "Curragundi" Strip/"Tooraweenah" Strip | 8321040

After becoming airborne the aircraft struck two trees situated 155 m beyond the departure end of the strip. The aircraft impacted the ground in a nose down attitude 70 m past the trees.

10 May | Hughes 269 C VH-ARG | Commercial—assoc. agriculture/baiting | C1N
0630 | Canungra, Qld. | Coolangatta, Qld./Canungra, Qld. | 8311029

The pilot landed the helicopter on an earthen dam wall. While the main rotor was winding down the landing skid heels sank into the wall which had been softened by recent rain. The tail rotor contacted the water of the dam resulting in damage to the tail rotor, tail rotor gearbox and drive shaft.

10 May | Cessna 182 Q VH-MJZ | Non-commercial—pleasure | C1N
1830 | Hamilton Downs, Qld. | Corella Park, Qld./Hamilton Downs, Qld. | 8311028

The pilot, who did not hold an instrument rating, arrived at his destination shortly after last light. An approach was made to the unlit strip, but on touchdown the aircraft was not aligned with the strip direction. Corrective action including the application of full power was unsuccessful, the nosegear collapsed and the aircraft overturned.

10 May | Piper 32 Rt300 VH-RHF | Non-commercial—pleasure | C1F, P5F
1231 | Port Moresby 30N | Port Moresby, PNG/Madang, PNG | 8391001

The pilot intended to depart at 0800 hours, but due to equipment unserviceabilities departure was delayed for 4 hours. Weather conditions on the planned track were reported to be adverse, and the pilot advised that he would track via an alternative route. No further communications were received from the aircraft, and after a search lasting 6 days the wreckage was located in a blind valley at an altitude of 7900 ft.

17 May | Cessna 182 P VH-THC | Non-commercial—pleasure | C1N, P1N
1211 | Arapunya Stn., NT | Alice Springs, NT/Arapunyah, NT | 8341015

The landing was made on a short strip in gusty conditions. During the flare the aircraft dropped heavily to the ground and bounced. The second touchdown was on the nosewheel, which broke off. This led to a third touchdown during which the nosewheel strut dug in and the aircraft stood on its nose and right wingtip before settling back on the main wheels and nose.

17 May | Hiller UH12-E VH-AGL | Commercial—power/pipe line patrol | C1N, P2N
1456 | Sydney, NSW 11SW | Hoxton Park, NSW/Hoxton Park, NSW | 8321041

Whilst on cruise at 1000 ft agl, the aircraft experienced a sudden loss of height. The pilot carried out an auto rotative landing on river mud flats. During the landing the tail rotor struck the water.

18 May | Partenavia P68-C VH-AJX | Non-commercial—corporate/executive | C1N, P6N
1110 | Mt. Magnet, WA 8NW | Perth, WA/Blackcat Mine, WA | 8351017

The pilot established the aircraft on final with full flap at 90 kt. Just before commencing the landing flare the pilot observed the airspeed drop to 70 kt and a high sink rate developed. The main wheels struck a windrow before the strip threshold and the right main gear was torn off. The aircraft continued down the strip and the left main gear collapsed before the aircraft came to a halt.

23 May | Mitsu MU2B-60 VH-MLU | Charter—cargo | C1F
0459 | Bargo, NSW 2E | Sydney, NSW/Melbourne, Vic. | 8321042

The aircraft was cleared via a Standard Instrument Departure with an unrestricted climb to FL220. The aircraft climbed on track at an average rate of 1300 ft/min until FL130. The rate-of-climb then reduced to 350 ft/min until FL140, when the rate-of-climb increased to 1800 ft/min. At FL160 the aircraft entered a near vertical descent and radar contact was lost one minute later at 3100 ft. The aircraft impacted the ground in a near-vertical attitude.

PRELIMINARY REPORTS (The following accidents are still under investigation)

Date Time	Aircraft type & registration Location	Kind of flying Departure point/Destination	Injuries Record number
26 May 1121	De Hav C2 VH-IDU Gembrook, Vic. 5E	Commercial—aerial agriculture/baiting Gembrook, Vic./Gembrook, Vic.	C1N 8331014

During spreading operations, the engine suddenly lost power due to mechanical failure. The pilot carried out a successful forced landing up a steep slope, the only clear area within range. The aircraft came to rest on the slope then began to slide backwards, with wheels locked, on the wet grass surface. The pilot released one brake and turned the aircraft across the slope but it continued to slide until it struck a ridge, and the left main gear was torn off.

02 Jun 1607	Bell 206 B VH-AJI Mt. Perisher, NSW	Commercial—construction (rotorcraft) Perisher Valley, NSW/Perisher Valley, NSW	C1M 8321044

The pilot landed the aircraft on snow-covered ground to allow the external load to be released manually, as the normal release system would not function. After the system was rectified and the load reconnected, the back of the left skid settled in the snow. The pilot attempted to correct the situation but the main rotor struck the ground and the aircraft rolled over.

04 Jun 1115	Beech A23 A VH-DEX "Nimmie Stn.", NSW	Non-commercial—business "Nimmie Stn.", NSW/"Nimmie Stn.", NSW	C1M, P1M 8321045

Immediately after becoming airborne the pilot turned the aircraft to the right. At 250 ft agl the flaps were retracted and the aircraft rolled right and the nose dropped. The pilot applied full left rudder and aileron and pushed the control column forward. The aircraft struck the ground with the wings level and bounced 28 m before coming to rest.

05 Jun 1125	Cessna 182 P VH-IRL Brunette Downs, NT	Non-commercial—pleasure Tennant Creek, NT/Brunette Downs, NT	C1N, P1N 8341016

After crossing the threshold at 75 kt power was reduced to idle and a landing flare commenced at about 25 ft agl. The aircraft floated for some distance before the nosewheel contacted the ground heavily 400 m from the threshold. A bounce ensued followed by a further heavy touchdown on the nosewheel which then collapsed and was torn off as the aircraft slid on its nose for 98 m.

05 Jun 1324	Bell 47 J2A VH-DMR Dagworth Stn., Qld.	Commercial—aerial mustering Galloway Stockyard/Galloway Stockyard	C1M, P1M 8311032

Whilst cattle mustering at approximately 100 ft agl the pilot heard a loud metallic noise. Auto-rotation was commenced but during the final stages of the approach the tail rotor struck a tree. The right skid then struck an anthill and the aircraft rolled over throwing the seat containing the pilot clear. After the passenger freed himself from the wreckage, fire broke out and the aircraft was destroyed.

06 Jun 1400	Piper 25 235 VH-CPU Naracoorte, SA 15S	Commercial—aerial agriculture/baiting Bool Lagoon, SA/Bool Lagoon, SA	C1N 8341017

The agricultural strip used for this operation was situated on the top of a ridge and contained three bends in its 395 m length. The average width of the strip was 8 m, the sides then falling away at an average angle of 25 degrees. After a takeoff run of 225 m the aircraft left the strip at the second bend, continued down the steep slope and became airborne just before colliding with trees.

06 Jun 0930	Hiller UH12-E VH-MKZ Tingoora, Qld.	Commercial-aerial agriculture/baiting Tingoora, Qld./Tingoora, Qld.	C1N 8311034

On the completion of each spray run the pilot was flying under power lines. On this particular run the pilot diverted the aircraft slightly to avoid a vehicle. The main rotor blades struck the power lines.

07 Jun 1255	Piper 28 R180 VH-PFB Cessnock, NSW 4E	Non-commercial—pleasure Warnervale, NSW/Moree, NSW	C1N, P3N 8321046

While the aircraft was cruising at 2000 ft amsl below an overcast at 2500 ft amsl, a large bird struck the outer leading edge of the left wing.

08 Jun 1630	Piper 28-161 VH-AAS Alice Springs, NT	Instructional—solo—supervised Alice Springs, NT/Alice Springs, NT	C1N 8341018

The student pilot carried out two dual, left-hand circuits before being sent solo again. On the first solo circuit of the consolidation a right-hand pattern and an extended downwind leg were required by the controller, due to other traffic. On final approach the aircraft was above the normal path and on level-off the aircraft ballooned. On touchdown the aircraft bounced and then touched down nosewheel first. The nose strut broke off and the aircraft slid to a halt.

09 Jun 0945	Piper 28 235 VH-BUJ Bathurst, NSW	Non-commercial—pleasure Bankstown, NSW/Bathurst, NSW	C1N, P1N 8321047

While the aircraft was taxiing along a road after landing, its left wing struck a fence post. The aircraft turned to the left and the propeller also struck the fence.

09 Jun 1700	Cessna A188B A1 VH-EJU Hyden, WA 13NW	Commercial—assoc. agriculture/baiting Hyden, WA 15NW/Hyden, WA 8NEE	C1N 8351018

Shortly after takeoff the pilot noticed that there was no indication of airspeed. The pilot pushed the control column forward and the aircraft collided with the ground causing the right main gear to detach and strike the right tailplane. The aircraft bounced back into the air and climbed steeply before the pilot was able to lower the nose by a combination of forward control column and reduced power. The aircraft crashed 200 m farther on from the initial impact point.

11 Jun 1017	Cessna 172 N VH-TEU Injune, Qld. 70NW	Non-commercial—pleasure Archerfield, Qld./Bandana, Qld.	C1M, P2N 8311035

The pilot became unsure of her position and decided to land in a paddock near a homestead to confirm the location. The paddock was 270 m long and studded with a number of large trees. The aircraft touched down well into the paddock and the right wing struck a tree and was torn off. The left wing then struck another tree and the aircraft turned to the left and rolled inverted before coming to rest.

PRELIMINARY REPORTS (The following accidents are still under investigation)

Date Time	Aircraft type & registration Location	Kind of flying Departure point/Destination	Injuries Record number
12 Jun 0715	Cessna P206 D VH-DPU Mt. Isa, Qld.	Non-commercial—pleasure Mt. Isa, Qld./Sweers Island, Qld.	C1M, P1M 8311036

The pilot was unable to start the engine with the starter. He set the park brake, explained to his passenger the foot brake operation, and briefed her to slightly open the throttle if the engine looked like stopping after he had it started by hand-swinging the propeller. As the engine started the aircraft moved forward. The passenger inadvertently fully opened the throttle, the aircraft collided with a fence and hangar door before coming to rest embedded in the side of the hangar.

12 Jun 1600	Expermtl Acro VH-FMK Wedderburn, NSW	Non-commercial—pleasure Bankstown, NSW/Wedderburn, NSW	C1N 8321048

The pilot misjudged the altitude on final approach and, before he initiated the land flare, the aircraft struck the ground heavily. The landing gear collapsed and the aircraft slid to a stop on the strip.

15 Jun 1140	Piper 31 350 VH-DVX Moomba, SA 9E	Charter—passenger Moomba, SA/Dullingari, SA	C1S, P1F, P2S 8341020

Shortly after takeoff, at about 500 ft agl, both engines began to loose power. As the airspeed decayed the pilot was unable to maintain straight and level flight, and initiated a descending right turn. At about this time the right engine failed completely. The aircraft then impacted with the ground at a relatively slow speed and caught fire after a groundslide.

17 Jun 1620	Cessna 404 VH-ARQ Coolangatta, Qld.	Scheduled passenger service—commute Lismore, NSW/Coolangatta, Qld.	C1N, P1ON 8311037

On approach the undercarriage down indications were normal. However, when the nosewheel was lowered after touchdown, the nosewheel leg collapsed and the nose section impacted the runway.

17 Jun 0735	Cessna 310 Q VH-RIX Exeter, NSW	Charter—cargo Sydney, NSW/Canberra, ACT	C1N 8321050

The pilot was unable to proceed to his planned destination because of fog at that aerodrome and had diverted to another that he believed was suitable. Whilst on a descent below lowest safe altitude in cloud, the top of the fin and rudder of the aircraft struck the lower two cables of an array of eight power cables. The approximate height of the cables struck was 23 ft agl.

18 Jun 1204	Beech A36 VH-BFB Coffs Harbour, NSW	Instructional—dual Coffs Harbour, NSW/Coffs Harbour, NSW	C2N, P1N 8321049

The student was undergoing instruction for his initial check on a retractable undercarriage type. During the circuit training, touch-and-go landings were carried out, with the instructor calling he had identified the flap lever and selecting it up. After the second landing the instructor called and selected the flap up. However, the student attempted to select flaps up but inadvertently selected the undercarriage up and the aircraft settled on the runway.

20 Jun 0715	Bell 47 G5A VH-AAW Normanton, Qld. 59S	Ferry Mogoura Stn., Qld./Washpool Camp, Qld.	C1F 8311038

The helicopter was cruising at approximately 200 ft agl. An observer saw an object fly horizontally from the helicopter. The helicopter then turned through 90 degrees to the left, rolled to the left and spun through 360 degrees before impacting the ground inverted. The helicopter exploded on impact.

20 Jun 1255	Embraer 110 P2 VH-MWW Sydney, NSW	Instructional—check Sydney, NSW/Bathurst, NSW	C3N 8321051

Just after takeoff the top right engine cowl separated from its mountings and struck the right horizontal stabiliser. The cowl remained attached to the stabiliser causing severe buffeting and a substantial loss of pitch control. The aircraft was landed immediately on a cross runway.

26 Jun 1545	Cessna 182 P VH-PKM Flinders Is., Tas.	Non-commercial—pleasure Flinders Is., Tas./Flinders Is., Tas.	C1N, P3N 8331016

The pilot was conducting practice circuits. On the fourth landing the aircraft bounced twice. The pilot attempted to go around, but the engine did not respond before the aircraft again contacted the ground. The nosewheel was dislodged and the nosegear leg was torn off during the ensuing slide.

27 Jun 1608	Cessna 182 G VH-DFQ Coolangatta, Qld. 4N	Non-commercial—pleasure Redcliffe, Qld./Lismore, NSW 15E	C1N 8311039

Whilst cruising at 1500 ft amsl the engine began to run roughly and backfire. The pilot was unable to rectify the problem and shut the engine down. A forced landing was carried out on a beach and after landing the pilot found a fire in the engine compartment. He was unable to extinguish the fire until the arrival of a fire tender from a nearby airport.

30 Jun 1635	Cessna 180 D VH-WFZ Bundaberg, Qld.	Non-commercial—practice Bundaberg, Qld./Bundaberg, Qld.	C1N 3311040

The pilot had recently purchased the aircraft and had then completed a period of dual instruction to re-familiarise himself with tailwheel aircraft. To consolidate this instruction the pilot was to carry out a period of solo circuits. On the first landing, just after touchdown, the aircraft veered to the right and the left wing and elevator struck the ground. The aircraft came to rest on the runway, heading 90 degrees from the landing direction.

30 Jun 1415	Cessna A188 A2 VH-KVA Perth, WA 275NNE	Non-commercial—agriculture/survey Goodlands Farm, WA/Goodlands Farm, WA	C1N 8351019

The landing was made on a private strip in strong gusty crosswind conditions. About 150 m after touchdown the aircraft swung to the right and ran off the side of the strip on to newly cultivated soil. The left main wheel was torn off and the propeller bent.

FINAL REPORTS (The investigation of the following accidents has been completed)

Date / Time / Pilot licence	Aircraft type & registration / Location	Age	Kind of flying / Departure/Destination / Hours Total	Hours on Type	Rating	Injuries / Recorded number
02 Apr 1034 Private	Beech C23 VH-SHP Jandakot, WA	41	Non-commercial—pleasure Quairading, WA/Jandakot, WA 135	4	None	C1N 8351012

On the first landing attempt the aircraft was flared too high and settled heavily on to the runway. The pilot carried out a go-around. On the second approach the pilot again flared too high resulting in a heavy bounced landing, during which the nosewheel struck the runway with sufficient force to collapse the nose strut.

Date / Time / Pilot licence	Aircraft type & registration / Location	Age	Kind of flying / Departure/Destination / Hours Total	Hours on Type	Rating	Injuries / Recorded number
14 Apr 0820 Private	Cessna 172-P VH-JRC Cue, WA 111W	20	Non-commercial—aerial mustering Meka Station, WA/Meka Station, WA 228	177	None	C1N 8351014

Whilst sheep spotting at 500 ft agl, the pilot turned the aircraft in an attempt to keep the sheep in sight. He progressively tightened the turn until the aircraft was in a steep turn with a nose-low attitude. The pilot attempted to recover from the turn but the aircraft struck the ground.

The investigation established that the aircraft was stalled while in a steep turn in close proximity to the ground.

Date / Time / Pilot licence	Aircraft type & registration / Location	Age	Kind of flying / Departure/Destination / Hours Total	Hours on Type	Rating	Injuries / Recorded number
16 Apr 1120 Commercial	Hiller UH12-E VH-FXX Byerwen Stn., 13S Helicopter	47	Commercial—aerial mustering Byerwen Stn., Qld./Byerwen Stn., Qld. 3500	2000	None	C1N, P1S 8311024

The helicopter was climbing to about 20 ft agl and entered a hover under overhanging branches of a tall eucalyptus tree. There was a loud bang and the helicopter began to vibrate and rotate to the right. The pilot was unable to regain control and the helicopter landed heavily in a nose-down attitude. A witness reported seeing a large dead branch fall from the tree into the main rotor system.

Date / Time / Pilot licence	Aircraft type & registration / Location	Age	Kind of flying / Departure/Destination / Hours Total	Hours on Type	Rating	Injuries / Recorded number
30 Apr 1230 Commercial	Airparts 24 950 VH-KSF Dysart, Tas.	50	Commercial—aerial agriculture/baiting Dysart, Tas./Dysart, Tas. 20 000	7000	Agric. Class 1	C1N 8331013

On climbout to the spreading area on the second flight of the day the pilot saw power lines ahead. He attempted to fly below them, but the aircraft struck the lines and dropped to the ground coming to rest on its wheels in a turnip field.

Although the pilot had operated from the strip many times over nine years, he was unaware of the power lines. He did not see the lines during an aerial inspection or on the first spreading flight. The lines were strung across a valley between a pole hidden by trees at the top of a ridge and a pole lower down on the other side. The span was 900 m and light conditions were dull.

Date / Time / Pilot licence	Aircraft type & registration / Location	Age	Kind of flying / Departure/Destination / Hours Total	Hours on Type	Rating	Injuries / Recorded number
29 May 1530 Private	Beech E33 VH-BZQ Hebel, Qld.	37	Non-commercial—pleasure Hebel, Qld./Mungindi, Qld. 500	330	None	C1N, P2N 8311030

The pilot intended using one stage of flap and rotating at 60 kt due to the soft condition of the strip. The gear was retracted just after the aircraft became airborne and the aircraft sank back to the ground.

The gear was retracted prior to a positive rate-of-climb being established and at a speed such that the changes in trim and drag had a marked effect on aircraft performance.

Date / Time / Pilot licence	Aircraft type & registration / Location	Age	Kind of flying / Departure/Destination / Hours Total	Hours on Type	Rating	Injuries / Recorded number
01 Jun 1720 Commercial	Hughes 269 C VH-CHV Highbury O.S., Qld. Helicopter	26	Ferry Drumduff Outstation/Highbury O.S., Qld. 763	763	Inst. Rat. Class 4	C1N 8311031

The pilot was positioning the helicopter for a periodic check on the following day. During his approach he saw the toolboxes to be used, and decided to land near them. A dusty area was encountered so the pilot moved towards a grassed area. The main rotor struck a branch and the pilot instinctively acted to move the helicopter away from the tree, but this caused the rotor to move up and strike a large branch.

In attempting to ease his engineer's workload the pilot had positioned the helicopter under tree branches and he had failed to notice one large branch protruding from the main foliage.

Date / Time / Pilot licence	Aircraft type & registration / Location	Age	Kind of flying / Departure/Destination / Hours Total	Hours on Type	Rating	Injuries / Recorded number
06 Jun 1650 Private	Cessna R182 VH-TMJ Toowoomba, Qld.	41	Non-commercial—business Thallon, Qld./Toowoomba, Qld. 250	24	None	C1N, P3N 8311033

On landing the aircraft bounced and the nosewheel tyre deflated. As the pilot was turning the aircraft off the runway the nosewheel strut entered soft ground and collapsed.

The pilot had misjudged his landing flare, probably because sunglare had restricted his forward visibility. The wind at the time was light, and a runway not affected by sunglare was available for landing.

Date / Time / Pilot licence	Aircraft type & registration / Location	Age	Kind of flying / Departure/Destination / Hours Total	Hours on Type	Rating	Injuries / Recorded number
21 Jun 1203 Commercial	Beech 36 VH-FWL Moorabbin, Vic.	19	Instructional—solo—supervised Moorabbin, Vic./Moorabbin, Vic 272	1	Instrument Rating Class 4 and Flight Instructor	C1N 8331015

The pilot decided to practise some touch-and-go landings because he had not flown an aircraft for some considerable time. During the landing roll of the second touch-and-go the pilot inadvertently selected gear up instead of flap up. The aircraft stopped after sliding 70 m on the partially retracted landing gear.

Subsequent examination established that both the landing gear squat switch and landing gear unsafe warning horn were serviceable. It is probable that there was insufficient weight on the landing gear to operate the squat switch.

FINAL UPDATES (The investigation of the following accidents has been completed. The information is additional to that previously printed in the preliminary report)

Date / Pilot licence	Record number / Age	Hours total	Hours on type	Rating
02 Jan Private restricted	8321001 21	64	11	None

The pilot did not initiate a go-around.

Date / Pilot licence	Record number / Age	Hours total	Hours on type	Rating
04 Jan Private	8311002 40	415	300	Instrument Rating Class 4

The pilot, who was inexperienced in judging local conditions and effects, had underestimated the wind strength. The downwind component for landing was 10 to 15 kt. Although the aircraft floated well beyond the target touchdown point the pilot did not initiate a go-around.

Date / Pilot licence	Record number / Age	Hours total	Hours on type	Rating
07 Jan Commercial helicop.	8311003 29	3860	2640	None

Fuel lines to two cylinders were found abraded by their clamps and one line was fractured. The pilot was operating just above the trees and he was unable to manoeuvre for a successful landing due to the lack of engine power.

Date / Pilot licence	Record number / Age	Hours total	Hours on type	Rating
07 Jan Private restricted	8321005 20	236	190	None

There was ample space to land on either side of the next glider to be towed. By making a maximum performance landing in the short distance behind the flider, the pilot gave himself little room to manoeuvre, to correct for the disturbance caused by the willy-willy.

Date / Pilot licence	Record number / Age	Hours total	Hours on type	Rating
17 Jan Glider	8351002 35	933	250	Glider Rating

Following the low pass, the glider was too slow to make a normal circuit. Airspeed was further reduced as the pilot attempted to manoeuvre for a landing on one of the strips. There were clear paddocks, suitable for landing, adjacent to the aerodrome but the rules required that the landing be on a strip for the record attempt to be valid.

Date / Pilot licence	Record number / Age	Hours total	Hours on type	Rating
23 Jan Commercial	8331002 26	1800	80	Instrument Rating 1st or Class 1 and Flight Instructor
29 Jan Private restricted	8341002 30	400	80	None

Examination of the engine found no reason for the reported rough running.

Date / Pilot licence	Record number / Age	Hours total	Hours on type	Rating
09 Feb Commercial	8311008 58	3000	2700	Instrument Rating Class 4

The low performance detected by the pilot was caused by poor seating of an exhaust valve and the associated reduced power output.

Date / Pilot licence	Record number / Age	Hours total	Hours on type	Rating
10 Feb Private	8311009 60	1500	600	None

Investigation failed to reveal evidence of an engine material failure. Atmospheric conditions at the time were conducive to carburettor icing, and the aircraft flew close to operating watersprinklers on the strip during the low pass.

Date / Pilot licence	Record number / Age	Hours total	Hours on type	Rating
14 Feb Private restricted	8311011 34	73	6	None
21 Feb Private	8311014 35	650	Unknown	None
06 Mar Private	8331005 24	306	84	Instrument Rating Class 4
10 Mar Private	8311018 66	3326	2594	None

Let George do it – but watch him!

A commercial DC-10 departed Frankfurt at about 2200 hours local time on an IFR flight plan to Miami. There were 295 passengers, three crewmembers and 13 flight attendants on board. Ground operations, take-off and the initial portion of the en route climb were uneventful. Air Traffic Control cleared the trijet to climb at 283 knots, the appropriate speed for the heavy weight of the aircraft. The captain controlled the aircraft manually to 10 000 feet. According to the crew, after reaching 10 000 feet the autopilot (AP) was engaged in the indicated airspeed (IAS) hold mode and the autothrottle system (ATS) speed selector was set at 320 knots. Climbing through 14 000 feet the autopilot disengaged, and was quickly re-engaged by the pilot.

A few minutes later, while climbing through 27 500 feet about 100 miles west of the departure airport, the DC-10 started to vibrate slightly which, within seconds, increased in intensity. The crew suspected an abnormal vibration in number three engine, elected to reduce power and then to shut it down. As soon as they reduced power on number three engine, the autopilot disengaged, the aircraft rolled first right, then left, and then the nose suddenly pitched down and they started to lose altitude rapidly.

As the aircraft's nose continued to drop, the captain deployed the spoilers to arrest the impending overspeed condition created by the aircraft's nose-low attitude. The flight recorder readout showed the recovery starting at 23 900 feet with vertical acceleration reaching a maximum of 1.68g during the recovery. The crew regained full control of the aircraft at about 18 000 feet.

Shortly after recovering control of the DC-10, the crew restarted number three engine and it appeared to function normally. They had requested a diversion to Madrid, but since all systems appeared normal, the crew elected to continue to Miami as if nothing had happened. The flight landed at Miami at 0105 local time.

After shutting down, the captain asked maintenance personnel to visually check the aircraft's exterior. Maintenance found that the 4 feet of each outboard elevator tip and the aircraft's tail-area-lower-access door were missing. The DC-10 was grounded at Miami where it underwent a thorough examination. All systems that could have induced the condition experienced by the crew during the incident were functionally checked. These included the flight control systems, the autothrottle system, the flight director/autopilot and the number three engine. No malfunctions were found.

Analysis

The aircraft's flight control systems and power plants operated normally both before and after the incident. There was no evidence that any malfunction of the aircraft systems had occurred. The structural damage, which was limited to the empennage and aft fuselage, was attributed to the application of high loads caused by the stall buffet. No indication of pre-existing fatigue cracking was discovered.

The flight data recorder indicated that the aircraft's airspeed continued to decrease during the climb. The stall speed of the DC-10 for its climb weight was determined to be 203 knots and the buffet onset speed was approximately 234 knots. According to the flight recorder, the aircraft was operated below 234 knots for over 40 seconds while climbing above 26 000 feet. For half of this period, the airspeed was below 203 knots. The minimum speed recorded during this portion of the climb was 176 knots, well below the stall speed. The National Transportation Safety Board (NTSB) concluded that the DC-10 entered a full aerodynamic stall.

Why would an experienced, professional flightcrew unknowingly allow a DC-10 aircraft to fly into a full aerodynamic stall? Evidence clearly indicates the aircraft was maintaining a constant vertical speed (1200 feet per minute) during the period immediately preceding the stall, and thrust from all three engines was at an autothrottle limiting value for several minutes during which pitch attitude increased and airspeed decreased. Here the DC-10's autopilot system was commanding aircraft pitch attitude and the autothrottle system was controlling thrust during the climb. The aircrew had mistakenly placed the autopilot system in a vertical speed mode rather than an airspeed or Mach command mode. This was contrary to both the airline's normal procedures and the manufacturer's prescribed normal operating procedures and recommendations.

From the time the pilot re-engaged the autopilot, up to the point the aircraft stalled at 28 800 feet, the DC-10 was in this vertical speed mode. Meanwhile, airspeed was bleeding off and the aircrew were not aware of it. The autopilot was commanding an increasing pitch attitude necessary to achieve the selected vertical speed, regardless of the aircraft's airspeed or pitch attitude (which increased to 14 degrees nose up). Add the DC-10's stickshaker alert (which investigators determined was indeed activated) to the situation and you have multiple warnings available to alert an aircrew of an impending stall.

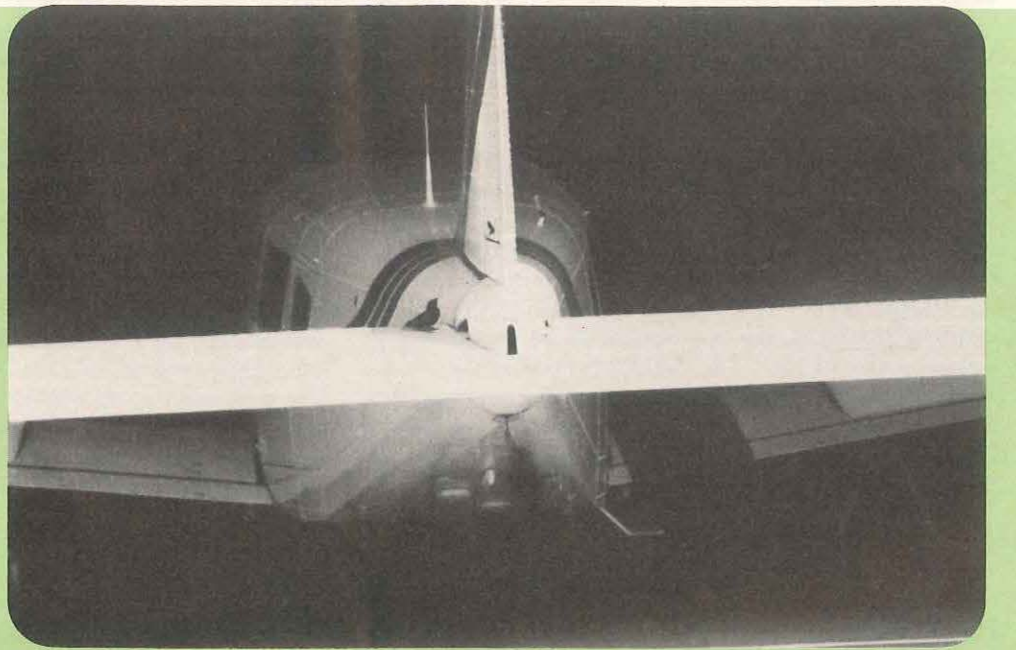
The Safety Board concluded that the crew's attention must have been diverted from the control of the aircraft and from instrument scan soon after re-engaging the autopilot at 14 000 feet. Believing that the autopilot was effectively maintaining a satisfactory climb attitude and speed, they were probably quite surprised at the onset of sudden vibrations, buffeting, and activation of the control column 'stickshaker'. They consequently misinterpreted the cues as an engine problem. When they retarded the number three engine throttle, the resultant decrease in total thrust along with the thrust asymmetry only aggravated the aircraft's entry into a full stall.

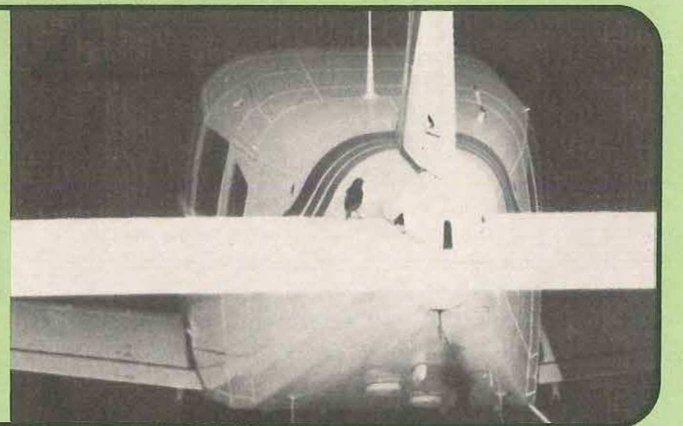
Probable cause

The NTSB determined that the probable cause of this occurrence was the failure of the flight crew to follow standard climb procedures and to adequately monitor the aircraft's flight instruments. Their inattention

(continued on page 15)

Bird proofing parked aircraft





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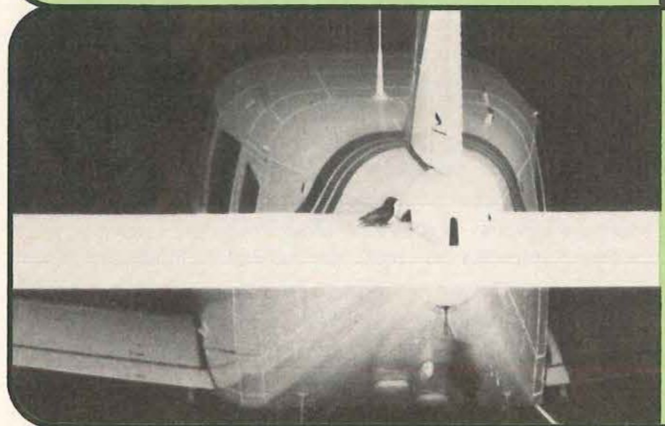

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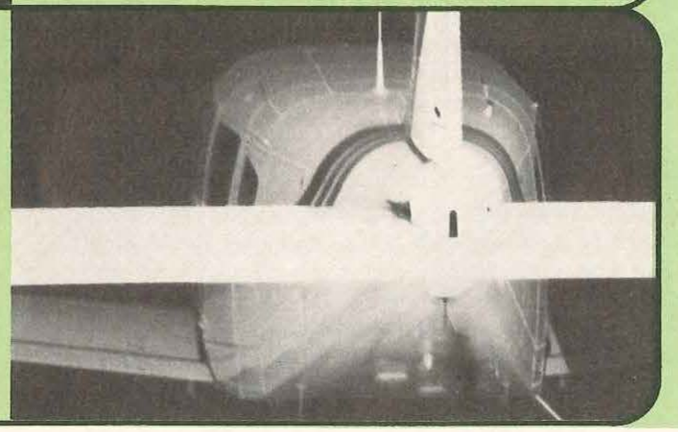


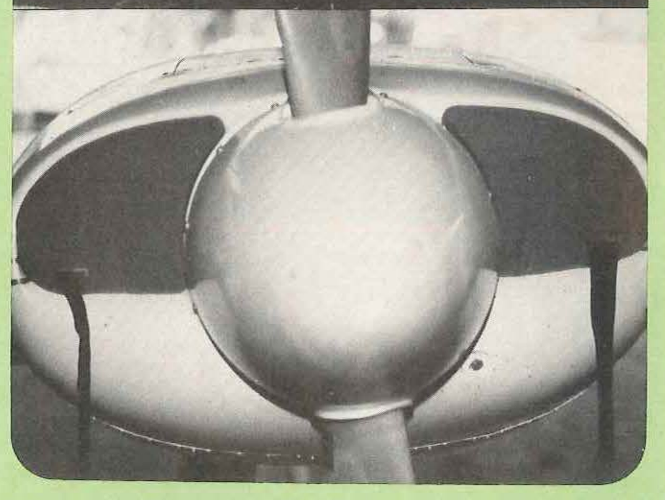
Gone!

Birds building nests in the various nooks and crannies of aircraft remain a persistent problem. While the accompanying photographs of a prospective tenant checking out its new home may appear amusing, the pilot who finds his controls jammed inflight is anything but amused (see *Aviation Safety Digest* 107, page 28).

Obviously, it is impossible to block off all available nesting sites, but the Latrobe Valley Aero Club, for one, has taken a positive measure to deny birds entry to the engine area — one of the most popular places for nests. This consists of using blanks which fit into the engine cooling openings in the engine cowls. Details of the blanks are as follows:

- made from low-density polyurethane foam
- cut out with the aid of a template and an electric carving knife
- red ribbons attached as warning flags.

The blanks can be inserted after allowing a few minutes for the engine to cool and are especially useful during the spring and early summer when starlings are nesting. The use of such blanks or covers would never, of course, obviate the need for a detailed visual check of possible nesting sites ●



(Thanks to the Latrobe Valley Aero Club for this contribution.)

Let George do it — but watch him!

(continued from page 13)

resulted in the jetliner entering a prolonged stall buffet which placed the aircraft outside the design envelope.

Although the crew failed to recognise the approach and entry to the stall they did, after approximately 1 minute, recognise the aircraft's stalled condition. They also responded with proper control inputs to recover the aircraft. A full minute for stall recognition is excessive, however, and at a lower altitude it could have very well caused the destruction of the aircraft and the deaths of hundreds of passengers.

The Safety Board also believed either a visual or aural warning device for the DC-10 would have aided the crew's stall recognition problem and might have prevented the material damage to the aircraft by causing the crew to react faster.

In this mishap the crew flew a transoceanic crossing to their destination after the occurrence. The violent and unexpected nature of the stall and recovery manoeuvre and the crew's lack of understanding as to why it happened should have been sufficient reason to get the plane on the ground as quickly as possible. Normal caution should have dictated this action.

In this case, 'letting George do it' would have been fine if someone had taken a more active interest in what 'George' was doing ●

Adapted from *The Mac Flyer*

★ ★ ★

Operations from dirt airstrips

A brief item on page 18 of *Aviation Safety Digest* 116 mentioned the danger of mud collecting in aircraft wheel fairings. The item outlined the case of a PA28 which had been operating from a dirt airstrip and which, during a wheel and brake inspection, was found to have nearly 10 kilograms of dirt caked inside each fairing. Clearly, this constituted a possible impediment to wheel rotation and braking.

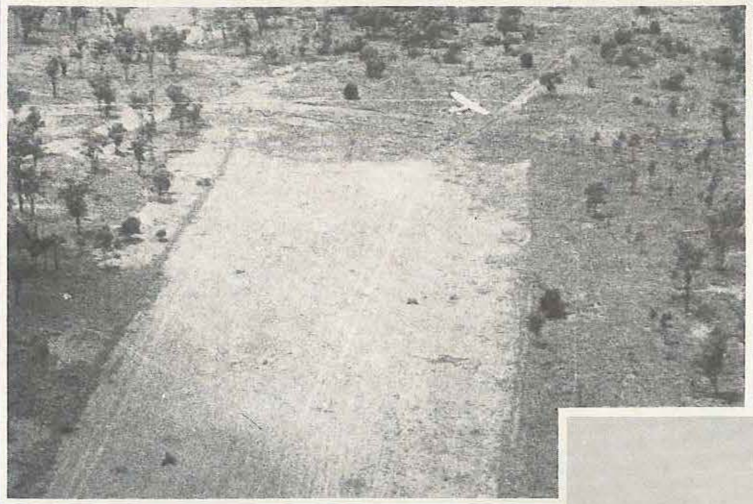
Since that item was written, a Jodel fitted with spats and operating from a wet, black soil strip nosed over on takeoff. The spats had filled with mud during the takeoff roll and prevented wheel rotation.

While damage was minor, the incident could have had far more serious consequences. Had the aircraft become airborne just before the spats filled, the black soil may well have solidified during flight, setting up the aircraft for an immediate noseover on landing, with all its attendant dangers for the pilot.

As the item in *Digest* 116 suggested, for sustained soft-field operations, temporary removal of wheel fairings should be considered. If this is done, engineering regulations, and the effect of removing the fairings on weight and balance, must be taken into account. If removal of the fairings is impractical, then a thorough visual inspection should be completed before each flight ●

There was no flight manual in the aircraft so the pilot 'eyeballed' the length of the strip and decided it was adequate . . .

. . . takeoff weight exceeded the climb weight limit stipulated in the P-charts . . .



. . . the pilot did not use his P-charts correctly . . .

. . . this ALA was too short for the particular aircraft to use for takeoff . . .

. . . and this one too short for landing.

Use your P-charts

A Cessna 210 was substantially damaged when it ran off the end of a landing area and down a gully. Although the landing area was 600 metres long, its effective length for takeoff and landing was reduced to 450 metres because of the infringement of trees on the approach/departure paths. Further, the area sloped down in the direction the pilot landed at an average gradient of minus 2 per cent. The pilot later recalled that he had used an approach speed of about 85 knots, and thought that he crossed the threshold 10-15 feet high at about 75 knots.

The landing distance actually required was subsequently calculated from the aircraft's flight manual using the following information:

aircraft landing weight	1446 kg
airfield pressure height	600 feet
temperature	33°C
strip gradient	minus 2 per cent
headwind component	7 knots

The distance required under the above conditions was found to be 633 metres and the approach speed 69 knots; that is, the landing distance available was 183 metres shorter than that based on a speed some 6 knots slower than the actual approach speed flown. Had the pilot consulted his aircraft's landing chart during his preflight planning, he would have been aware of this, and the accident could have been avoided.

Accidents which are attributable to a pilot's failure to use performance charts are an unfortunately persistent feature of Australian General Aviation. Of these accidents, those related to inadequate takeoff or landing distances are the most prevalent.

P-charts

Basically there are three publications to which a pilot may refer to obtain performance information for his aircraft. These are:

- the owner's manual
- the pilot's operating handbook
- the flight manual issued and approved by the Department of Aviation

The owner's manual and pilot's operating handbook are produced by the aircraft manufacturer and include performance information for a range of situations — range, endurance, en route power settings etc. They also include takeoff and landing data, but it is most important to note that this particular information is not authorised for Australian operations. The only approved takeoff and landing data are those in the flight manual issued by the Department of Aviation, and it is those landing weight charts and takeoff weight charts — generally referred to as P-charts — which pilots must consult to determine their aircraft's takeoff and landing distance/weight limits.

It is a requirement of the Air Navigation Regulations that the flight manual be carried in the aircraft at all times. From the information it contains a pilot can determine the suitability of an aerodrome for the operation of his aircraft, or the maximum weight at which he can operate the aircraft from a given runway or strip.

When to use P-charts

In the majority of accidents like the one described at the start of this article, the basic problem arises when a pilot does not check his P-charts and/or does not obtain an accurate measurement of the strip length.

It is not, of course, necessary to consult the charts before every flight. Obviously if you are taking off or landing on a 3000 metre runway in a light aircraft there is no need to check takeoff or landing data charts. But where is the dividing line — 700, 1000 or 1500 metres? This will be decided by a large number of variables, and *only* by reference to the P-charts can the safety — or otherwise — of that particular phase of flight be properly determined.

Any time there is the slightest doubt about your aircraft's performance capability, the charts *must* be used. You may be concerned by any one of a number of factors: the length and/or condition of the runway, a high-density altitude, a recognition of your own limitations or a lack of familiarity with the equipment you are flying are just some factors which may create doubt. In all cases, those doubts can be alleviated by reference to the P-charts. They will give you the information you need to enable you to plan your operations to cater for the prevailing conditions. For example, it may become apparent to you by consulting your P-charts that the load you intend carrying is excessive for the conditions, and that either passengers, cargo or fuel will have to be off-loaded. Indeed, it may even become clear — as it has after the event to some pilots — that a strip you would like to use is inadequate regardless of your aircraft's all-up weight.

The following sections of this article discuss the use of P-charts in aircraft with a maximum AUW of less than 5700 kg. There are sometimes minor differences between the P-charts issued for different aircraft types, but those used here remain representative of the common format.

Using the P-charts

Landing weight charts. The key information which can be obtained from your aircraft's landing weight chart is that of the maximum landing weight at which your aircraft can be safely operated into a strip of a particular length. Variables which are allowed for include airfield pressure height, temperature, strip gradient and the wind component. The data are based on an aircraft making an approach at a speed of not less than 1.3Vs (Vs being the stall speed) to within 50 feet of the landing surface, i.e. they allow for a 50 foot obstacle clearance. Data obtained are increased by a factor of from 1.15 to 1.43 (depending on maximum certified takeoff weight) to cater for such variations as pilot handling techniques and abilities, and aircraft age and condition.

The landing weight chart at Figure 1 is typical of those in flight manuals. In this case the pilot wishes to land on a strip 600 metres long. Following the example through, the pressure height of the strip is 6500 feet, temperature +5°C, the strip is level and there is zero wind; therefore, the maximum landing weight at which the aircraft can be flown into the strip is 1330 kg. A flap setting of 30 degrees and an approach speed of 77 knots IAS are stipulated.

Note that density height and climb weight limit information is also included on this chart. The climb weight limit is important should a baulked approach be necessary as, for a given pressure height, it defines the maximum weight at which the aircraft will achieve the stipulated climb gradient of 3.2 per cent at takeoff power, in the landing configuration, and at a speed not exceeding 1.3Vs. In the example, with a pressure height of 6500 feet, this maximum allowable weight is 1360 kg.

Takeoff weight charts. Like the landing P-chart, the takeoff chart allows for a 50 foot obstacle clearance, and includes a safety factor of from 1.15 to 1.25 (depending on maximum certified takeoff weight). In addition to the variables included in the landing chart, the takeoff chart provided as an example at Figure 2 also makes allowance for the nature of the airstrip's surface.

Following the example through, the airfield pressure height is 2200 feet and the temperature +30°C. The strip is 600 metres long, its surface is short wet or long dry grass, and it is level. With a 10 knot headwind, the maximum permissible takeoff weight is 1320 kg. Note that takeoff power and flap setting are stipulated, while a takeoff safety speed of 75 knots is also defined (this is the speed to which the aircraft must be accelerated in establishing the takeoff distance required).

Note also that a climb weight limit is defined (in this example, 1550 kg). This is the maximum weight at which, for a given airfield density height, and in the takeoff configuration with the landing gear extended, the aircraft will be able to achieve the stipulated climb gradient of 6 per cent at takeoff safety speed and takeoff power.

Summary

The use of P-charts is *vital* in preflight planning. It may be tempting to 'eyeball' the variables affecting your flight and decide that your aircraft will be able to give you the performance you need, but the fact is that small changes in operating conditions can often significantly reduce an aircraft's capabilities. Pilots must be thoroughly familiar with the charts applicable to their aircraft, and they must consult them on any occasion the slightest doubt exists regarding their aircraft's capabilities in any given situation. Preflight preparation is the basis of air safety ●

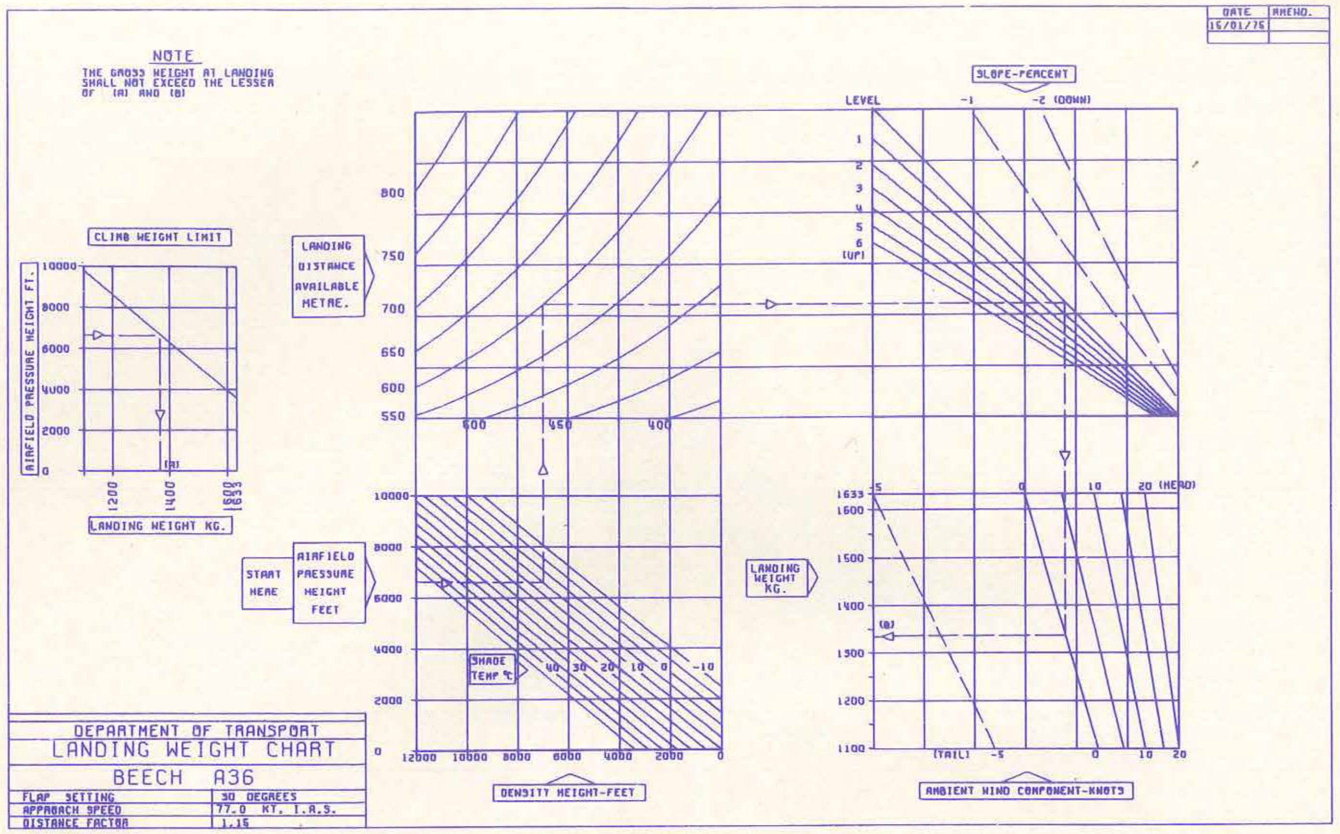


Figure 1

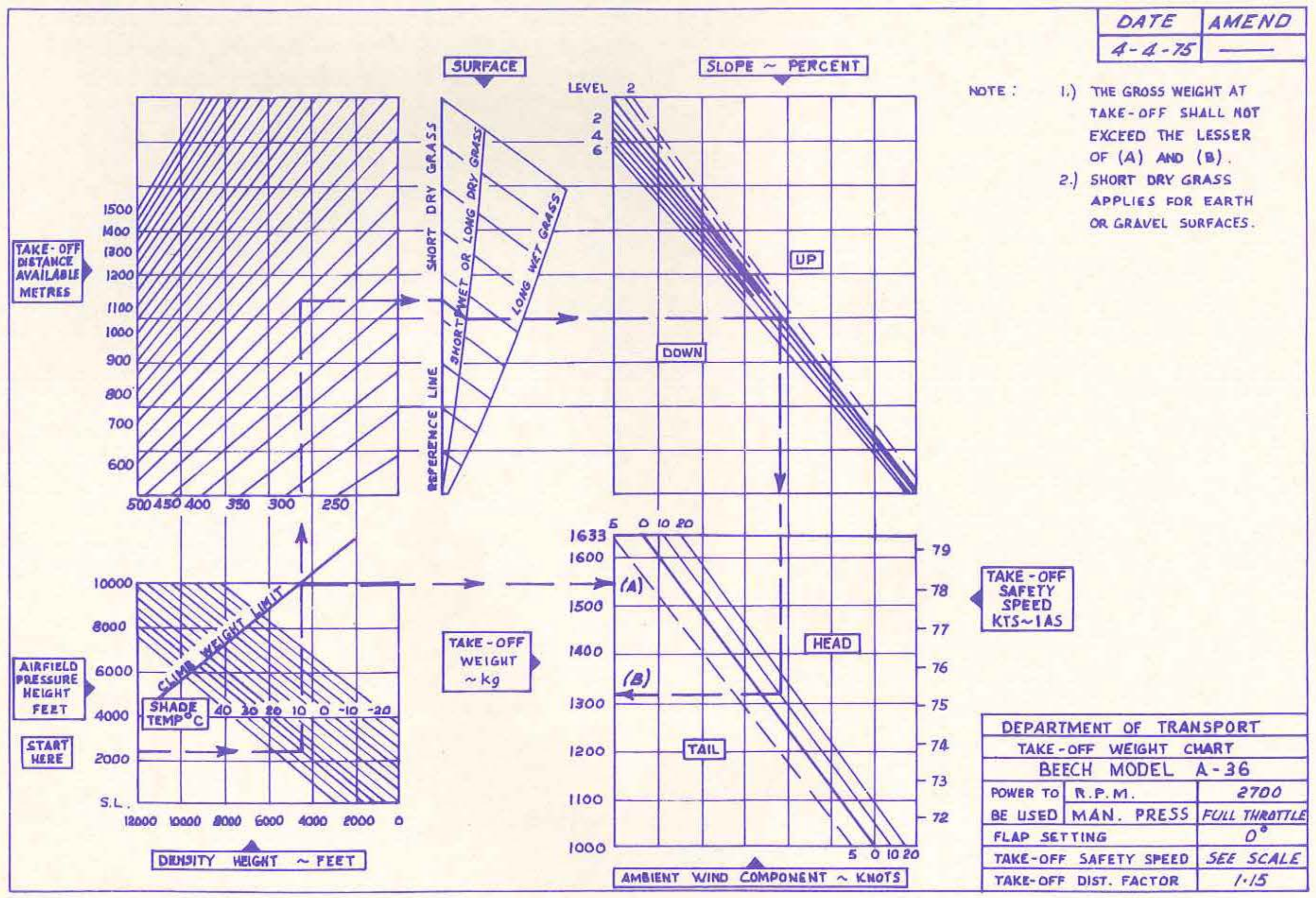


Figure 2

An ill wind

The effect of wind on the landing performance of aircraft is one of the first and most fundamental lessons of flying taught to all pilots. As an individual's experience level and skills increase, so too does his or her ability to safely accommodate more demanding landing conditions. Notwithstanding this, no pilot can afford to ignore the likely effect of wind; a careful assessment of surface conditions is essential before any landing is attempted. This article reviews an accident in which a pilot did not assess the wind speed, landed with an extremely strong tail wind, and substantially damaged his aircraft, a Beech Bonanza, when he overran a 758 metre landing area.

The accident

The pilot had arranged to take some of his family and friends out to his country property. Including the pilot the party numbered five and, with the fuel load carried, the aircraft's weight and centre of gravity were comfortably within limits.

After a mid-morning departure a routine flight to the property was made. Because the strip — which was aligned 155/335 degrees — sloped up towards the south-east, the pilot was in the habit of always landing in the 155 degrees direction. The gradient was 5 per cent for about the first third of the strip decreasing to 1 per cent for about the last half.

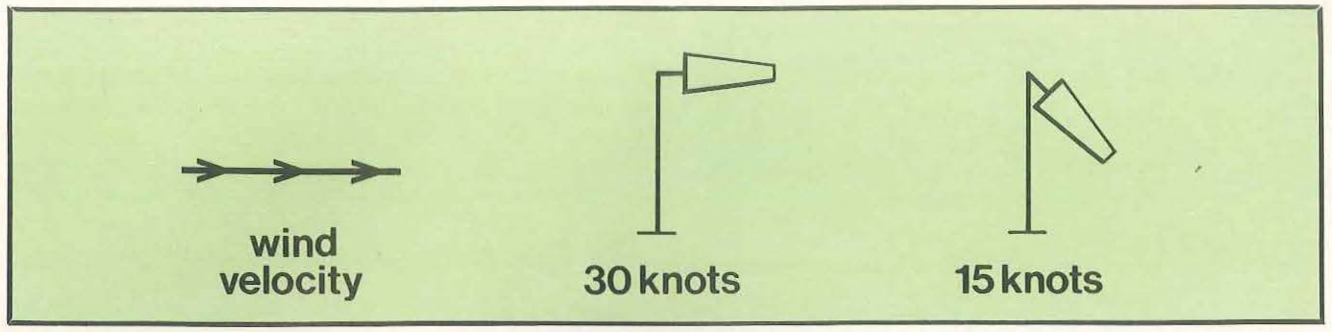
There was not a windsock at the landing area, but a nearby windmill was often used to gauge the wind. The pilot noted from the tail vane that the wind direction was from the north-west, blowing almost straight down the 155 degrees strip. As the mill's rotary vanes were locked at the time they could not be used to estimate the wind speed. However, the pilot was confident that conditions would be satisfactory as he had spoken by telephone to the property manager and another pilot earlier in the morning and both had reported the weather as fine.

The approach seemed satisfactory to the pilot, who later recalled that the airspeed indicator was registering about 80 knots — the speed he was aiming for — on final. He planned to land at a point about 220 metres from the threshold, which was the crest of the 5 per cent gradient. The aircraft actually touched down 300 metres from the threshold and the pilot stated that he experienced difficulty in getting the aircraft to 'stick' on the ground. He quickly realised that he was going to have problems in stopping the aircraft before the end of the runway and, as he considered a go-around was not possible, began to apply heavy braking. This did not have the desired effect, so in order to stop he deliberately ground looped the aircraft. This caused the left main gear to collapse and the left mainplane to strike the ground.

After the aircraft stopped the pilot shut down the engine and turned off the switches, and all of the occupants exited the aircraft unhurt. On getting out of the aircraft the pilot was surprised by the strength of the wind, which he estimated at 15-20 knots.

Analysis

In fact, the wind speed was in the order of 30 knots, almost directly down the 155 degrees strip. While the approach had seemed normal to the pilot, several witnesses subsequently recalled that the aircraft seemed to be travelling 'very fast' on final. Some simple calculations confirm that this must have been the case.



Description	*Wind speed (knots)*	*Visual clues*
Calm	1	Calm; smoke rises vertically.
Light air	1-3	Direction of wind shown by smoke-drift but not by wind vanes.
Gentle breeze	7-10	Wind extends light flag; leaves and small twigs in constant motion.
Moderate breeze	11-16	Raises dust and loose paper; small branches are moved.
Fresh breeze	17-21	Small trees in leaf begin to sway; crested wavelets form on inland waters.
Strong breeze	22-27	Large branches in motion.
Near gale	28-33	Whole trees in motion.
Gale	34-40	Breaks twigs off trees.

Note that if it is possible to determine the wind speed, then the direction should be obvious.

Based on the approach air speed of 80 knots, the aircraft would have normally achieved a threshold speed of about 75 knots. In normal circumstances, assuming a 10 knot headwind, the aircraft's groundspeed just before touchdown would have been about 65 knots. In this instance, with a 30 knot tailwind, the groundspeed would have been about 105 knots — an increase of about 60 per cent on the norm!

While there were several factors contributing to this accident, the matter of the pilot's failure to assess the wind speed is the most significant in terms of flight safety: given that the pilot concerned confined himself to one-way operations on that particular strip, he undoubtedly would have abandoned his attempts to land there had he appreciated the strength of the tailwind.

Assessing wind velocity

At the start of this article it was mentioned that one of the first lessons given to pilots is that of assessing the effect of the wind on landing, and this lesson will invariably include instruction on how to 'read' a windsock. Every pilot should know that a windsock which is being blown out parallel to the ground indicates a wind of about 30 knots, while one at 45 degrees to the vertical indicates about 15 knots (see diagram).

All authorised landing areas (ALAs) should have a suitable means of determining the wind velocity: at any unmanned aerodrome (including ALAs) a windsock provides the best means by which a pilot can assess the wind velocity. However, on occasions circumstances do arise which cause pilots to land at areas where no windsock is available. If you find yourself in that situation, then the above table showing how to assess wind speed may be of use. This table is an extract of information provided to meteorological observers by the Bureau of Meteorology.

Crosswind

While this discussion has concentrated on wind speed, it is also most important for pilots to be able to assess any crosswind component. Many Pilot's Operating Handbooks contain graphs for this. Sometimes, however, it is difficult to use graphs inflight, so the following guide may be of use:

If the wind direction is 30 degrees off runway heading, the crosswind component will be half of the windspeed; for 45 degrees off it will be 0.7; and for 60 degrees 0.9.

For example, if you were landing on runway 36, the following crosswinds would apply:

Wind	*Crosswind factor*	*Crosswind component*
330/20	0.5	10 knots
315/20	0.7	14 knots
300/20	0.9	18 knots

Summary

While the effect of wind on landing performance is one of the first and most important lessons taught to pilots, some continue to ignore it — often to their regret. A careful assessment of wind velocity — that is, both direction and speed — is essential before any landing is attempted. If circumstances force you to land at an aerodrome without a windsock, then you should be prepared to be able to use the terrain to make your assessment ●

Reader contribution

Door open in flight

An article in *Aviation Safety Digest* 115 discussed the difficulties faced by the pilot of an aircraft on which a door came open in flight. He suddenly found himself operating in a very noisy and disturbing environment, allowed himself to become distracted from his prime task — that of completing a safe landing — and so his problems compounded.

Subsequent to printing that article, the *Digest* received a reader contribution concerning a similar incident, and from which several valuable lessons can be drawn. Of particular interest is the way in which the pilot assessed his situation, determined courses of action open to him and then made his decisions.

* * *

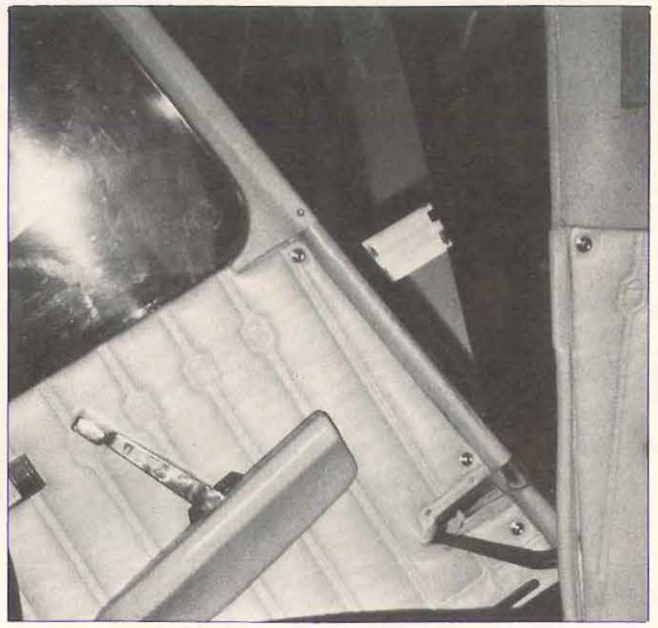
'I was returning from Condobolin to Moorabbin in a Cessna 182RG with two passengers. The weather forecast had been satisfactory and I had filed and flown a VFR plan without any difficulties. We had passed Kilmore, planning to track to Moorabbin via Yan Yean. Cruise altitude was just below 3000 feet, while a 65 per cent power setting of 23 inches manifold pressure and 2100 RPM was giving us the advertised IAS of 135-140 knots. The only cloud was high above us, while there was slight to moderate convective turbulence. The wind was steady from the north-west at 10-15 knots.

'Immediately before the incident we unexpectedly encountered heavy convective turbulence which resulted in the Cessna sustaining two or three rapid and very hard applications of positive g. These applications were strong enough to make the aircraft's structure creak. At that time I had my left hand on the control wheel and was resting my left elbow on the door-mounted arm rest, while my right hand was on the throttle. Because of the severity of the turbulence, it was my intention to close the throttle and reduce IAS.

'Suddenly, there was a very loud, sharp noise and a flood of light poured into the cabin. The cockpit was scoured by a blast of air and a deafening roar; papers and loose clothing started flying about. This was accompanied by the aircraft yawing and rolling to the left. At the same time I was startled to notice that there was nothing between me and the ground — the left-hand side of the aircraft seemed to have disappeared.

'My first thought was that the aircraft had suffered a structural failure, particularly as it did not immediately respond to control inputs (later I concluded that this was probably due to the effect of the continued turbulence). In an attempt to regain control I closed the throttle, extended the landing gear and slowed to 90 knots. Having established control I started a descent, put the mixture to rich, applied power, lowered 10 degrees of flap and maintained 85 knots. Although skidding to the right, the aircraft remained controllable. The noise level was very high.

'At this stage I remembered my rear-seat passenger and, looking back over my right shoulder, was relieved to see that he was still there. I declared a PAN to Melbourne Flight Service, advising them that I thought the left-hand door had completely separated from the aircraft. Just after this R/T call I noticed that the door was still with us; it was hanging by its restraining strap (which is meant to prevent the door from opening too far) and appeared to be resting on the undercarriage leg or the wing strut. The combination of these restraints and the airloads seemed to be holding the door in place. However, I noticed that when I applied rudder to correct the aircraft's skid, the door began to flap alarmingly. Needless to say, I did not persist with attempts to remove the skid.



'The fact that the door was still on the aircraft introduced a new factor as well as those I already had to assess before deciding what to do. Specifically, I was now concerned that if the restraining strap broke the door might fly rearwards and strike the empennage, making the aircraft uncontrollable. There was also the possibility that the door could injure someone on the ground if it fell away. In an attempt to circumvent both of these possibilities I removed my leather trousers belt, passed it through the door handle and knotted it around the aircraft's seat belt attachment.

'I was now in a position to consider how best to get the aircraft on to the ground. Whittlesea airstrip was the closest available; however, I was not familiar with the airfield, and did not know the radio frequency for its traffic. Further, Whittlesea does not have the emergency services that are available at Moorabbin, and I was concerned that the disturbance to the airflow caused by the door might create difficulties in the approach, or that the door might come loose on landing and damage the landing gear. Consequently, I elected to continue to Moorabbin and advised Melbourne of my intentions. Ground-air communication remained very difficult — as did that inside the aircraft — because of the high noise level.

'I tracked to Moorabbin OCTA, avoiding built-up areas as far as possible. A straight-in landing for Runway 17C was approved, and 20 degrees of flap only was selected to minimise aircraft configuration changes. The landing was poor because of my nervousness and the fact that I did not trim out the drag-induced yaw on finals, but rather tried to hold the aircraft in balanced flight by use of the rudder. Although the landing was not as smooth as I would have wished, it was safe enough, and I was able to taxi the aircraft to its tie-down point.

'Post-flight inspection revealed that the hinge pin on the upper door hinge had sheared, allowing the leading edge of the door to protrude into the airflow; the 140 knot slipstream had then "peeled" the door open. The restraining scrap stopped the aft movement of the door, while the wing strut stopped it dropping downwards. It was also interesting to note that in its final position, the door was acting to "scoop" air into the cabin.

'The only other thought I have had on this occurrence which may be of use to other pilots concerns the temperature in the aircraft's cabin. When the door came off the outside air temperature was plus 20 degrees Celsius. Had the door come off where the aircraft was not in warm, dry air and only 20 minutes from landing, the wind-chill aspects may well have had an important bearing on the outcome.'

* * *

Aviation Safety Digest would like to thank this pilot for relating his experience for the benefit of other readers.

Reader contributions are generally well received by those who read the *Digest* — most of us can relate to them. If you believe you have had an incident with a flight safety message for the rest of us, then please send it in, even though you may have already submitted an air safety incident report ●

Aircraft tyre care

Maintaining the correct inflation pressure in an aircraft tyre is one of the most essential factors in obtaining maximum safe service life. Inner tubes and tubeless tyre liners used in most automotive tyres are made of butyl rubber. Most aircraft inner tubes and tubeless tyre liners, on the other hand, are made of natural rubber to satisfy extreme low temperature performance requirements. Natural rubber is a poor air retainer when compared with butyl rubber. This accounts for the comparatively high daily air pressure loss and need for frequent pressure checks of aircraft tyres.

Daily inspection of tyres includes checking the pressure. This can only be done properly with calibrated gauges. Do not let an improperly serviced tyre cause an aircraft accident/incident or injury to personnel. Ensure that tyre-servicing equipment is in good working condition and properly calibrated ●

You were saying . . .?

A Flight Engineer Union representative in the U.S.A. was appearing before a Presidential committee enquiring into airline flight crew complements. After describing the necessity for a 'third pair of eyes' in the cockpit, the representative stood up and walked into a broom closet on his way out of the hearing ●

In brief

A Cessna 172 RG was contracted to fly two passengers from an international airport to a large country town. Arrangements at the airport did not proceed according to plan, with the result that the pilot became distracted and completed his preflight inspection in a piecemeal fashion. While the engine run-up and takeoff were normal, at 400 feet on the climb-out the pilot noticed a high cylinder head temperature. The pilot then realised that he had forgotten to remove the engine covers (inserts into the cowl openings) used to prevent birds from nesting in the aircraft. He turned back immediately and effected an uneventful recovery.

As a sequel to this, the pilot concerned has since taped the engine covers to the pilot head cover to make them more obvious. The incident also confirmed the value of a temperature/pressures check soon after takeoff.

* * *

Shortly after takeoff, smoke became visible in the cockpit of a Cessna 206. The smoke disappeared while the aircraft was returning to base. The engine had just undergone a periodic inspection, including the replacement of No. 2 cylinder. It seems probable that a few drops of oil entered the exhaust heater shroud at that time. ●