AUSTRALIA

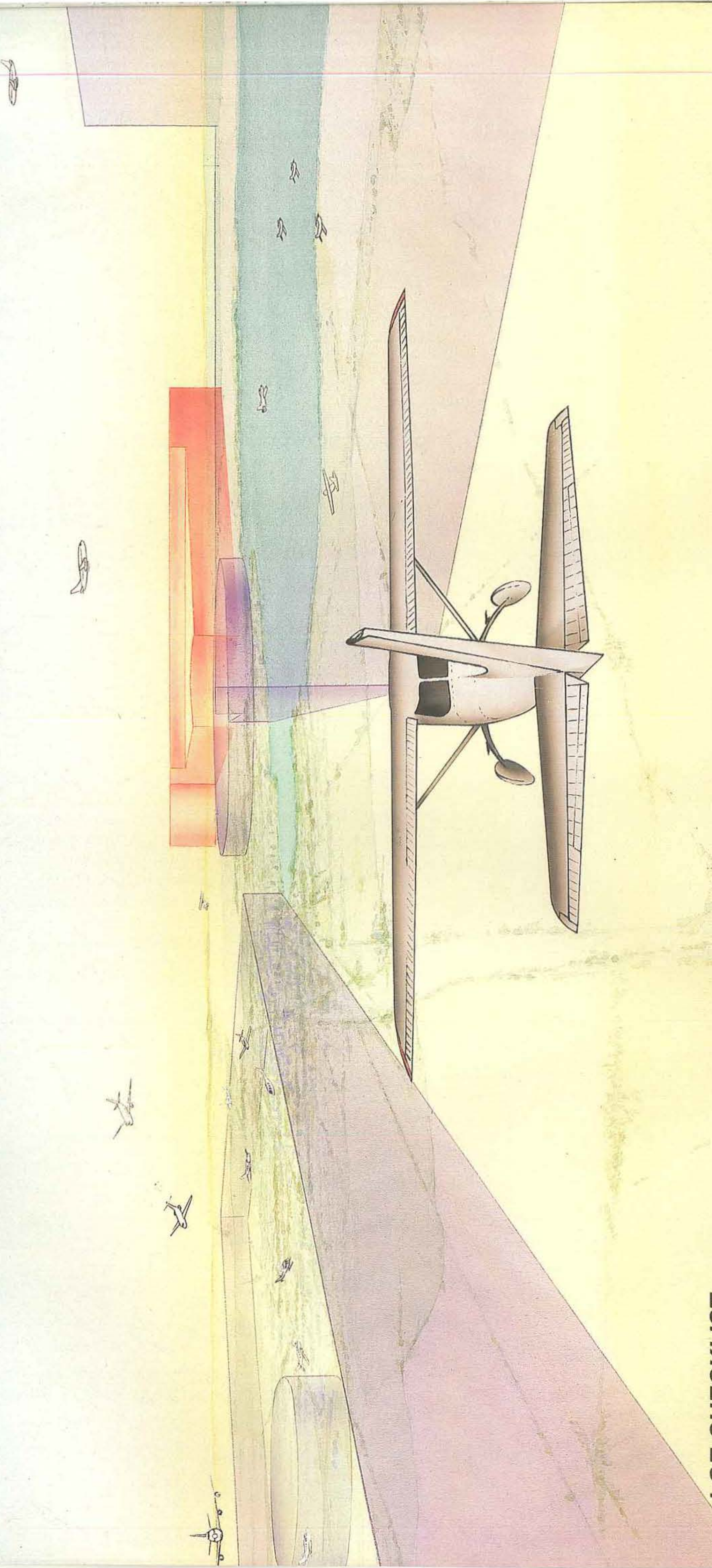
Aviation Safety Digest

ASD 143

SUMMER 1990

CIVIL AVIATION AUTHORITY AUSTRALIA

DOWN THE LANE...



LOE CHECKLIST

- Flight plan - requirements are on the back of the VTC
- Reset DG and check for precession just before entering
- Watch the wind - track is not heading
- Keep to your planned altitude
- NAVIGATE NAVIGATE NAVIGATE - slow down if vis deteriorates
- Eyes open for other traffic (denser near destination)
- Keep to the right and break right if in conflict
- Review your approach plan - circuit entry/ altitude
- Airfield in sight? - DO NOT RELAX - it's still see and be seen
- Be prepared to be sent round - have your plan of action ready

IF IN DOUBT, DON'T MESS ABOUT - TELL ATC!

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Statement by Ron Cooper

General Manager, Standards Development

AVIATION IN AUSTRALIA depends upon the skill and care of those involved in the industry, operating within a rational and appropriate framework of safety standards. The better the framework, the easier and more efficient it will be for the industry to provide safe aviation for more people. The development of a better framework of aviation safety standards is a challenging and rewarding task that has been allocated to Standards Development.

I took up the position of General Manager of Standards Development in February 1989 and have since spent much time refining the organisation to allow us to get on with the review and development of standards to the benefit of both industry and the travelling public.

We are currently bringing to a conclusion some projects that might be termed 'long-standing', the flight crew licensing review and the classification of flying operations being two obvious examples. Our intention is to simplify the legislation to remove administrative action and requirements that do not add to safety, and so reduce costs and inconvenience. I expect that, by the end of the year, flight crew licences will no longer need to be renewed — a current medical slip will be all the validation necessary.

Action is well advanced to revise the rules governing the use of ultra-light aircraft; CAO 95.55 and its related orders are expected to be in effect by the time you are reading this edition.

Following consideration of the first report of the Air Safety Regulation Review Task Force, a decision has been taken to adopt a two-tier legislative framework. This will require all mandatory requirements to be contained within the Civil Aviation Act (first tier) or the Civil Aviation Regulations (second tier). Information to assist people in aviation to comply with the law will be made available as Civil Aviation Advisory Publications. This system will be introduced progressively, in line with the review of particular standards. The two-tier format will replace existing CAOs relating to a standard, and the aim is to have the more simple system completely in place within four years.

Review and development of safety standards is a major step towards providing benefits to the industry and the travelling public alike: I am both enthusiastic and optimistic about the future of aviation in this country.

Editorial

WE HAVE SEEN over the past few months, and probably will see in the near future, turbulence (pun intended) in the aviation industry; it may be some time before stability returns.

Standing aside from the infighting are the eternal verities of aviation: training, responsibility, and gravity. Knowledge gained from diligent application of the first two will go a long way towards conquering the third. Knowledge is what the Digest tries to offer every pilot. The BASI Journal most effectively sets out the accidents, and you will profit from perusal of that publication; we attempt to keep you out of their (bulging) files, and incidentally, out of the hands of Al Bridges, my predecessor and Editor of ASD's 141 and 142, who has moved to a senior position within the Bureau. We extend our good wishes for his new job.

Mr Cooper's statement indicates that, whereas the law is the law, a somewhat simpler presentation should enhance comprehension and thus compliance. The 'rules' are designed to offer flight safety to those who know and remain within them. It is always as well to remember that just *flying* an aircraft requires lots of ability and attention — in this business doing the unexpected merely loads the odds against you.

Following the pieces on mid-airs in ASD 142, we now present an accident from which the pilots walked away. Applied knowledge in this case saved them both: it is worth reading — the principles involved apply to any aircraft, and the lessons are there for the taking.

Also, this edition welcomes 'Ground to Air', the beginning of what I hope will be a regular feature giving Air Traffic Services a voice in this forum. The blow-by-blow record of a run down the lane to Moorabbin should be read in conjunction with the GAAP poster from ASD 141 and this edition's back cover. There is an awful lot of controlled airspace around our capital cities — not to hinder pilots, but to help them. No-one should be apprehensive about taking advantage of what is a very good system. As I say somewhere else, 'the Air Trafficker is your friend!'

Finally, a few lines to introduce myself: 20 years navigator RAF, five with the RAAF (radar controller, Tullamarine), eight with Aviation, DoTC and CAA, mostly in Flight Standards. I have been writing for Australian and overseas flight safety publications for many years and maintain a passion for general aviation. My aim, therefore, is relevant articles, interesting letters, controversy where productive, but with accuracy as top priority. After all, *never* was I more than half a mile off track.

Covers

Front: The cover picture by Brian Westin titled 'Avoiding Action-Whose Environment' is the winner of Category Two of the NIKON/ASD photographic competition.

Back: Poster design and production by Norm Wintrip

'...and live to talk about it!'

Scenario

Both pilots were at Horsham to compete in the annual 'Horsham Week' gliding competitions. On the day of this accident no task had been set but both pilots had taken the opportunity to make pleasure/familiarisation flights of the area.

At the time of the accident the two aircraft were at approximately 5000 feet above sea level. VH-HDY was flying towards Horsham on a constant heading of approximately 330 degrees. The aircraft was in a descent and the pilot estimated he was about 1000 feet below the cloud base. Cloud cover was reported as six eighths of cumulus type cloud.

VH-KYO was flying in the opposite direction to VH-HDY, also on a constant heading at the same altitude. The pilot of VH-HDY reported that he had just completed a scan of his instruments when he looked up to see the other glider head on. He was unable to prevent a collision. The pilot of KYO reported that he had also looked up from concentration on another task, to sight the other aircraft head on at the very last moment. He had no time to take any avoiding action.

The right wing of HDY hit the nose/cockpit area of KYO, smashing the canopy, dislodging the instrument panel and damaging the nose. HDY lost part of its right wing, became uncontrollable and the pilot took to his parachute. The pilot of KYO received injuries to his right foot and face in the collision but was able to maintain control of the aircraft and fly it back to Horsham where he made a safe landing in a paddock beside the aerodrome.

At the time of the accident both aircraft were operating in an environment where the pilots were responsible for maintaining separation from other aircraft on the basis of see and be seen. In this accident both aircraft were approaching head on, both were gliders with thin wings and narrow fuselages, both were essentially white in colour when viewed from head on and both were against a background of whitish coloured cloud. Such circumstances would have made it very difficult for either pilot to sight the other's aircraft.

This is a difficult accident upon which to make any meaningful safety recommendations. What it really boils down to is that the accident occurred because the pilots did not see each other's aircraft. They were operating in a see and be seen environment yet failed to see and be seen. Both admitted that they had not been looking out immediately beforehand but both had been on a constant heading for a considerable period prior to the collision. Both had been following the same 'cloud street' but in different directions.

The accident was discussed in depth with the Gliding Federation and a point it made was that when there are cloud streets existing a pilot should always keep it in mind that someone else will no doubt be following the same street and not necessarily on the opposite side of the road. It is a time for extra vigilance, and in this case that was exactly the situation.

An idea that comes to mind for accident prevention when considering the above is 'at what distance could a pilot reasonably be expected to see another glider in a head on situation, such as was the case in this accident?' Gliders head-on do not present much to the eye.. A glider that is basically white against a whitish cloud background obviously makes acquisition very difficult.

It is recommended that some research be done on this area with a view to publishing some meaningful information to the gliding fraternity. Whether the research be done within BASI or outside can best be decided by BASI Central Office. Allied to this subject are closing speeds and reaction times. In this case the closing speed was approximately 170 knots.

Both Duncan Ferguson and Bob Irvine are very experienced glider pilots, and have written for us two detailed and efficient accounts of the accident. Having accepted the fact that the mid-air perhaps was preventable, it is a pleasure to publish 'success' stories such as these, wherein are covered practically all aspects of post-collision survival...

Duncan Ferguson

Saturday 6th February was to be the first day of competition for Horsham Week 1988. Since there had been a lot of rain overnight, the competition organisers decided to cancel the day rather than risk outlandings in boggy paddocks. However, local flying would be permitted in the afternoon.

I decided to take the opportunity to further familiarise myself with VH-KYO, the LS4 I had hired from Euroa Soaring Centre. I launched to 2000 ft at around 4.45pm local time. The surface wind was about 15 knots SW and soaring conditions looked good with 4/8 Cumulus at about 6500 ft.

I quickly climbed to around 6000 ft and about 20 minutes after launch decided to follow one of the cloud streets that led south towards the Grampians. The street was working well and I was able to maintain height without turning between 5000 and 6000 ft as I headed south.

I reached a point about 10 km south of the aerodrome, cruising at about 90 knots (IAS), when I collided head-on with the ASW-20B.

I had seen him only just before the impact. He was coming straight at me — his fuselage slightly to the right of mine, wings and pitch level. I had no time to take avoiding action.

Not surprisingly, the impact was violent but brief. My first reaction was disbelief. The canopy had gone, the upper half of the nose of my glider had been destroyed and the instrument panel had been bent towards me and across to my left. I was aware that I was injured but I had not lost consciousness and felt alert.

With considerable damage to the glider and the airflow blasting my face my first decision was to jump and use the parachute. I quickly released my harness and located the ripcord handle with my right hand — careful not to pull it at this stage. Since I had plenty of height — about 5500 ft — I took a couple of seconds to tighten the straps on my parachute.

I then realised that the glider was still flying wings level but in a slight dive. Although I didn't really believe it would be controllable, I thought it worth trying; I had plenty of height to jump if it became necessary.

I took hold of the stick and successfully raised the nose, happy to feel the reducing airflow on my face. The aircraft felt normal. I quickly decided that it was worth further investigation. Again I let go of the stick in order to re-latch my harness I latched the waist straps only. I then systematically tested all the primary controls — elevator aileron and rudder. All functioned normally, so I flew several gentle 'S' turns without incident. I had no instruments but felt this of little concern. I looked at each wing and they looked fine. Since there was no canopy and I only had waist straps on I was able to sit upright and turn my head to examine the tail. It looked normal except that the Brunswick tube on the fin was bent considerably. This was the only damage I could see outside the cockpit area.

At this stage I decided that a landing might be possible. The only other control I needed for a safe landing was the air brakes. Not much time had passed so I considered that I still had well over 4000 ft — still plenty of height to jump should the airbrakes cause some failure in the wing. I gently cranked the brakes open and extended them to about two-thirds of their limit. Everything felt normal so I closed them again.

I was then satisfied that the glider was probably capable of being landed; I recognised that it was likely that there would be other damage to the airframe but the glider felt fine. The only other question was whether I was well enough to carry off a safe landing. I didn't feel too bad. I knew that there was something wrong with my right leg and foot but I could work the rudder. There was a lot of blood around. My left arm and face were bleeding a lot. My left eye had obviously received a thump because it was already swollen to the point where I couldn't open it. I could see clearly out of my right eye, taking into account the irritation of the airflow in my face. I felt around my face and head to see if there were any more serious injuries but found none. I felt alert and reflected on the fact that I was thinking clearly. I committed myself to a landing.

I decided that the safest way to descend was at a low airspeed and without airbrake. Although I would be airborne longer, this would put minimum stress on the airframe. Since I would be achieving a reasonable glide angle in this configuration I decided that I may as well head towards the aerodrome. I wasn't overly concerned about reaching the aerodrome but I thought it was worth a try.

The single fact that most concerned me was my vision. My good eye (the right one) was being blocked by blood from cuts on my face. A couple of times this completely obscured my vision. I used my left hand and part of my shirt to clean out the eye regularly during the descent.

I tracked well to the east of the city of Horsham and then towards the aerodrome. I could see by judging the angle to the aerodrome that I was going to make it easily.

I decided that the landing should be conducted with the main wheel retracted. This would minimise the ground run — thereby eliminating the risk of damage due to loss of control on the ground. I was also concerned that lowering the wheel might cause further strain on the structure with the attendant risk of structural failure.

I decided to land directly into wind in a paddock immediately adjacent to the duty strip and the Pie Cart. I felt that a landing on the duty strip would carry an unnecessary risk of damaging one of the many gliders tied down alongside should I loose control near the ground. I had had a good look at the paddock before take-off. Ironically, a training glider pilot had asked me whether this particular paddock would be a suitable choice for an outlanding. It was. I felt that a landing within sight of the Pie Cart was a priority since I wanted to attract the attention of the people in the area. I knew I would need medical attention and I could also alert them to the fact that there was probably another pilot in trouble.

I flew to a point directly downwind of the Pie Cart area, arriving at a good height for a long straight-in approach to the paddock. I had a very gentle left turn onto long final. Everything worked well. I left the wheel up and used half airbrake during the first part of the approach. The touchdown was gentle but the ground run was very short. People from the Pie Cart soon came to my assistance and called an ambulance.

Bob Irvine

I am a very keen competition glider pilot, and after placing third in the Australian National Championships, I decided to share a glider with the other members of my club in Horsham Week, which is one of the biggest non-championship gliding competitions on the calendar, and competitors vary from beginners to champions. I enjoy both the low-key flying-for-fun atmosphere and the ideal gliding countryside around central Victoria.

On the first day no task was set, due soaking rain and high wind. By afternoon, however, conditions had improved sufficiently to allow our club's UK visitor, Cynthea, to launch the ASW 20 sailplane for an area famil. She flew for an hour and a half below 7/8 Cu, finding strong thermals in the moist, unstable air. I then launched at about 4pm and found conditions very good: thermals of 600/800 fpm to the 6000 ft. cloudbase.

I flew south to the Grampians, a mountain range of considerable ruggedness and beauty, some 50 km south of Horsham. Because of the close spacing of the cumulus clouds, I was able to stay high, frequently near the cloudbase and never below 4500 ft. This made it ideal to explore the otherwise forbidding region without the risk of an outlanding. As I approached the mountain peaks surrounding Wartook Reservoir, I deliberately climbed close to the cloudbase (6500 ft. over the peaks) to keep a healthy safety factor for a glide, if necessary, to the nearest paddocks, 25 km away. In the event, this was not needed; the lift so regular that I could maintain altitude near the bases, simply by flying from cloud to cloud and slowing down in the best rising air ('dolphining'). Thus I made my way back to Mt Stapleton, 33 km from Horsham.

Since I was above 5500 ft. at this point, and the countryside steadily fell away to flat farming land, I was in easy gliding range of Horsham Airfield, even allowing for the strong westerly drift. I decided to RTB direct, heading considerably upwind of the now-visible airfield in order to counter the drift, frequently looking at my destination as confirmation that the glide angle was satisfactory.

It is useful practice for competition gliding to carry out realistic glides to the airfield from various directions, learning to recognise important landmarks and the general look of the place, so that in actual competition no time is wasted on the 'final' glide. If the pilot leaves his last climb with insufficient height, and glides down too low before recognising the need for more height, he may be unable to find more lift and thus be committed to an outlanding, or, in competition, be forced to use 'weak' lift and thus waste time gaining the required height. On the other hand, if he leaves with excess height, and fails to recognise this, he will arrive at his goal without having taken advantage of the energy surplus. The correct technique is to start with an excess of height and fly at an appropriately higher airspeed, as the excess height is recognised with greater and greater accuracy, reducing the excess only when the circuit area is reached.

However, I was well over the required height, and making no attempt to fly the correct speed as I approached Horsham town. My memory tells me that I was at about 5000 ft and 70-80 kt. Then, as I lifted my eyes after an instrument scan, I saw another glider, head-on and *very* close, directly in front of me. I judged it to be just above so pushed the stick hard forward; in what seemed like 2-3 seconds it passed over the top of my cockpit.

I almost had time to think 'Missed!' before I heard the bang. My aircraft continued to pitch down into a steep dive — attempts to pull out were quite ineffective and I was experiencing negative 'G'. I decided there and then that I had no control in pitch and would have to bail out.

I consciously located and identified the red canopy-jettison handles on each side of the cockpit. A moment of indecision — 'Should I go?', but the aircraft was now past the vertical and I was hanging in the straps, so I had no choice. I jettisoned the canopy, which immediately tore out of my hands in an explosion of plexiglass and a roar of air. My glasses and maps vanished with the debris sucked out by the wind.

I remember staying quite calm, and thinking through my actions. Since I was hanging in the straps, I would fall out as soon as I released my seatbelt, I decided to locate the parachute ripcord before I departed. I grasped the handle with my right hand (a little awkwardly, as it was jammed between my left side and the seatpan), then pulled the seatbelt release. I immediately fell cleanly from the aircraft. I pulled the ripcord until it was completely out of the pack and a few seconds later saw the parachute snaking out behind and above me. Because I was falling head-down, the view I had of the opening was between my legs — it seemed strange... I had expected a large jolt as I came to the end of my tether, but it was surprisingly gentle as first I was snatched upright by the shoulder straps then arrested by the leg harness. Everything went extremely quiet.

Several seconds later, I saw my glider above me, inverted. It passed below and continued down in a flat spin It seemed to take ages to descend, but then impacted in a ploughed paddock below. The sound of the crash snapped me out of my calm reaction phase; I could now feel the adrenaline in my system and for the first time felt fear. I craned my neck, but couldn't see another glider, or even a chute.

The next few minutes were a condensed lesson in parachute flying. I practised turning (by pulling the bundles of lines behind each shoulder) — yes, I could turn, but turning created large pendulum swings as well. So I practised not turning. The wind was pretty strong (20 kt), so I headed into it. Even so, the landscape under me moved backwards and it was hard to see where I was going Eventually I realised that the ground was rapidly approaching, and I was safely over one fence and clear into the next paddock. The landing (bent knees) and backwards roll were not elegant, but I was up and ready to reef in one side of the canopy as it fell, before the wind could reinflate it. It was a bit of a struggle, but I eventually managed to collapse my friend the parachute. Then I could relax.

I walked to a road, followed it to the highway and called Horsham from a farmhouse (it wasn't easy — the lines were engaged: I wonder why?). They told me the other glider had 'crashed' on the airfield, and the pilot was injured.

When help arrived, we went back and examined the wreckage. To my surprise, the tailplane hadn't been struck, but the starboard wingtip, including the aileron, had lost 2.5 metres. It seems that after the collision the aircraft entered an inverted spin because it was at a negative angle of attack (as I attempted to dive) when it received a large yawing moment (impact) and rolling moment (asymmetry of the wings).

So what have I learned? Well, the importance of a good lookout is obvious. I *think* my attention in general was outside the cockpit and in the direction it needed to be (ie focused on the distant ground, out near the horizon ahead). But a glider *[any aircraft? — ed.]* approaching head-on is hard to acquire.

Bailing-out? Glider pilots always wear parachutes in competition; most strap them on at all other times, except perhaps for circuit training. The majority of our sailplanes are designed with bail-out in mind. The ASW, for example, has a plexiglass canopy 1.8 m long and, when jettisoned, the complete canopy, frame and all, is blown away. The instrument panel then springs upward, allowing the pilot an unobstructed escape-route. It was also obviously well worth-while that I had familiarised myself with the emergency exit procedures and parachute operation. Having this knowledge kept me calm and helped me work through the procedures without panic.

This is not to say I advocate parachute training for all! The modern safety chute operates reliably for even unskilled operators, in the most difficult of circumstances.

I have always said that I would do my first jump when the wings come off. They did, and I did. *And it saved my life* □

Nikon

AVIATION PHOTOGRAPHIC COMPETITION

The Digest competition was a great success, attracting over 200 entries, most of an exceptional standard. My thanks to all those people who participated and made my job and that of the two other judges so difficult! The winners are:

Category One: The open category for the best overall photograph was won by **James Dobbin** for his *Tiger Moth Over Cairns*. This picture is featured below; James wins a Nikon f-401 Auto-Focus SLR camera with a 50 mm FL.8AF lens.

Category Two: The category for a photo on a safety theme was theme **Brian Westlin**, for *Avoiding Action — Whose Environment?* (cover picture)

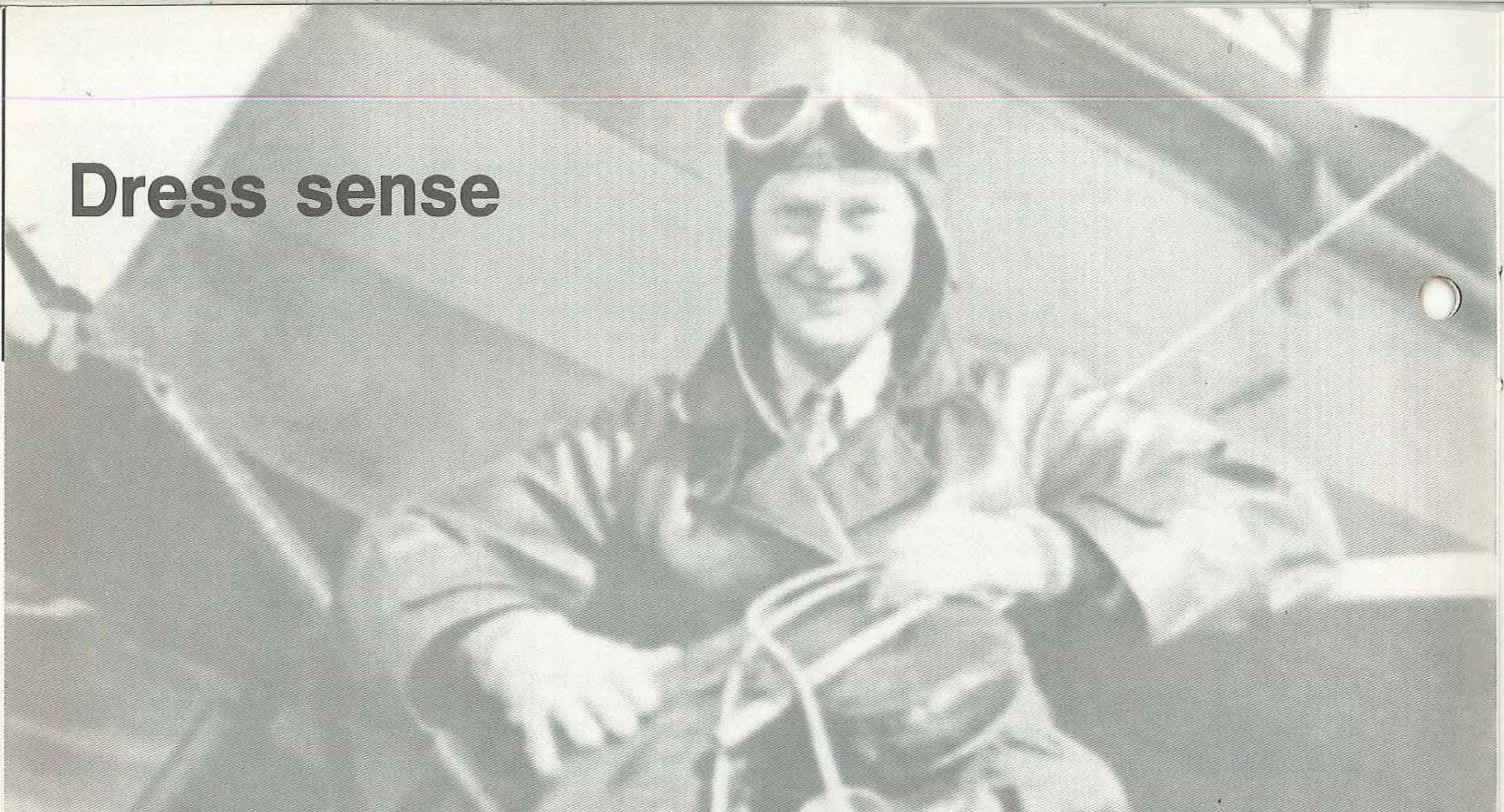
Category Three: The best black and white photo was that by **David Foote** with his picture entitled *Thrush* (on facing page).

Both Category Two and Three winners have been awarded Nikon TW2 Dual Lens AF Compact cameras, all prizes being kindly donated by MAXWELL OPTICAL INDUSTRIES.

In addition it was decided to award a number of Highly Commended citations. The winning entries will be featured in future Digests, and the awards go (in no particular order of excellence) to:

Category One:	**Kevin Waid** *Augusta*
	Kim Wirth *PA23 Off the Coast of Cape York*
	Dennis Starson *Finals*
	David Staley Photo of the B200
Category Two:	**Andrea Hirschon** *Double Trouble*
	Andrea Hirschon *Off With His Head!*
	Raymond Wilson *Further Left, Mate!*
Category Three:	**David Foote** for a second entry, also titled *Thrush*.

Dress sense



WHAT WAS THAT? This is often the reaction of many of us to the figure dressed in old leathers with a battered helmet stuck on his head — the bikie.

But experienced motorcyclists know the dangers, particularly the injuries they might sustain coming off the bike, even at a low speed. Good riders dress for the occasion — not because they plan to fall off every time they set out: they merely take sensible precautions. On the roads of today, they aim for survival.

Exactly the same dress sense is important — though often ignored — in other activities . . . cover up on the beach against the sun, wear all sorts of things against a fast bowler, don't wear WWII 'paratrooper' boots when parachuting (they tend to transfer the load off the ankle on to the lower leg — could be nasty in a crosswind). In motor racing, protective gear is mandatory.

What about flying? Why is it that the Defence Forces purchase expensive Nomex flying suits — coveralls — and equally efficient gloves, boots, socks and helmets for their aircrew? It's significant that most of this clothing is anti-heat, anti-fire.

Many people have survived the crash but died from toxic smoke inhalation or, overcome by the heat, have perished in the ensuing flames. Dress sense and rapid evacuation provide the best protection against heat, fire and smoke. A smoke hood may be of use but may, on the other hand, cost the potential survivor valuable seconds of escape time trying to put it on properly and then removing the smoke that is already inside.

In aviation, particularly for aircrew, dress sense means covering as much skin as possible. Wear well-fitting clothes, not too tight, but certainly not loose and flowing. The more layers you wear, the more protection from heat and flames. Choose light colours and a tight knit, rather than dark colours and a fuzzy material.

The best protection in everyday clothing is closely-woven, light-coloured wool.

Although synthetics generally are not good (they melt into your skin), some are expressly designed to offer fire protection. They are expensive and not found in everyday clothing, but may well be one of your best investments if you are a regular flyer. To check the characteristics of a material, take a few strands and burn them. If they melt — don't wear the garment they came from. Try to find something that merely chars when put to the flame.

Shoes are very important items of your clothing. Again, they must be well-fitting and should be made of leather. Shoes with open toes, high heels, sandals and thongs ought not be worn in aircraft. Because of the problems during the emergency evacuation of a badly broken-up aircraft, flat shoes are obviously to be preferred — high heels can so easily get jammed in wreckage; they certainly will make their wearer less sure-footed at a time when agility could equate to safety.

Dress sense is applicable equally to a Cessna 150 and a Boeing 747. Indeed, it is important in all forms of transport. Just as the motor-cyclist, none of us expects to become involved in an accident, otherwise we'd stay indoors. But once committed to a journey, the statistics act against us. Therefore, to be prepared might mean the difference between a long life and a tragically short one, or even worse, years where each day is filled with the agony of third degree burn scars: the Guinea-Pig Club of WWII could tell us — but they had the odds really stacked against them □

DRESS SENSE

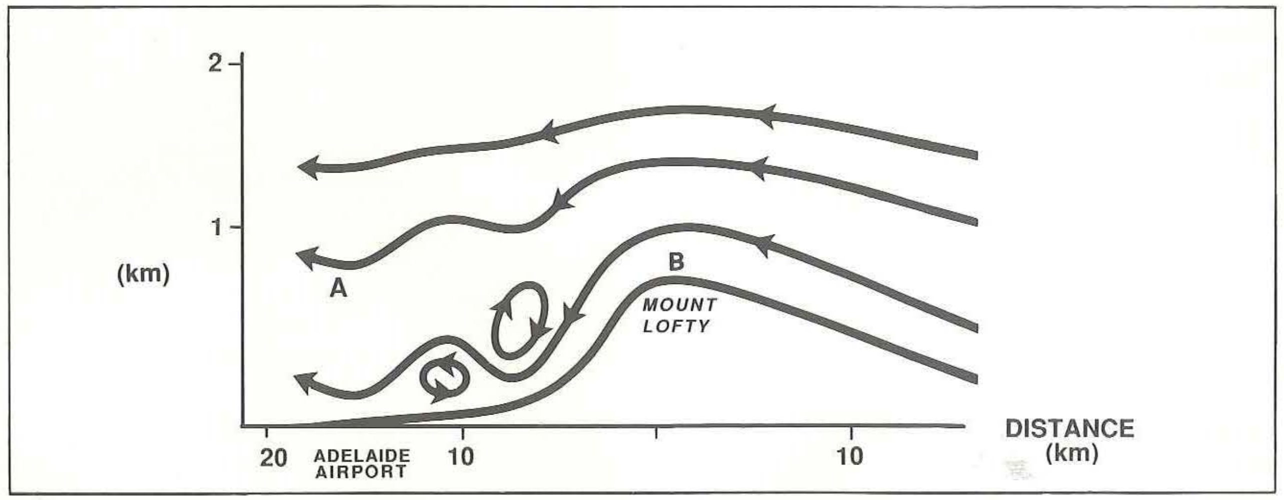
- **CLOSE-KNIT WOOL COVERING AS MUCH AS POSSIBLE**
- **ENCLOSED, LOW-HEEL LEATHER SHOES**
- **GLOVES □**

Downslope winds are dangerous!

Bureau of Meteorology

MECHANICAL turbulence and downslope waves are well-known hazardous conditions that form in the vicinity of mountains under certain meteorological conditions. A not-quite-so-familiar condition involves downslope winds which, under favourable conditions, create wind shears and turbulence in the downwind (or lee) side of the mountain. These can be particularly dangerous to aircraft close to the surface.

To see how these effects occur it is necessary to develop a picture of the airflow under particular circumstances. In the example, we consider an easterly low-level flow in the region just to the east of Adelaide (see diagram).



ROTOR FORMATION NEAR ADELAIDE AIRPORT. THE CLOCKWISE ROTOR IS PARTICULARLY STRONG.

As the airstream crosses the escarpment it flows quickly down the lee side, and a marked wind shear occurs near the discontinuity between the rapidly descending air and the relatively slow-moving or undisturbed air further away from the escarpment. Towards the base of the escarpment turbulent eddies or rotors may form as a result of this wind shear, creating a very dangerous situation for aircraft on approach or take-off. The airflow under these conditions is analogous to the frothy, turbulent water visible at the base of the spillway of an overflowing dam. The topographically-induced wind shear and turbulence is accentuated where there is a ramp-shaped range.(ie a gentle slope to windward and a steep slope leeward).

The downslope winds and associated effects described above occur predominantly in the warmer months of the year, particularly during the period from late evening to mid-morning. Pilots operating to the immediate west of the Darling Scarp near Perth, or of the Mt Lofty Ranges in SA, should expect turbulence near the surface in an easterly airflow, especially during the night and in the early morning. These hazards may exist on the lee side of any large hill/mountain, if conditions are right.

In the absence of confirming evidence from other aircraft or specific wind shear information, **Wind-socks** may provide valuable visual clues to the presence of wind shears and rotors. If an aircraft on its approach experiences considerable drift — **and** one or more of the windsocks is limp, or if the socks are pointing in different directions, wind shear and/or rotors must always be suspected. Be aware, however, that rotors may not be all that large in area, although quite vicious in effect. One to two kilometres across is usual, which means that the visual clues may not be available until you are almost upon the beasts.

Bureau of Meteorology staff in Adelaide and Perth are working towards the provision of more specific advice concerning wind shear and turbulence. One result of their studies is the confirmation that the degree of turbulence is related not only to windspeed, but also to the difference in temperatures between the points A and B, as indicated on the diagram — the greater the variation, the more severe the turbulence □

Those D-M-E'd elusive codes!

THIS LITTLE article is directed, I'm sure, at only a handful of Australian pilots. These few, though, can make life very difficult.

Australia, New Zealand and PNG have a DME system, known here as 'Domestic ('Australian') DME', utilising the 200MHz frequency band. All other DMEs around the world operate in the 1000MHz region, and are known here as 'International DME'.

With more and more 'international' DMEs being installed around the country, it becomes increasingly important for the pilot to make sure that ATC know what type of equipment is carried. Aircraft with only international DMEs, for example, cannot interrogate the 'Domestic' version, and vice versa.

Therefore, ATC can only provide the 'quicker' service associated with the use of DME (separation by distance) if flight-plan information is correct.

And here lies the snag. Over the years, there has been not only a change in flight-plan format, but also in the identification of DME information upon that plan.

As a signatory to the Chicago Convention, Australia has accepted the great majority of the flight standards developed by the International Civil Aviation Organisation. One of these, very small, but totally logical to the rest of the world, is the adoption of 'D' as the flight plan designator for DME ('international' DME, of course), just as 'O' is used for VOR, 'F' for ADF and 'L' for ILS. After the ICAO designators were used, 'X' was one of the few letters still available, so this was chosen as the code for domestic DME on the domestic flight plan form.

Therefore, in the navaids box in the Australian domestic flight plan, there appears 'D' and 'X'...

'D' MEANS 'INTERNATIONAL' DME
'X' MEANS 'DOMESTIC' DME

Therefore, pleeeeeease, get it right! Take pity on the poor old Domestic-DME-equipped Air Trafficker who has set up a nice tight sequence on the assumption all the arriving aircraft can read out their DME distance, only to find that some !#!$%?@! put 'X' on his flightplan, thinking it meant 'international', and can't in fact interrogate the beacon. Believe me, a last-minute reversion to more onerous standards for separation not only wastes *your* precious time, but grows ulcers on the controller's ulcers.

★★★★★★★★★★★X for domeXtic !★★★★★★★★★★★

Instrument procedures

METICULOUS

'scrupulous about minute details; very careful, accurate' (from Latin metus = fear)

Instrument procedures are carried out by the thousand each day: the majority of pilots flying large jets make every approach on the clocks, VMC or no, and lesser mortals rely on the NDB, ILS etc when it's a bit murky. Added to this is the daily training, training, training in instrument procedures, whether it be 'cheaply' (in the simulator) or under the eagle eye of an examiner/instructor in the real air.

I wonder, though, just how much we understand the need to fly accurately when we let down in weather? (other than when we're being observed by the aforesaid examiner, that is).

John Edwards here leads us gently through some of the problems facing the procedure designer and his interface with the pilot. The piece deserves careful reading — although the concepts are simple, the complications following therefrom show that 'meticulous' in all its shades of meaning is the correct adjective to describe the surveyor's work.

Producing an instrument procedure represents one of the more demanding aspects of the airways surveyor's craft. In Australia, the requirement is identified and subsequent draft plans are drawn up by surveyors in the Field Offices. The final design, checking, approval, drafting and, if all be well, publication is a Head Office responsibility.

It is an extremely serious affair, where the meticulous (that word again) standards internationally agreed are rigorously applied. The procedure designer wants to assure all pilots flying instrument procedures that they will not hit the ground, or any known obstruction. However, and this is where we must read carefully, to stay alive the pilot must not only be aware of the constraints implicit in the design of the approach, but stay always within those limits.

AVIATION SAFETY DIGEST reports incidents, recounts stories, relays technical information, represents the pilot and others involved in aviation, and, to the extent that it falls short of being a legal document, reflects the viewpoint of the CAA.

We have noted previously that regulation alone may well have been exhausted as a means of reducing accidents. This is not to say the CAA is on autopilot — there are moves afoot to make CARs, CAOs and subsidiary legislation more user-friendly (or at least, somewhat simpler).

Although an aviator will always benefit from reading about another's brush with disaster, we are all fortified in the diligence of our personal pursuit of safety by the knowledge that there are a lot of fellow flyers who think twice — nay three times even — before committing themselves (and their passengers — never forget the pax) to operations in marginal conditions. Self-discipline, mechanical reliability and the correct application of hard-gained expertise are but the three leading links in the chain of circumstances that define a truly successful flight.

The wide range of submissions that cross the editor's desk are testimony that 'marginal conditions' cover practically everything. There are a million articles out there in the real world, and a zillion incidents (99% of which you wouldn't dream of putting your name to — that's OK, we'll respect your desire for anonymity). So why not share your hard-earned lessons? As I said, **your** story is unique!

To be part of this accumulated wisdom, those with an interest in flying, be it as a professional or paid-for-by-yourself, will do themselves a favour by reading the Digest on a regular basis; if you do not obtain a free copy, the subscription form is, as they say, overleaf.

AIRFLOW

Feeling a little query?

The AIRFLOW column is intended to promote discussion on topics relating to aviation safety. Input from student pilots and flying instructors is particularly welcome.

Anonymity will be respected if requested. 'Immunity' applies with respect to any self-confessed infringements that are highlighted for the benefit of others.

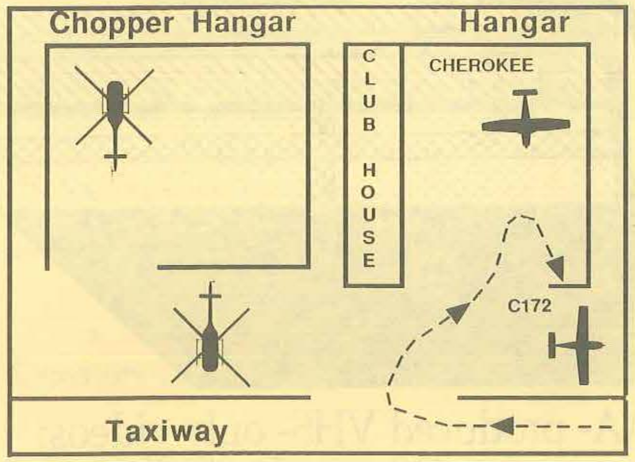
Write to: AIRFLOW
Aviation Safety Digest
G.P.O. Box 367
CANBERRA A.C.T. 2601
Australia

AIRFLOW

Dear Sir,

I'm concerned about people who enter occupied hangars whilst taxying their aircraft — a practice I witnessed recently.

The diagram shows the relevant layout:



I was sitting in the Long Ranger, ready for a demonstration flight. The Cessna 210 attached to the Aero Club returned, taxied around the back of the 172, entered the hangar then turned through some 120 degrees. Normally, the 210 is backed into the corner of the hangar, with the 172 blocking the way out.

Obviously, the 172 had been pulled out of the way so the 210 could depart. This left not much room on the grassed/tarmac area to turn the 210 around when it returned.

Of course, shifting the planes manually would have meant a hassle with the steering handle, plus muscle work: it's always convenient to stop as close to the parking spot as possible, and 99 times out of a 100 a pilot will get away with cutting the corner on safety to do just that.

But I tend to think of what the results could be if that 1:100 chance came up, and in this case there was a real risk of collision with the Cherokee in a hangar with a built-in clubhouse and a 172 parked just outside. And all this within a couple of metres of another hangar containing a stationary helicopter with another, rotor turning, outside. To me, it was poor airmanship, indicating a lack of thought or awareness of possible consequences of the action.

I was taught never to trust aeroplane brakes to be 100% effective at all times — an instructor whose opinions and explanations I respect drummed that into me the first time I rolled nose-first up to a fuel bowser.

Even those who fly privately have to be professional in their approach to those areas because, I believe, they are the foundations of aviation safety. When someone does something stupid the public doesn't distinguish between professional and private pilots. Flying gets the blame, thus reinforcing the attitude that what is really one of the safest of activities is the most dangerous.

A study of flying organisations' maintenance accounts might well make trainees appreciate the potential cost and effect of careless mistakes.

This letter arrived from a correspondent who did not want to be identified: that's all right — the message is of sufficient importance to act as a reminder to all pilots. Laziness, or misplaced over-familiarity and over-confidence has led the pilot in question to display appalling airmanship (yes, airmanship applies on the ground as well: goodness knows how he flies).

And yes, it was illegal: he blatantly transgressed CAO 20.9 subsection 5. There are so many complicated traps in the aviation game — why on earth get caught by a simple one?

Dear Sir,

In ASD 139 Michael Badge expresses his concerns that flying training rarely provides actual forced landing practice. Having made literally hundreds of forced landings, I agree wholeheartedly with Michael that what happens in the last few hundred feet 'determines whether your passengers survive or not'.

The relevant articles promised for ASD will be most useful; however, the point is that first-hand experience, so crucial in the training of a pilot to cope with such an emergency situation, is generally unavailable.

Training in carrying out forced landings is actually readily available through organisations which have been conducting such exercises for decades — gliding clubs. Most power pilots would be aware that every glider landing is a forced landing, but few would realise that many of these landings are actually 'outlandings'. Glider pilots who regularly fly cross-country tasks do so in the knowledge that on at least some occasions their flights will end in an outlanding. Training permits them to methodically and as a matter of routine select a suitable landing area during the final minutes in the air.

AIRFLOW

Such a scenario sounds horrific to the uninitiated, principally due to the lack of opportunity to participate in the decision making of the critical last minutes prior to touchdown. Applying such judgement to the conduct of a well-planned outlanding is a highly rewarding experience.

Gliding training has greatly reduced my concerns regarding the outcome of an engine failure or such while flying powered aircraft.

Laurie Hoffman

Agreed. Gliding does provide practice at landing without an engine — every time! (and a lot of other skill-sharpening practices for pilots in general). Gliders also have flatter glide angles than most light aircraft, and better control of the approach glide angle. Even for an experienced glider pilot an engine-off landing in an aeroplane is highly stressful.

*As to **Michael Badge's** letter, unless pilots have access to an ALA (with the owner's permission, of course), the actual touchdown during a practice forced landing carries greatly increased risks, particularly if the surface hasn't been inspected. Rocks, stumps and holes usually aren't visible from circuit height. The surface may be rough, boggy, covered in tall vegetation and contain unseen fences. It is absolutely essential, before landing off a practice forced landing approach, to know that the surface is safe for landing (and a subsequent take-off!), and to have the landowner's permission. Not even glider pilots land without doing this, if the outlanding is for practice rather than forced.*

Any touchdown in a real paddock (whether practice or after engine failure) must be as slow as possible to reduce ground-roll, wings level, and into wind. In a retractable the wheels are provided for a landing on, so they should be used in a real forced landing if at all possible, unless the approved pilots handling notes recommend otherwise.

Mike Cleaver, *Inspector (Sport Aviation)*

*Support for this sort of training also came from **Mark Townsend**, of Bankstown, who is of the ultralight fraternity. Here is a paraphrase of his most pertinent point: '... and as ultralights are currently required to operate no higher than 500 ft, much time is spent considering emergency procedures that commence below that altitude and do not terminate until the aircraft is well into ground effect...If you want to know what it's like to 'go all the way', a few hours spent at an ultralight training school will probably do more for your forced landing education than a week in the training area.'*

Dear Sir,

I am writing to you to express my views with reference to the back cover poster which featured on ASD 140 by Kathy Walter.

As a LAME and Flight Engineer one can but wonder who holds this belief that the LAME or indeed mechanics and engineers in general are in anyway viewed as the heart of anything, let alone airworthiness.

To many pilots, maintenance is only important when serviceable aircraft are not available for flight, or unserviceabilities in flight cause them concern. After all, in the scheme of things the status of piloting is more important than maintenance.

Manufacturers would like us to believe that their machines are rugged and reliable. Minimal maintenance requirements are a design criteria, after all, maintenance is so costly to aircraft operators. So cutting the costs of maintenance is more important than the maintenance itself.

The CAA treads the delicate path of policing minimum standards so as not to unduly effect the commercial environment, while keeping the incident and accident rate at a politically acceptable level. So maintenance standards are set by the political climate. The input of the LAME to this process is minimal.

To operators economics is more important than any other consideration. Maintenance is a direct cost against revenue so it must be contained. This containment however is a matter of insightful judgement. The LAME's opinion is not sought, instead a remote decision is made to which the LAME must attempt to comply.

So who and where is the LAME in the scheme of things.

I would suggest he is an overworked, underpaid, underappreciated and grossly undervalued member of the aviation community. He plays no part in the decision making process of senior management. In fact I would be surprised if management even considered consulting a LAME for his opinion when an important decision which will effect him is made.

Currently not only in Australia but worldwide there is a crisis in the maintenance of airworthy aircraft. Rapid expansion in the demand for air travel combined with unremitting cost cutting, especially where maintenance is concerned, now shows itself in accidents which should never have happened and thousands of revenue hours which cannot be flown.

AIRFLOW

Chronic undermanning, underpaying, underskilling and undervaluing of the LAME and the role he plays continues to lead to a mass exodus of dedicated professionals from the industry. At the same time management culture and practice which has presided over this state of affairs wrings its collective corporate hands. While admitting it has a massive problem it continues to dither in the dark of its own twisted economic logic so far removed from the workplace. To the LAME he wonders what other company they work for.

Airworthiness IS the heart of aviation. It takes decades to build a dedicated professional workforce able to make it a reality. This reality is rapidly leaving the industry and the community in general will suffer as a result.

Once again a world-leading Australian industry is deskilled by its own inepitude. Unable to perform and compete at such a basic level it must turn increasingly to overseas suppliers of dubious quality and all that this implies to Australia's reputation and economy.

The heart is rapidly leaving the LAME as he looks for advancement and fullfilment outside an industry blinded by shortsightedness.

Yours faithfully,

J.S. Seaburn

We hope the poster may help to keep the heart in the LAME.

Dear Sir,

Yesterday 18-07-89 I travelled Du — Lilydale by charter aircraft on business. Due inclement weather beyond Eildon Weir we were forced over the top (LSALT 5200) and began to plan a diversion to Moorabbin. The duty controller for our sector went to additional effort to radar vector us away from high country and allowed a descent earlier than would normally have been available. During the descent radar confirmed us in close proximity to Lilydale. We obtained a visual fix and subsequently completed a landing, thus enabling us to meet our business commitments. Please convey our thanks to the responsible operator for his assistance.

David Honner

Thanks duly conveyed to Melbourne Radar.

Morals: 1. They were absolutely right to make preparations for a diversion in good time

2. The Air Traffic Controller is your friend!

Dear Sir,

Whilst on a navex recently Melbourne asked us if we would look for a C-150, presumably forced down.

It turned out that the C-150 was uncertain of its position and not forced down, as we had expected. Anyway, before this was known, we spotted a highwing Cessna on the ground along the search route. As I realised that the probability of spotting a Cessna on the ground was extremely small, it seemed that the Cessna that we saw could have been the subject of our search. However, we couldn't be certain, since the plane on the ground appeared more like a Cessna 172 than a 150. I thought at the time how positive identification could have been easier if aircraft registration markings were painted on the top of the wings. Could this not be a consideration, to aid those involved in SAR operations?

On the issue of forced landings, I'm sure most pilots would find it extremely inconvenient if a landing had to be made in a high-tree-density area. After my first navex over an area south of La Trobe Valley, I realised this possibility, as I flew over forest for the first time.

Although high-tree-density areas are not clearly indicated on WACs, other charts, such as the Tactical Pilotage Chart (TPC) series used in Papua Niugini show the location of forest and boundaries of clearings distinctively. Could not this be an inclusion in the next WAC edition? If not, could there be easier access to the TPC series for Australian FIRs?

Juanda Ismail

Thanks for the constructive suggestions. Your letter has raised considerable interest and comment here. This lengthy reply is therefore justified:

Concerning aircraft markings, it was a requirement up to 1978 that markings should be displayed on upper and lower wing surfaces. Now, however, Civil Aviation Regulation 17(5) ***requires*** *that nationality and registration marks be located on the lower surface of the wing. Advice is that the expense to operators involved in painting both wings is not merited by SAR considerations: in other words, the likelihood of a rescue attempt being compromised in the fashion you described is sufficiently remote.* [this is not to say I wouldn't like the aircraft I was aboard having two sets of identification on its wings — ed]

Perhaps far more value for money would be the universal carriage of Emergency Locator Beacons (ELB), operating on 121.5. As you may know, the Government, through the Federal Sea Safety Centre (FSSC), has funded a COSPAS/SARSAT LUT (Local User Terminal), located in Alice Springs. Testing of this facility is in progress, and it is already giving good results from beacons located ***all over*** *Australia, as well as from ships on the surrounding seas. During Exercise Kangaroo '89 an Orion, way out over the Indian Ocean, homed on to a fix reported by the satellite to Alice Springs. The point is that the aircraft could have been coming to your aid, if you were unlucky enough to be in a survival situation —* ***BUT*** *only if you were ELB-equipped.*

We'll run a comprehensive article on satellite/ELB capabilities when the system is declared fully operational.

There has been detailed discussion between mapping authorities about including high-density tree areas on the current charts. However, there were problems. The first (to get it over quickly) is that the cost ***may*** *be formidable — to the extent that it might make the product far too expensive for the benefits achieved.*

Second is the impracticability of accurate depiction of vegetation on 1:1M charts (WAC). A flight trial in 1986 compared LANDSAT data with the visual picture at representative VFR cruising altitudes; the results were no better than 'mixed'. Whereas intensely cultivated areas usually showed a good correlation between 'map' and 'ground', scrub bordering on to grassland, together with the more complex patterns of cleared and timbered land, proved difficult to process, and produced an uncomfortably 'cluttered' impression. Most of mainland PNG that you referred to is either thickly forested or tropical swampland — both of which provide good contrast for any cleared area.

The Australian ONC (also 1:1M) does make some effort to delineate 'vegetation' (thick scrub or heavily timbered woodland) and 'distinctive vegetation' (pine forest or mangrove). These areas, where they are distinctive pockets of vegetation, can be useful for position fixing, but the ONC is of doubtful value for general nav. purposes or planning a route clear of tall timber. This drawback would of course apply to the WAC as well.

The 1:500 000 Tactical Pilotage Chart (TPC) is much better, although the boundaries of normal scrubland and wooded areas still need to be treated with caution — not only may they change between issues of the chart but the patterns of vegetation are depicted only in relatively level terrain, in order not to interfere with the more important relief data.

A general point concerning the use of maps and charts in the air (TPC, 1:500 000 topo survey or even a Shell road map): remember that Air Traffic staff, by international agreement, have the WAC as standard reference, and this is the chart that is most frequently updated (radio masts etc). So, if you try to describe a position that may be on your map, but doesn't appear on the WAC, ATC or FS may not know what you're talking about.

Having said all that, we agree that the TPC ***is*** *perhaps the favoured visual navigation aid. It presents information in a very readable format, and the scale is appropriate for map-reading, even if you have to carry more sheets than if you had opted for the WAC. Following agreement by the RAAF to make the charts available for civilian use, the CAA is currently negotiating means whereby the TPC may be sold through the Authority's outlets. Australia-wide cover may take until around 1992, though.*

A plea to those who do use the TPC — the frequency of changes to Prohibited, Restricted and Danger areas makes it very difficult for these to be kept completely up to date on the chart. Therefore ***DO NOT*** *rely on P,R or D boundaries as shown until you have checked them against a VEC/VTC, ERC/AC, DAH or other authoritative and* ***current*** *source.*

AVIATION REGULATORY PROPOSALS

The following ARPs have been circulated since the last Digest:

89/4	CAR 214 Maintenance Training	Closed 30 Nov Responses under consideration
89/10	AGA-7	Review Closed 9 Oct Responses under consideration

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AERONAUTICAL INFORMATION SERVICE AUSTRALIA

NOTICE

CURRENT DOCUMENTATION AND PLANNED NEXT ISSUE

DOCUMENT	CURRENT ISSUE	NEXT ISSUE
DAP(E)	14 DEC 89	8 MAR 90
DAP (W)	11 JAN 90	5 APR 90
AGA 0-1-2	4 MAY 89	3 MAY 90
ADDGM	11 JAN 90	DISCONTINUED (SEE BELOW)
ERSA	14 DEC 89	8 MAR 90
AIP(BOOK)	14 DEC 89	3 MAY 90
VFG(BOOK)	14 DEC 89	3 MAY 90
AIP/MAP	14 DEC 89	28 JUN 90
VFG/MAP	14 DEC 89	28 JUN 90
DAH	14 DEC 89	28 JUN 90

Dates quoted are effective dates

1. CLASS I AND CLASS II NOTAM ARE TO BE CONSULTED WHEN USING ANY OF THE ABOVE DOCUMENTS
2. The issue of Aerodrome Diagrams effective 11 JAN 90 will be the last as a discrete document. The diagrams will appear in the ERSA edition effective 8 MAR 90.

Issue 8 Date 11 JAN 90

Revelations Restrictions Requirements

Captain John Edwards
Airways Surveyor, Civil Aviation Authority

note: readers' attention is drawn to *ILS — Some whats and whys,* published in ASD 139

NO! THIS IS NOT an article about power plus attitude equals performance, neither is it about degrees lead and needle movement to become established on the nominal track as if you were on a railway line. Rather, this discussion is about how you should perceive a procedure, how it is designed, what operating assumptions are made and what are the consequential operating limitations for the pilot if he is to ensure separation from obstacles in the manner intended by the procedure designer.

PROCEDURE AND PERCEPTIONS

The types and parts of procedures are the **holding procedure**, the **approach procedure** which may be precision or non- precision, the **missed approach procedure** and the **standard instrument departure(SID)**. Except for the SID, the purpose of these procedures is to enable the pilot to take the aircraft from the safety of the en-route lowest safe altitude (LSALT) or an area safety altitude down into the more hostile obstacle environment and to a point from which a high probability of successfully completing a landing should be assured. The missed approach procedure is provided to enable aircraft that cannot complete the approach due to weather or an on-board problem such as a navigation receiver failure, or external navigation signal failure or corruption, to regain the safety of the more benign en-route environment via a safe climb away.

The purpose of the SID is to provide a detailed departure clearance routing that has been assessed to provide a path of known performance requirement safely past or over obstacles until the safety of the en-route lowest safe altitude is reached.

To achieve these objectives, a procedure designer must provide a series of connected volumes of air to provide safe passage for the aircraft. This air must encompass all the likely errors of the navigation techniques required, the inaccuracies of the manoeuvring aircraft, the inaccuracies of the transmitted signals, the problems caused by meteorological factors, the inaccuracy of the obstacle data to be used and the changes that are likely to occur to that data before the next obstacle survey. These portions of air have to be strictly defined so that the pilot knows exactly what is provided and so that the designer can define the necessary volume geometrically.

Therefore, each portion of the procedure must have a defined start point or fix, a specified track or nominal track, a defined end point of fix and vertical limits. In addition, precision procedures must specify a path in the vertical. Missed approach procedures and departure procedures also specify a minimum acceptable vertical path (This performance requirement is expressed as a minimum gradient to be achieved.)

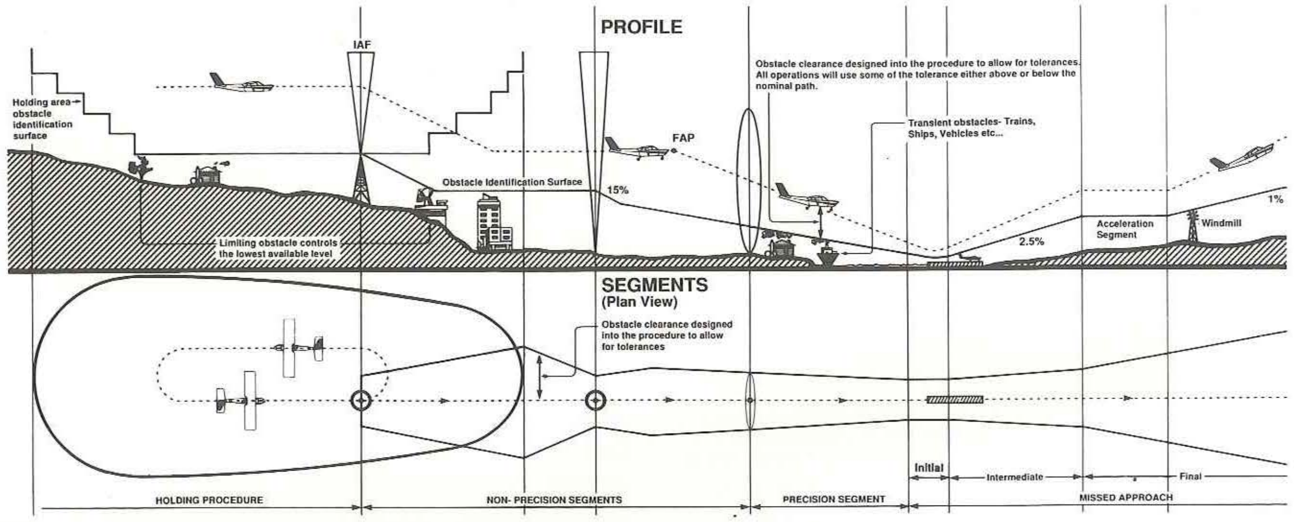
To visualize what is provided, a non-precision procedure maybe thought of as a series of abutting boxes starting at the LSALT with each successive box lower than the last until the MDA is achieved. A precision procedure is a non-precision design until the final approach fix or point (FAF/FAP) is reached; from there to the decision altitude (DA) it is more like a sloping half-funnel channelling aircraft to the runway. Missed approach and departure procedures are boxes with upward sloping bottoms, except the acceleration segments, which are normal horizontal boxes. The diagram illustrates a typical instrument approach.

A way to check the adequacy of any part of the pre-procedure briefing is to check to see if enough information has been identified to define adequately each successive volume of air to be used. If this test is not satisfied, either a vital point has been missed or insufficient information has been provided. A further element of an instrument approach briefing is the action to be taken if a missed approach is necessary from any point in the approach procedure. For reasons given earlier, some aircraft may begin the missed approach before reaching the missed approach point (MAPt). Usually, the only course that is available to ensure the safety of the aircraft is to follow the prescribed tracks, even if only by DR techniques in the event of signal loss, until the safety of the missed approach altitude is reached.

DESIGN

In the horizontal, procedures have both straight and turning segments and to define properly the necessary areas designers must account for the following:

- aircraft
  - — geometry;
  - — TAS;
  - — turn radius;
  - — aircraft inertia;
  - — pilot reaction times;



TYPICAL PROCEDURE PROTECTION (NOT TO SCALE)

SEGMENT ITEM	ARRIVAL	INITIAL	INTERMEDIATE	FINAL	MISSED APPROACH INITIAL	MISSED APPROACH INTERMEDIATE	MISSED APPROACH FINAL
AIRCRAFT	en route	manouevring	changing configuration speed & positioning	alignment & descent for landing	transitioning to missed approach climb	climbing at stabilised speed	accelerate & climb
NAVIGATION	guidance req'd	guidance required. DR for max 10nm	guidance inbound to FAF	guidance shall be provided	not possible	can use available guidance	can use guidance
LENGTH	as required	as req'd by height loss	between 5 & 15 (optimum 10 nm)	normally 6 nm to landing surface or MAPt	MAPt or timing tolerance + 15 sec + tailwind	as required to achieve 164 ft MOC	as required
OBSTACLE CLEARANCE	en route	1000 ft	500 ft	(1) at precision approach DA initiate missed approach; (2) at non-precision MDA do not go below (300 ft)	as for final segment	100 ft	164 ft then 300 ft
GRADIENT Normal	en route	4% (243 ft/nm)	flat	(1) ILS/LLZ 2.5-3.5 degrees (2) radar 5% (6.5% max) (3) VOR/NDB (+FAF) 5% (6.5% max)	level	2.5%	2.5% then 1%
GRADIENT Maximum	en route	8% (486 ft/nm)	5% (304 ft/nm) then flat segment		level	max 5%	max 5%
OPTIONS	en route	(1) using track + DME arcs (2) radar vectors (3) racetrack procedure (4) reversal procedure	(1) using tracks (2) part of racetrack or reversal procedure	(1) excessive length (2) mountainous terrain (3) remote altimeter setting (4) forecast altimeter setting	(1) NO requirement to change direction permissible (2) MAPt (a) facility (b) fix (c) distance	(1) may alter track 15 degrees maximum	(1) turns OK (2) accel. segment 6nm: 300ft MOC: 1% climb grade
COMMENT (Crew alertness)	en route	en route	distracted by speed & configuration changes	paying attention	concentrating on establishing climb & configuration changes	relaxed enough to navigate	accelerating to en route climb configuration - relaxing

INSTRUMENT APPROACH PROCEDURE SUMMARY

- meteorological factors
  - — wind;
- navigation facility performance and interpretation
  - — the ground system tolerance;
  - — the monitor tolerance;
  - — airborne receiver tolerance;
  - — flight technical tolerance — The tolerance allowed for the pilot to interpret and track the signal; and
- the quality of the obstacle information
  - — the accuracy of the surveys available;
  - — the age and reliability of the surveys;
  - — the frequency of the surveys and the likely effects of cultural and vegetation growth during the period between surveys.

In the vertical, the designer accounts for the following:

- aircraft
  - — geometry;
  - — minimum specified ascent gradients;
  - — maximum descent gradients;
  - — altimetry effects;
  - — aircraft inertia and time needed to change configuration;
  - — pilot reaction times;
- meteorological effects
  - — the quality of QNH data, ie reported or forecast QNH;
  - — the QNH inaccuracies and handling difficulties experienced in mountainous areas;
- navigation facility performance and interpretation
  - — as before; and
- the quality of obstacle information
  - — as before.

It should be noted that the designer cannot allow for either pressure error correction (PEC), as this is specific to aircraft type, or temperature error correction, as this is a local variable effect. To provide an allowance for such effects would require large values; these would prove unnecessarily punitive to many operations. Therefore, such corrections are the responsibility of the pilot.

The designer supports the above information with the following assumptions:

a. aircraft will not descend vertically, but will be flown in a way that gives a descent gradient which is extremely unlikely to exceed 15%;

b. during the different phases of a procedure the pilot is capable of differing degrees of navigation and the aircraft should only be required to perform certain manoeuvres. A summary for an instrument approach procedure is shown in the table; and

c. the pilot will fly the nominated tracks as closely as possible. This assumes that where track guidance is not provided, the pilot will use best known drift corrections except when being radar vectored.

Two assumptions need a little discussion.

a. Descent gradient. The provision of a descent gradient assumption is necessary, as the fix at the beginning of the segment is frequently marked by the passage of facilities which are sited on hills, or it is selected to mark the passage of a limiting obstacle. Consequently, the assumption allows the designer to consider most facility sites or the obstacle as an obstruction in the segment being exited rather than an obstacle in the segment being entered.

b. Tracking accuracy. Obstacle protection is provided on a statistical basis. Therefore, if the track or nominal track is not followed as closely as possible, the pilot is deliberately allowing erosion of the design safety margins; there is no provision in the margins for this source of degradation. What this means in practice is that for the majority of the time tracking deviations should be less than half the prescribed tracking tolerance, and only very rarely (less than 5% of occasions) should the indication show a deviation from track greater than 2/3 of the prescribed tolerance.

The factors and assumptions listed are all straightforward but the procedure designer must be able to reduce them to geometric shapes containing the maximum and minimum possible positions of the normally operating aircraft at any time during the procedure. The designer must also use airspace efficiently if unnecessary penalties are to be avoided. These constraints lead to interesting solutions and requirements, some of which are discussed below.

Holding and racetrack procedures. Here are some questions for those who hold instrument ratings:

1. Why are the entry sector boundaries defined by heading and not track?

2. Why does AIP/IAL require that the outbound track be parallel to the inbound track, ie only one drift allowance, rather than a non-parallel track that would allow for the drift effect accumulated in the turns at both ends of the pattern plus the drift effect on the outbound leg?

3. If your outbound track is going to cross the procedure's inbound track what are you required to do?

4. In a sector 2 entry, are you required to intercept and track the 30 degree offset after passing the fix or do you merely adopt a 30 degree offset heading?

Answer 1. The procedure designer needs to know the maximum number of degrees through which the aircraft might turn if he is to be able to draw up the protection area. This is not possible if the sector boundaries are defined by track, as the drift allowance (which is variable) might increase the time spent in the turn beyond that provided in the design. Therefore, sector entry boundaries are defined by heading.

Answer 2. To minimise the airspace required for the procedure, the designer applies drift corrections throughout the procedure. This means that only the drift allowance experienced on the outbound leg is provided for in the design of that leg. Consequently, flight procedures that apply a greater drift allowance, up to 2 or 3 times, to the outbound leg invalidate the design and pilots may not assume that the manoeuvre will be contained within the prescribed airspace.

NOTE: A subsequent AIP/IAL requirement in the procedure is 'execute a 180 degree turn to realign the aircraft on the inbound track'. This requirement does not require re-alignment without passing through the inbound track. Some wind conditions will require the pilot to pass through the inbound track before re-alignment and this has been provided for by the designer.

Answer 3. The pilot has no track guidance on the outbound leg, so it is possible that the achieved track may cross the required inbound track. The probability of this occuring in a holding procedure is low, but it is likely with the longer outbound times permitted in race-track procedures. In order to conserve airspace, designers recognise that pilots have sufficient information available to identify such an occurrence and assume that pilots will not cross the inbound track but will adjust their achieved track to continue outbound on the reciprocal of the inbound track until the prescribed time or position is achieved. The procedure should then be completed in the normal way and in the direction specified.

Answer 4. To minimise the airspace required, you are required to intercept and track the 30 degree offset outbound.

Approach procedures. More questions:

5. Is it safe to join the procedure below the initial approach altitude, provided that the altitude at which you join is higher than the next descent limit in the procedure?

6. In a reversal procedure, is it safe to shorten the outbound leg and turn early?

7. Why does the AIP/IAL caution against descent rates in excess of 1000ft/min?

Answer 5. NO! because the vertical and lateral obstacle clearance provided to protect the joining manoeuvres will no longer be assured.

Answer 6. NO! because the protection for the turn is provided on the assumption that the turn is initiated at the prescribed fix. Turns initiated early might not be contained within the normal protected area, as the areas are usually widest at the planned turn point.

Answer 7. The obstacle clearance provided contains some allowance for excursions below the prescribed descent limits. However, to ensure the best operational advantage in the procedure and at the DA or MDA, these allowances are small and not sufficient to accommodate the excursions associated with arresting high rates of descent.

Undoubtedly, briefing rooms, crew rooms and bars can produce similar informative discussion on missed approach and departure procedures as well as expanding the above quick quiz. However, the usual warning against 'informal' intelligence must of course apply!

LIMITATIONS

The interface between the procedure designer and the pilot to ensure that both have a common and unambiguous understanding of the procedure are the API/IAL requirements for:

- IAS;
- average achieved bank angle;
- tracking tolerances;
- fix and timing rules;
- joining procedures;
- rules for drift application; and
- special situation rules such as those applying to holding in question 3.

CONCLUSION

The source of the rules and techniques used for instrument procedure design by the CAA have been developed from a considerable international experience base. Therefore, it is unlikely that any single pilot would know sufficient or be able to access the required data on the spur of the moment to take a liberty with a procedure or the rules and yet be able to ensure the safety of the operation. However, the rules and the underpinning experience are not sacrosanct and are continually subject to review by the CAA and ICAO. Therefore, change and variation are possible but all proposals need thorough documentation followed by exposure to a wide range of relevant discussion and experience before they may be attempted in practice.

More immediately, in preparing to fly a procedure, the pilot can increase the safety of his operation by visualising what the procedure is doing for him and ensuring that he has been given and identified the necessary elements of information for each segment of the procedure. We should be mindful that designers are not infallible and that even an error in the proof-reading or printing of the chart could mean that a significant element of information is omitted or corrupt; the pilot must endeavour to identify the problem before commencing the procedure □

Beware the big bang

'Dear Sir,

On numerous occasions I have had cause to contact your Department with regard to helicopters flying over this mine site. On the most recent occasion, two different helicopters flew over, one at about 600 feet and the other at only 200 feet. This last overflight was but 15 minutes from a blast...'

This extract is from a letter written by a mine manager to the CAA. Further excerpts emphasise the dangers of flying low over mines:

'...up to seven tonnes of explosive are used in a single blast.'

'...a safety fuse of about three minutes' duration is used. Once the fuse is lit, there is no safe way to stop the blast.'

'...blasting at surface level is a regular occurrence'.

The Chief Government Engineer for the NT Department of Mines and Energy also was sufficiently concerned to write. Here is part of his letter:

'Open cut mines and quarries are recognisable from the air, and may be blasted at any time, although usually by daylight. However, pilots should be suspicious of even apparently abandoned mines; these are sometimes reopened, and some quarries are worked very infrequently. From the air, the preparations for blasting will not be visible. A mine that appears deserted might in fact be cleared for blasting. We have no information on the height of trajectories of rock fragments, but opinion is that they could rise at least to 500 feet, and they have been known to travel 500 metres horizontally.'

A recent TV travelogue was filmed from a balloon in Australia. The balloon was cruising at about 100 ft on a beautiful morning when suddenly the ground dropped away into a huge opencut mine. Serenely, and with hardly a sound, the balloon floated over the busy scene below. An accident was averted only because the very active mine **happened** not to be blasting at the time.

Balloons have raised the ire of the oil industry, too, although the message is applicable to all low-level aviation. The balloon/oil incidents involved flight over bulk storage tanks. Fortunately, the tanks were not venting at the time.

A similar danger can be encountered with sea-tankers. Some liquid-gas vessels have tanks up to 100ft above sea level, and they vent automatically, at high pressure to ensure the gas clears the crew's living quarters. The tonnes of vented gas are highly flammable and present a major hazard to low-flying aircraft.

Luckily, this type of vessel is not a frequent visitor to Australian waters, and although tankers regularly put into Westernport Bay, Spencer Gulf and Dampier, they rarely vent gas when at sea. However, there are at least three occasions when all liquid-gas tankers vent: approaching dry-dock, preparing for a change of cargo, and, of course, in emergency. Note that none of these circumstances need be readily obvious to an aircraft.

So, low-level flight does present hazards extra to birds, unexpected flying machines, wires and turbulence. And, of course, close to the ground leaves less time for action in an emergency.

Therefore **beware the big bang!** Only go as low as is lawful, and certainly no lower than is necessary. And if you plan to fly down there at the legal limit, do yourself a favour and learn where the hazards are likely to be, and exactly what sort of danger might confront you.

The picture shows a representative opencut mine — very recognisable from a reasonable (and safe) altitude, but liable to creep up on you unobserved if your horizon is only some twenty miles away, and your attention is fully occupied by the ground just ahead! □

Give military jets a miss

FOR SOME TIME now the CAA, RAAF and Agricultural Aviation Industry have been seeking to minimise potential conflict between military jets on low jet routes (LJR) and civil aircraft carrying out agricultural operations.

Most LJR operations take place below 500 feet AGL, both day and night, just the right height to contribute to the premature ageing of the agricultural pilot fraternity. Several agricultural pilots who have had encounters of the close kind with military low jets (MLJ) would doubtless testify that relying on the 'see and be seen' principle is just not good enough.

While efforts to date have concentrated largely on development of a satisfactory method of notification of LJR operations to civil operators, there is also a need for RAAF crews to be aware of conflicting agricultural operations when flight planning LJR operations. A better system of notification is also required in this respect, and at the time of going to press the plans are as follows:

Agricultural operators who operate in areas of likely LJR activity are encouraged to notify directly to the RAAF the details of their intended operation, giving as much advance notice as possible. As LJR operations are generally planned and notified to the CAA on the afternoon of the preceding day, advice of planned agricultural operations should also be passed to the RAAF on the preceding day to maximise the benefits of this information to both parties. The RAAF has agreed to provide 008 telephone numbers for Amberley and Williamtown. These numbers will be published in ERSA, but in the interim will be notified by NOTAM Class I and to AAAA as soon as they are installed, hopefully by the time that you are reading this article.

All notified agricultural activity is plotted in the RAAF Flight Planning rooms, on maps which crews are required to check before flight. If the MLJ is to avoid you, timely notification is a must □

Accident response

Piper PA23-250, 23 March 1989

The grass was 10-15cm and wet on the firm 750m strip. The pilot had not previously operated a PA23 in wet conditions. The aircraft was held on the brakes under full power, with 10 degrees of flap selected. During the take-off roll the pilot became concerned at what appeared to be a slow rate of acceleration, but put this down to the characteristics of the type he was flying; he considered aborting, but there seemed to be too little strip remaining to stop the aircraft successfully.

The aircraft became airborne about 20m from the upwind end; shortly afterwards the port wing contacted vegetation, slewing the aircraft left and breaking the fuselage just aft of the cockpit. The 'take-off' ended in a mangrove patch.

The take-off performance chart for the aircraft indicated that the strip was of sufficient length for take-off under dry conditions. However, there was no information available to the pilot as to what allowance should have been made for long wet grass. The aircraft probably became airborne before the correct speed had been reached.

BASI recommendation

ASD produce an article highlighting the effect of variable ground conditions on light aircraft.

CAA action

We have reproduced below, courtesy of the UK CAA '*General Aviation Safety Information Leaflet*', a table of variables affecting, particularly, light aircraft take-off performance. It is emphasised, though, that this accident appears to be pilot error: AIP AGA 6-8 Section 9, para 9.2.1, and VFG 81-11 warn of substandard runway surfaces.

FACTORS ARE CUMULATIVE AND MUST BE MULTIPLIED

CONDITION	TAKE-OFF		LANDING	
	INCREASE IN DISTANCE TO HEIGHT 50 FT	FACTOR	INCREASE IN LANDING DISTANCE FROM 50 FT	FACTOR
A 10% increase in aeroplane weight	20%	1.2	10%	1.1
An increase of 1000ft in aerodrome altitude	10%	1.1	5%	1.05
An increase of 10 deg C in ambient temperature	10%	1.1	5%	1.05
Dry grass* - Short, 5" (13cm) - Long, between 5" & 10"(13-25cm)	20% 25%	1.2 1.25	20% 30%	1.2 1.3
Wet grass* - Short - Long	25% 30%	1.25 1.3	30% 40%	1.3 1.4
A 2% Slope*	uphill 10%	1.1	downhill 10%	1.1
A tailwind component of 10% of Lift-off speed	20%	1.2	20%	1.2
Soft ground or snow*	25% or more	1.25 +	25% or more	1.25 +
NOW USE ADDITIONAL SAFETY FACTORS (If data is unfactored)		1.33		1.43

Notes: *Effect on Ground Run/Roll will be greater
Any deviation from normal operating techniques is likely to result in an increased distance

Cessna 172M, 29 January 1989

The aircraft was hired for a short local pleasure flight. After take-off, at approximately 100 feet and 60 kt the engine began to run very roughly. The pilot landed back on the strip, started to brake but realised he wouldn't stop in time so applied full power in an attempt to clear the boundary fence. He didn't make it; the aircraft hit the top wires and an adjacent hedge and stopped within 50 metres, with nose gear detached.

Witnesses reported that the take-off was attempted a very short time after start-up. There was evidence of a tailwind component of around 10-20 kt during take-off. Carburettor icing was excluded as a factor, but examination of the engine revealed a number of faulty spark-plugs: an engine specialist confirmed that this could lead to rough running.

BASI recommendation.

As the strong suspicion that the engine was not up to operating temperature at take-off, faulty spark-plugs and the undoubted existence of a tailwind were all factors in this accident, the Digest should highlight these points.

CAA action

The report speaks for itself: downwind components dramatically increase strip length requirements and engine inspections and operating temperatures are specific and vital.

Cessna 182P, 14 June, 1989

Run-up, taxi and take-off — normal. At 200ft the engine failed completely. A landing back on was attempted, but the aircraft touched down on the overrun, entered a muddy area, and overturned. An inspection of the fuel system disclosed that the engine had stopped due water contamination of the fuel supply to the carburettor. The fuel cap to one tank had a defective seal.

The aircraft had been refuelled two days before the accident. In the meantime, heavy rain had fallen and the pilot found a significant amount of water in the fuel system during the pre-flight fuel check. Fuel was drained from the system until no water was present in the fuel sample.

The pilot was not aware that water accumulated in the fuel tank may not be completely cleared merely by a fuel drain. Consequently, he did not 'rock' the aircraft to ensure that all the water was clear.

BASI recommendation

That it be emphasised that aircraft parked on a slope and aircraft with bladder type fuel tanks can have water in their fuel systems even though the fuel drain check strongly indicates that the system is clear.

CAA *action*

There is really nothing to add to this warning — be diligent in knowing and carrying out all the checks; after all, it's your life! □

Canyon flying

Pilot contribution by P J Little

IT WAS WITH eager anticipation that the Monday morning arrived for my business trip to Cairns from Bankstown in the company of a very old friend who was to spend the week travelling around with me. We had planned to make Mackay in Queensland the first night's stop then proceed to Cairns the next day, stopping on the way home for a night at Hamilton Island, and then flying Hamilton Island to Bankstown on the Friday.

However, Monday morning dawned with overcast conditions and a forecast of occasional to frequent thunderstorms along the coast from Sydney to Cairns. Our friendly Met. man at Bankstown suggested that west of the ranges was clear and provided we could make it over the ranges and back to the coast we would have little else to worry about. I planned IFR to Roma via Mudgee, Coonamble and Walgett and then to Mackay via Emerald.

We had an uneventful flight to Roma, refuelled man and machine and again departed, knowing that thunderstorms are worst in the afternoon. Our anxiety level was soon raised when Brisbane started to issue reports of thunderstorms in its vicinity, the reports being frequent and varied but mostly issued with a kind of urgency. We had completed 90 miles of the 182 miles to Emerald when the cumulus started to build and we were forced to climb to FL180 to remain on top. Then I saw it on the weather radar about 60 miles ahead: green with a yellow centre. As we approached it was directly in our path towering 6 or 7000 feet above us and then going what seemed to be all the way to the ground, white and rounded on top, crisp and well defined, all sparkling in the sunlight like new fallen snow then dark and sinister-looking down below, the murky grey and black patches interspersed with shafts of rain or even hail. As the weather was moving west to east generally and as it appeared clearer to the west we made a 70 degree turn to the left and tracked west around the storm, watching it on radar as we passed. In the nine months I had owned the weather radar this was the first time I had used it in earnest and I was fascinated to see the storm appear just as the book said it would. It had a red centre (hail), about five miles long and three miles wide, the overall storm being at least 10 miles long by radar. And much longer visually.

Despite a considerable diversion to the west we arrived at Emerald only one minute late, thanks to a tail wind, and headed towards the coast and Mackay, still at FL180, and in clear skies.

However, about 80 miles out of Emerald the way ahead was again blocked to both the north and the south for a considerable distance either way. The weather radar, which I was beginning to have confidence in, showed a gap through the middle all the way to Mackay. This was not entirely supported by visual inspection, as the apparent gap appeared to end in blackness. Regardless of this, since the storm stretched at least 50 miles either way, I decided to at least have a look and, as predicted by the radar, I found a gap between the cells that enabled me to descend into Mackay in clear skies.

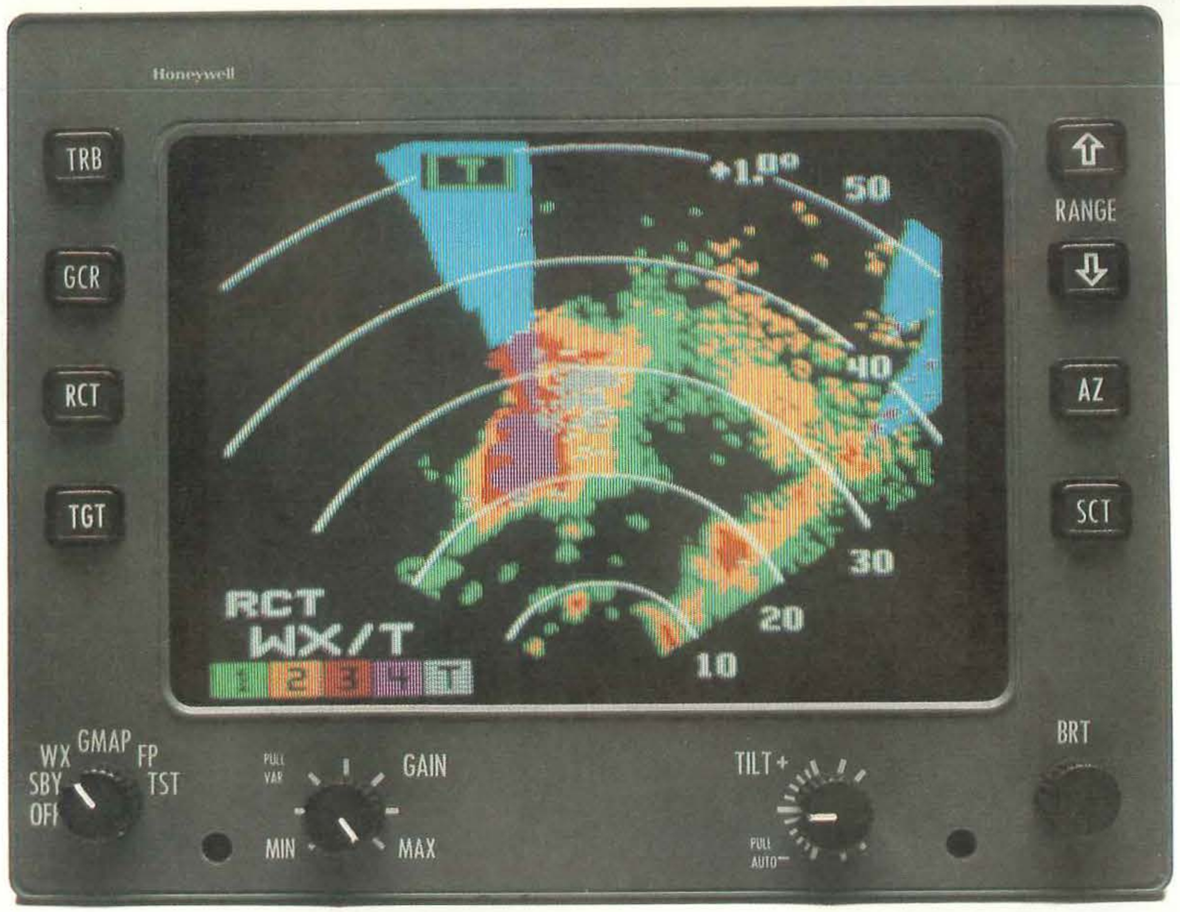
After landing, my passenger commented on what a smooth flight it had been and when I thought back I realised that although we had passed through the most dreadful weather maybe there had hardly been a bump. Was this due to the radar? Maybe, maybe not, but I know I would not have attempted the trip without it. That night on the television we saw torrential rain in Sydney with local flooding and also the damage storms had wreaked in Brisbane and various other cities that day. One of those upper air troughs which seem to be used to describe any weather that was not forecast had appeared from nowhere inland from the eastern seaboard and was creating havoc.

The balance of the flight to Cairns was uneventful. The trip from Mackay to Cairns was flown in the morning in clear skies. The return flight to Hamilton Island was not quite as good because although it was the morning we ran into two larger cells just north of Townsville but again used the radar to successfully negotiate a path between them. However our trip to Sydney was to be another story.

I had planned our flight from Hamilton Island to Bankstown direct with fuel stops at Rockhampton and Archerfield. The forecast, however, indicated few problems to Archerfield, but beyond to Bankstown it was 'isolated CB 2000 coastal 4000 inland tops 36000 becoming occasional after 05Z with SCT CU 4000 tops 1.8000 and SCT AS 10000-18000' and TAF for Bankstown which included 'PROB 20 INTER 04-11 3000 95TS 3 CB 040' together with a special on Sydney at 22Z 'Wind 180/10 Vis 7000 rain 3/8 500 8/8 1000'. I decided to proceed to Archerfield and review the situation there.

We arrived at Archerfield after skirting two thunderstorms en route Rockhampton and a check with briefing revealed that the actual for Bankstown was well above minima but that thunderstorms were still forecast after 05Z. The en route thunderstorms were also still forecast although they could not provide details. A glance in the general direction revealed nothing untoward. We therefore departed again hoping to reach Bankstown by 0615Z, well after the 0400 for thunderstorms on the TAF, and cruising at an altitude of FL140.

Within 50 miles of Archerfield our radar began painting colours and visual inspection showed a massive build-up 20 miles ahead. At this time a



DC9 above and ahead of me reported diverting to the west, so I followed. It was becoming obvious that FL140 would not clear the lower cloud so we went to FL160 and then to FL180 and even so we were concerned over the magnitude of the diversion necessary, when the DC9 reported he was 110 DME Brisbane and returning to track. I was about 90 DME at this time and still tracking west. At exactly 110 DME I rounded the storm to see a gap to the east and was able to turn to achieve a 30 degrees intercept of track. We now entered an eerie sort of canyon with large build-ups all around us but the way ahead clear, although the space was layered with altostratus layers above and some below us. At times visibility to the left or right was completely obscured by layers of altostratus. My passenger chose this time to go to sleep, thus adding to the eeriness. Then up ahead I could see a complete wall with no breaks and it was becoming apparent that I would have to penetrate it. The weather radar showed clear although registering cells off in the distance, but just then a high flying aircraft on track Williamtown to Casino at 34000 feet reported he was diverting west to avoid several build-ups. I wondered how high they must go and whether I would be flying into them. I asked him what it looked like on my track from Mount Sandon to Singleton and he said it appeared to be clear with one or two cells further west. The radar was still showing clear so I plunged into the cloud only to emerge a short while later in almost clear skies. After dodging one more cell we arrived at Bankstown. My friend woke up during the descent and remarked again what a smooth flight it had been.

If you can afford a weather radar, this, another of Mr Little's excellent contributions, should convince you to splurge. A good radar is a marvellous tool and will help you get the job done safely when others must call it quits. Notice that Mr Little says he would not have undertaken the trip without his radar. Notice, too, that he compares the visual size of a storm with the radar size — without the radar you may well have to divert 50 miles further.

A word of caution, though, on radar and storm scopes. They are aids, useful tools to help you. But they are not infallible. I'm sure all IFR rated pilots have tales to tell. I well remember flying into cloud which gave no paint on our radar. Within seconds, we were icing up and losing airspeed. At the point where I was about to add power, we popped out into the clear again. We were in it for only about 30 seconds, it did not paint on radar, yet we iced up unbelievably.

And a word of caution for the no-radar pilot. As you can see from this article, radar fitted aircraft have a big advantage over non-radar fitted. Do not be tempted to push on just because you hear someone else getting through. If you have doubts, ask ATS or the other aircraft, but make it clear you are not radar equipped.

Mr Little has another very good technique to complement the use of radar. He communicates very well. He listens to other aircraft near him, learns from their reactions to the weather and, when in doubt, asks for advice.

Through careful planning and good communication we can all make the right decision when it comes to lousy weather. Adding the extras — Command Instrument rating, storm scope, weather radar — will give us more confidence, a greater margin of safety and enable the job to be done more often □

GROUND TO AIR

SCENE: Charlene and Ralph in their Cessna 172 flying southeast down the Light Aircraft Lane into Moorabbin for the first time.

Charlene: (examining the Visual Terminal Chart) Let's see . . . Moorabbin . . . a 3 mile zone up to 2000 with a 5 mile frequency buffer . . . inbound point from the north-west iiiiiis . . . Brighton . . . just south of the outbound point . . . Point Ormond . . . we've also got Westgate Bridge, Point Ormond and Station Pier, the routes in and out of Essendon . . .

Ralph: Sounds like a pretty busy area!

Charlene: Yeah, it looks like the combination of the Melbourne Control Zone and the military restricted area funnels a lot of traffic through this area. We're at 1500 now, and we should be at 1500 at Brighton.

Ralph: What do aircraft flying from Moorabbin to Essendon do?

Charlene: There's a new procedure. Aircraft flying down the Lane like us are at 1500, and going back we'll be at 2000, so going from Moorabbin to Essendon via Point Ormond they'd climb to 2000 so they aren't nose to nose with us at 1500.

Ralph: I suppose that going from Essendon to Moorabbin they fly at 1500 to match us.

Charlene: Yeah, that's right.

Ralph: Better listen to the ATIS.

Charlene: OK.

They listen to the ATIS:
'Moorabbin Information Sierra, arrivals and departures east runway 35 right frequency 118.1, arrivals and departures west runway 35 left frequency 123.0, wind 360 degrees 10 knots, QNH 1013, temperature 14, CAVOK. When calling ready, nominate direction of departure, Moorabbin information SIERRA.'

Ralph: What's this arrivals and departures east and west?

Charlene: GAAP's two aerodromes back to back, two frequencies, two controllers.

Ralph: Which one do we call?

Charlene: Let's check . . . They're using runway 35, so if we extend the runway centreline to 8 miles we're to the west of the line, so we call 123.0, the western frequency. Runway 17 is obviously the same.

Ralph: What if the duty runway was 13 or 31?

Charlene: Well . . . extending the centreline . . . it passes to the north of Point Ormond and Brighton, and we're west of it, so we'd still call the western frequency.

Ralph: OK, what about 04/22?

Charlene: Let's see . . . there's only one runway in that direction so there would only be one frequency and one controller . . . the frequency would be on the ATIS, but the old frequency when Moorabbin only had one controller was 118.1, so I'd use that one if I was them . . . that's the eastern frequency.

Ralph: Can you work out the frequency for all entry and exit points from the runway in use, using the extended runway centreline method?

Charlene: Almost!

Ralph: You mean there's the usual exception!

Charlene: Yeah. SAPS say that when 17/35 is being used Carrum is in the western circuit.

Ralph: But it's not if you use the extended runway centreline method?

Charlene: No.

Ralph: I wonder why they changed it.

Charlene: Let's have a look . . . 17/35 . . . extend centreline Brighton's to the west and the Academy, GMH and Carrum are to the east. Yeah, I see . . . if it was left like that you'd have the eastern circuit being very busy, and the western circuit very quiet. Putting Carrum in the western circuit evens out the workload on the controllers and reduces congestion in the eastern circuit. Whaddya reckon?

Ralph: Sounds reasonable.

Charlene: Time to call inbound . . . Moorabbin Tower this is Cessna ZZZ Brighton, one thousand five hundred, inbound, received information Sierra.

Speaker: ZZZ Moorabbin Tower, join downwind.

Charlene: ZZZ

Ralph: Downwind eh?

Charlene: Yeah.

Ralph: Should I fly down the coast, then east to intercept the normal downwind turning point, or should I fly straight ahead to intercept the highway heading SSE?

Charlene: If we fly down the coast and head east we'll be nose to nose with aircraft on crosswind, that doesn't appeal to me.

Ralph: OK, I'll follow the highway.

Charlene: Don't forget to be at 1000 at the zone boundary.

Ralph: Right.

Speaker: AAA, ready for the training area.

Speaker: AAA, clear for take off!

Charlene: The training area is down to the south-east so AAA will be departing on downwind. We'd better try and find him, the tower doesn't think he's traffic, but we have a joint responsibility for separation, so let's look . . . There he is, getting airborne, we'll be well ahead of him.

Speaker: Moorabbin Tower this is Navajo, QQQ Shoal, one thousand five hundred, received Sierra.

Speaker: QQQ, Moorabbin Tower, track for a straight in approach, you are number two, follow a Cessna joining downwind, report crossing the coast.

Speaker: QQQ.

Ralph: That's us!

Charlene: Yeah! Time to report downwind . . . ZZZ downwind.

Speaker: ZZZ number one.

Charlene: That means there is no-one for us to follow, and those Navajos are pretty fast, better make it a reasonably close circuit.

Ralph: OK . . . Those runways look pretty close together and there's three of them!

Charlene: Nah, there used to be three under the old system, but now there should only be two . . . see . . . the middle runway doesn't have any runway markings on it. It must be used as a taxiway now.

Ralph: Yeah, you're right.

Speaker: QQQ, approaching the coast, preceding Cessna unsighted.

Speaker: QQQ, the Cessna is now on base.

Speaker: QQQ.

Speaker: QQQ, sighted.

Speaker: ZZZ, clear to land.

Charlene: ZZZ . . . don't dawdle on the runway Ralph, the Navajo is going to be right behind us.

Ralph: Right!

Charlene: The runway is three times as wide as the sealed surface in the middle . . . see the white gable markers ... and the yellow lines on the taxiways? They mark the edges of the runway.

Ralph: So when I land I'm not clear until my tail has passed the yellow line.

Charlene: Right.

Charlene: Nice landing Ralph.

Ralph: Thanks Charlene.

Speaker: QQQ, clear to land.

Speaker: QQQ.

Charlene: OK, we're clear, better call on the ground frequency . . . ZZZ.

Speaker: ZZZ.

Ralph: That was pretty easy.

Charlene: Yeah, it is if you try to make sense of the system and keep an eye and an ear out.

Ralph: No worries □