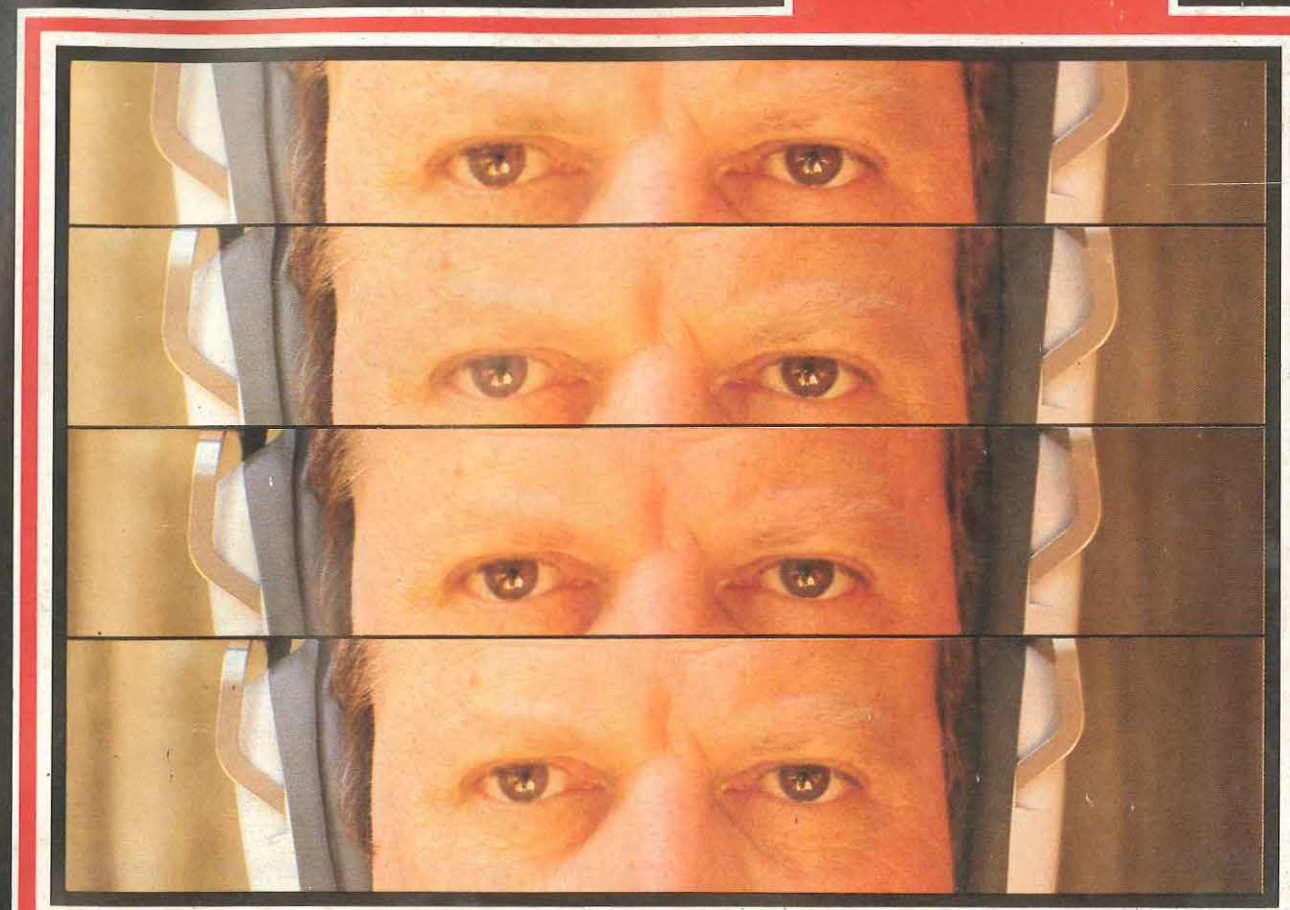
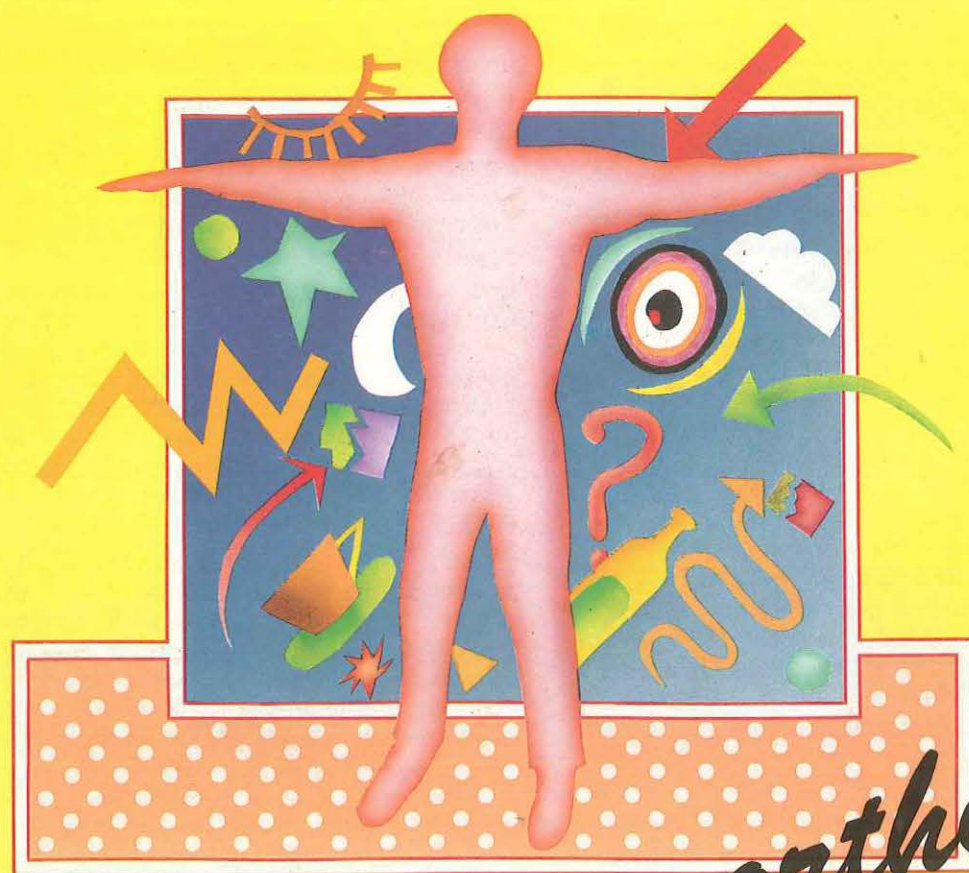




# Aviation Safety Digest



## THE HUMAN FACTOR



*Are you airworthy?*

YOUR PERSONAL CHECK-LIST	
R	Rested, Refreshed and Ready to go?
A	Attitude?
M	Medical condition and Medication?
B	"Bottle to Throttle" and Breakfast?
O	Organised?

Well-being, Get-up and go
Positive
Compatible with flying
Hours of sleep Food and fluid
Fully prepared for the flight and current



Aviation Safety Digest is prepared by the Department of Aviation and is published by the Australian Government Publishing Service. It is distributed to Australian licence holders (except student pilots), registered aircraft owners and certain other persons and organisations having an operational interest in safety within the Australian civil aviation environment.

Distributors who experience delivery problems or who wish to notify a change of address should contact:

The Publications Distribution Officer (EPSD)  
Department of Aviation  
P.O. Box 1986, Carlton South, Vic. 3053,  
AUSTRALIA  
Telephone (03) 667 2733

Aviation Safety Digest is also available on subscription from the Australian Government Publishing Service. There is a subscription form in this issue. Inquiries and notifications of change of address should be directed to:

Mail Order Sales  
Australian Government Publishing Service  
G.P.O. Box 84, Canberra, A.C.T. 2601,  
AUSTRALIA  
Telephone (062) 95 4411. Telex AA62013

Subscriptions may also be lodged at Commonwealth Government Bookshops in the capital cities.

The views expressed in the Aviation Safety Digest are those of the editor or the individual contributor and are intended to stimulate discussion in the fields of aviation safety and related areas. They do not necessarily reflect the policy of the Department. The articles are intended to serve as a basis for discussion and even argument in an effort to identify and resolve problem areas and potentially hazardous situations.

Unless otherwise noted, articles in this publication are based on Australian accidents, incidents or statistics.

Reader comments and contributions are welcome but the editor reserves the right to publish only those items which are assessed as being constructive towards flight safety.

Reader contributions and correspondence should be addressed to:

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Canberra, A.C.T. 2601, AUSTRALIA

© Commonwealth of Australia 1986  
ISSN 0045-1207  
R85/979(4) Cat. No. 86 0310 3

Printed by Ambassador Press Pty Ltd  
51 Good Street, Granville, N.S.W. 2142,  
AUSTRALIA

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## Editorial

### A rose by any other name . . .

THE 'HUMAN FACTOR' has been highlighted as the significant common element in the great majority of aircraft accidents. I think this is good news. Why? Because it means that the solution to the majority of aircraft accidents rests in our own hands. We can do something to prevent or avoid the specific accidents that are likely to happen to us as a result of our human limitations.

The term 'Human Factors' covers a multitude of human failings, weaknesses and limitations. They can take many forms and are a general reflection of the situation where the airborne environment severely taxes the innate abilities of the human being. However, there is much that can be done to assist the human pilot and there is much the human pilot can do to help himself or herself. The human machine is remarkable for its ability to adapt and to respond to new situations.

The human pilot can perform extremely well provided that he or she is adequately prepared physiologically and psychologically for the task.

It is this preparation that is critical. As we realise more fully the part played by the human and as we recognise both our attributes and our limitations, it becomes clear that the capability of a particular human is not a constant value. Each of us is born with a degree of aptitude and a degree of potential. It is good training and experience that exploits that aptitude and develops that potential. Nor can the human machine perform at its optimum level indefinitely. It is vulnerable to fatigue, to illness, to distraction and to psychological stress.

The capacity of the human to cope with a particular situation can be developed by specific preparation for that particular situation. The man-in-the-street could not hope to fly a B747 or a space shuttle but a trained woman or man can fly it with little difficulty. These training courses have traditionally encompassed the manipulative and technical skills necessary for the task. Recently, as the pilot became more of a manager, the courses introduced management skills. Now that the aircraft and its systems have become highly reliable and the human has been shown to be the weak link in the safety chain, the courses are being developed to introduce an awareness of the human factor.

The more aware we become of the effect of physiological and psychological influences on human performance the more we can avoid or prevent the situations developing to the extent of being an accident cause. The antidote to human limitations and the defence against human failings can be learnt. Traditionally we knew it as 'AIRMANSHIP'. I don't see any reason to change the name now.

Airmanship was an undefined quality that a pilot was expected to develop with experience, training and by observing the 'old hands'.

Airmanship encompassed consideration for fellow users of the sky, courtesy for passengers and crew, thoroughness of preparation for flight, depth of knowledge of the aircraft and its systems, responsibility for one's own actions and decisions, self-discipline and an observance of the unwritten ethics of the piloting profession.

Sounds a bit like a character from 'Boys' Own' perhaps, but nevertheless it was a reasonable way of countering the human 'weaknesses' that were identified at the time. Today we know more about ourselves and the nature of the human animal. We can now understand the significance of those unwritten, untaught rules of airmanship. They do not apply any less today.

This Reference Issue of the *Digest* is an attempt to coalesce recent discussion on the subject of human factors in a form which is useful and accessible. It may gloss over some of the theoretical concepts and I make no apology for this. If it serves as a basis for reflection and some lively discussion, I will have achieved all I could ask.

For me the ultimate message about human factors is that I largely decide my own fate. If I wish to survive my flying I have the means to do it. So do you. The time for blaming other people, the aircraft or the environment, is passed.

The *human* in the *human* factor is me and it is you. I have to try to allow for my weaknesses and you have to allow for yours. Between us we can both fly safely □

## Covers

*Front. The human machine is a complex of many facets. It is the least understood and least predictable element in the aircraft's systems. It can perform way beyond expectations and it can fall well short of safe practices. It represents both the best and the worst aspects of the aircraft's performance.*

*To be competent pilots we each must strive to understand, assess and allow for our own capabilities.*

*Design by David Robson. Photograph by Daniel Robson, NIKON F. Kodacolor.*

*Back. The pilot is the most important element in each and every aircraft system and like any other part of the aircraft, must be pre-flighted.*

*Poster design by Lesley Gordon.*



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P 8,36 BASI

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Cartoons } Soussanith Nokham  
Aphorisms } David Robson  
Posters }



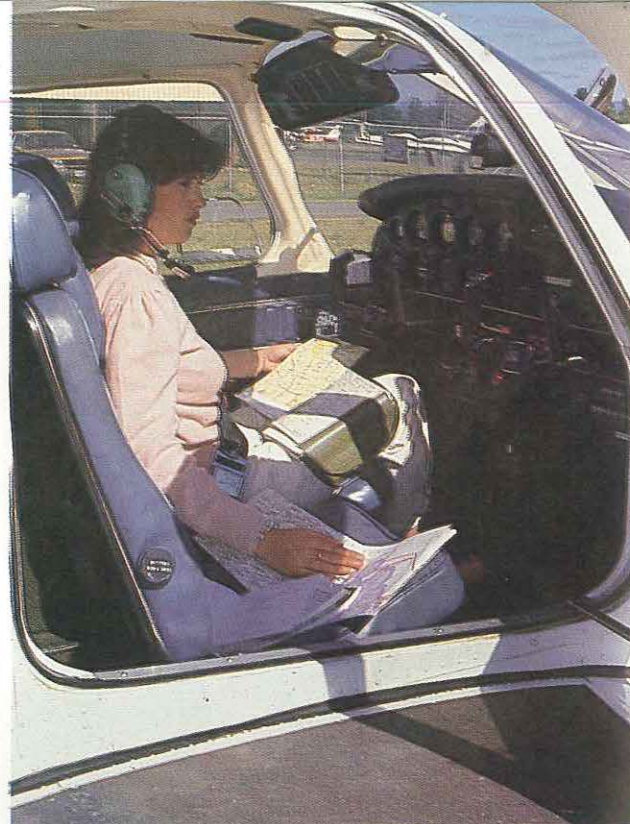
## The dreamtime

*Air conditioning the pilot*

IT'S NOT A NEW idea. Some airlines and some air forces have been doing it for years. Some even pay a fortune for simulators and procedural trainers to achieve the same thing. But in GA we can do it for nothing and gain the same benefits.

What on earth am I talking about? I am talking about 'air conditioning' the pilot. By that I mean mentally preparing the pilot for flight in a particular aircraft. A few hours spent in the cockpit of the aircraft while it is sitting on the tarmac can save time, money and lives in the air. Chuck Yeager did it before he flew each type. He sat for hours in the cockpit until he knew every control and every procedure by heart. Then he repeated the practice with a cover over the canopy so that he could still find everything in the dark — eyes closed. He knew that there was no time for second thoughts once the plane was launched from the mother ship. And a GA aeroplane is no different. If something goes wrong we haven't got all day to read the procedures and find out how to lower the undercarriage. We should know them so that while our body is carrying out the actions, our minds can be making decisions — survival decisions.

Australia's world champion racing driver, Alan Jones, described it beautifully. When he was at the peak of the season in the intense competitive environment of Formula One racing, it was as if his body was driving the car almost automatically and he was a spectator looking over his own shoulder. Looking 'through the window of my helmet', was the way Alan described it. His body and mind were so conditioned that he had spare mental capacity to 'sit back', monitor the situation and make tactical decisions. Athletes will know the feeling. Paratroops, too, practice their drills over and over so that in the few seconds that they have to react, their actions will be automatic and correct.



If you spend a half an hour in the cockpit before each flight — and I am assuming you fly infrequently like most of us — then you can run through the checks, the local radio procedures and the emergency procedures. You can even rehearse the flight — the departure, arrival and instrument approach. When you go flying, you will be more competent, more relaxed and when your emergency occurs, you will cope correctly, calmly and quickly.

I have a delightful book called 'Teach Yourself to Fly'. It was one of the English Universities Press 'Teach Yourself' series, published in 1941. The author, Nigel Tangye, spent months mentally rehearsing his forthcoming flying lessons to the extent that when he flew for the first time he felt completely at home and it was all familiar — with one exception. He had incorrectly assumed the rudder pedals worked in the same sense as a billy-cart [heaven knows why they don't]. After such strong mental conditioning it took him some time to readjust. Even so, he estimated that the preparation he had done saved him half the flying time it would otherwise have taken him to learn each lesson. You can see how effective and time-saving this conditioning technique can be.

The 'old hands' around the place don't get that way by sitting in the bar. They fly frequently in one aircraft type and if they have to fly a new type or to an unfamiliar area they do their homework first.

We who fly less often have an obligation to do at least as much.

We should be 'air conditioned' before each flight □

## What is, or is it are, Ergonomics?

THE CAN OF shaving cream with parallel sides — cunningly designed to slip through your wet fingers, the shampoo bottle which tapers towards the base so that it falls over whenever you put it down, the doorknob that catches your finger tips, the dials you can't read but look trendy, the sore neck due to inadequate headroom, these are variously classified under the heading of 'design', or more particularly, 'ergonomics' — the art of matching the environment and the machine to the operator.

It is important to the aviator because the aviation environment is unforgiving — intolerant of mistakes. A control that is awkward to operate, the instrument that is difficult to read, the charts that are confusing, the radios that are garbled and the cockpit lighting that is poor — these are all potential accident causes and yet they are all fairly easy to correct.

How many of us have almost retracted the undercarriage instead of the flaps in a Bonanza? How many pilots naturally turn the frequency selector the wrong way on the NAVCOM? How many have mis-set the trim in a Bonanza? How many of us have thought we heard a takeoff clearance that was never given? Or mis-read an altimeter, an IAL chart or let-down plate?

Have you ever pulled the mixture control instead of the propeller RPM when reducing power after takeoff? I nearly was caught out recently in a Cutlass as I was maintaining a climb attitude after takeoff in windy conditions. The two controls feel very similar and as I looked down to confirm, I found I had hold of the mixture control.

And what about the press-to-talk button on the left horn of the right yoke? A simple deficiency that considerably interferes with smooth con-

trol during a demonstrated instrument approach from the right-hand seat.

It is a complex problem to perfectly match the machine to the man — or more significantly several different men and women of various shapes and sizes, differing skills, experience and physical and mental capacities.

The Baron with its throttles and propeller levers reversed to the layout in other twins is an obvious potential problem for pilots who fly several types and fly the Baron only occasionally.

They all *should* be standardised but they are not — the military and the RPT aircraft are tightly controlled in the design and specification stage so that most controls and displays are internationally standardised but GA aircraft aren't so rigidly regulated.

So why are we bothering to discuss the subject? Because you and I, as pilots, have to compensate for these differences or deficiencies. The onus is on us to note the differences and mentally adjust our techniques or procedures to allow for them.

There is the classic story of the F104 Starfighter. The original version had a downwards firing ejection seat because it was felt that the high charge necessary to propel the pilot over the tall fin would cause serious spinal injuries.

The Air National Guard pilots therefore mentally briefed themselves that in the event of an engine failure after takeoff, they would roll the aircraft inverted before ejection. Under these circumstances there was little time for thought. The F104 was not an outstanding glider and so the pilots went over and over the procedure until they could do it in their sleep.

The later version came to be fitted with an upward-firing seat as a multi-stage ejection gun was developed which could propel the pilot clear without risk of serious injury.

The next pilot to suffer an engine failure after takeoff — and I understand it was his first flight after a holiday and his first on the new version — promptly rolled inverted, fired the seat and ejected into the ground.

Ergonomics are factors which can increase or reduce pilot workload and they significantly influence the probability of correct action in the event of an emergency.

We pilots, we 'trained' humans, can accommodate a large number of deficiencies if we fly one aircraft type regularly and if we pre-program ourselves to react correctly. If we fly more than one aircraft type — watch out. Currency is one thing — currency on type is another matter — and it does matter. It's a *serious* matter. In the longer term we must let the manufacturers know that good ergonomic design is just as important in GA aeroplanes □



## Never mind the currency — feel the width

THE DILEMMA facing all of us is how to fly frequently enough to be safe, or more particularly, how to be able to afford to fly frequently enough to be safe.

Unless we are employed as pilots most of us cannot fly often enough to remain fully current at all times — and I don't just mean meeting the legal letter-of-the-law — I mean enough to be both competent and confident.

There is a temptation to fly at the minimum rate necessary to be legally current so as to maintain our licences and our ratings. In many cases it happens that a pilot flies despite being uncurrent and gets into trouble — *accidentally*.

It has always been a problem and it always will be. One solution is timing and the other is to replace quantity with quality.

Let's look at the reason for currency minima. A pilot progressively loses his touch during any period of inactivity or lack of exposure to a particular set of circumstances. The longer the break, the less current or the less competent and confident he or she becomes. The Department has minimum requirements for a pilot to be able to exercise the privileges of his licence. There are also recency requirements with respect to each type of operation. However, in the case of each individual, the loss of efficiency or safety margins is a function of original training, experience, attitude, the value of recent flying and the risks that one is prepared to take. There is no absolute amount for each and every pilot. Only you can judge if you are current enough to undertake a particular flight or part of a flight — say an approach into a marginal ALA with a gusting 15 knot crosswind. Currency is not just a number of flying hours in the last 30 days — it's a measurement of our readiness to undertake a particular exercise without significant risk. You may have heard of risk management — this is part of it.

So currency has to be estimated before each flight and each phase of flight. The risk — the probability of failure — must be weighed against the cost of that failure — it's like not betting more than you are prepared or can afford to lose.

The difficult part is to be realistic — to be honest with ourselves. It is not easy to admit that we are not happy with an approach and actually turn away before it gets to the point that we have to go around to avoid loss of control. The temptation to try it is almost irresistible — and on most occasions we may get away with it.

But back to the real world. We haven't enough money to stay completely current. How do we maximise the value of our flying and how do we minimise the risks under these circumstances?

Let's look at it logically — by analysing the problem. First what are we trying to achieve? This will vary for each of us. Let's take a hypothetical situation — a pilot who flies only for pleasure and the occasional business trip, who trained on C150s and Warriors some ten years ago and who now has a total of 350 hours. Our pilot progressively gained endorsements on C182 and the retractable C210. He now has a NVMC rating. He is self-employed and has a problem finding both the time and the money to fly as often as he would like.

### What can he do?

Continuing our logical attitude, we have a VFR pilot, single engine, constant speed and retractable, and night rated. For his particular requirement he has had the training and the endorsements he needs. If he wanted to travel on business reliably he might consider gaining a Class One instrument rating but that raises even more of a currency problem and in this case is not justified. He may choose to gain a twin engine endorsement but again it is not necessary and causes more problems with currency and finances.

So step one is to define our requirement and not to waste time and money increasing the currency problem when it isn't necessary. Now that we have done this let's see how we use our licence and ratings.

Our pilot only used his NVMC rating once when he wanted to reach his destination after being delayed at a meeting. It was handy at the time but not essential. Perhaps he should reconsider its value. Since our pilot mainly flies for the pleasure of it, he only chooses those times of year and those conditions that allow pleasant flying. Obviously he doesn't need the Class One. But maybe he could go one step further — if he only flies in the summer months he could save his flying for those times. What I mean is instead of staying marginally current all year he could allow his currency to lapse through the winter and fly more intensively just before his active flying season.

As to value for money, think carefully and honestly about the type of flying you do and the most difficult circumstances applicable to your operations. It may be that you operate from an ALA with a windshear problem or you may have to operate at the maximum gross weight and aft CG position for your aircraft type. You may have to fly low and slow or in very gusty or very humid conditions. Tailor your currency flying to best prepare you for your operation.

Next choose a school and instructor who will give you value for money. By that I mean someone who will assess and coach you honestly and thoroughly. Don't regard a check ride as a nuisance to be gotten over with — but a potentially valuable way of learning something.

Use the time on the ground to prepare for each flight. It is a terrible waste of airborne time and money if you can't recall checks and procedures. I know we get rusty by not doing them regularly but if you spend an hour or two sitting in an aircraft on the tarmac practising checks, emergency procedures and radio calls out loud, you will have no problem with them airborne — and the ground rehearsals are free.

Whenever you fly don't just plod along with your mind in neutral. Discipline yourself to periodically fly exactly on speed or altitude, set the power exactly and follow procedures precisely. This exercise rubs off and the general quality of your flying will improve.

And if you are an infrequent flyer don't collect endorsements for the sake of it. Stick to one aircraft type and get to know it thoroughly. You will feel more confident and your flying will be more enjoyable as a result.

This all sounds pretty obvious, doesn't it? But it works, and you will be getting the most capable pilot that your money can buy.

I know of one pilot who goes to the St Patrick's Day races at Broken Hill every year. It is his only major cross-country flight. Before each year's expedition, he goes to Wangaratta Aero Club and has a check flight and a mini navex with the CFI — and he gets the CFI to check his completed flight plan and maps immediately before he departs. That's a sensible, professional approach to safe flying.

Another old hand who usually flies locally on Sunday mornings wanted to attend the Adelaide Grand Prix. He had the CFI check his flying, refresh his navigation techniques on a cross-country and added a flight into Moorabbin to his navex route so he could come up to scratch on his GAAP procedures before going into Parafield. He didn't want to spoil his trip nor anyone else's so he made sure he knew all that was required of him and he didn't wait to be asked. He tracked down the instructor and he told him what he wanted. That's good use of currency flying and that's also good captaincy — he was in command of his flight from several weeks before he even left the ground □

## Now you'll think I'm awful

AS PILOTS-IN-COMMAND we have to sometimes make unpopular decisions. It is our responsibility to ensure that the odds of safely completing a flight are as high as possible. That may entail making a decision or taking a course of action that is for the good of the passengers even though they may be hard to convince at the time.

The easy-way-out is often to accede to the requests or intimidation of our passengers. It is easier to squeeze in that extra suitcase rather than argue the point — 'the old aircraft will probably not even notice the extra weight' — famous last words. Those same passengers will not hesitate to hang you if you run off the end of the runway because you couldn't get airborne in the available distance.

It really isn't worth the risk. The pilot will always be the loser. Part of the responsibility of command is having the guts to take the hard decisions as well as the easy ones. When the time comes be prepared to 'stand on your dig' □





# Decisions — decisions

A GA pilot has only God or himself for a co-pilot

THERE IS NO such thing as a bad decision — or a good decision for that matter — only better or less good decisions. Under one particular set of circumstances, there is probably an optimum course of action and often that can only be decided conclusively or second-guessed in the cool of the clubroom. Under the pressure of the moment there is a 'best' decision and some less good options. The probability of us choosing the optimum course of action every time is not good. But the odds can be stacked in our favour. Also, the consequences of a less-than-optimum decision may not always be serious. We may get away with it and hopefully learn for next time.

The quality of our decisions and the consistency of our responses is a matter of heredity, training (at school as well as the aviation environment), personality, wellbeing, alertness, conditioned response and the quality and amount of good data available on which to base that decision.

Pilots are in a unique combination of circumstances with respect to the time available and the implications of each decision.

Before we become esoteric let's consider a few real-life situations:

## Decision one

The flight plan ETA was 20 minutes before last light and the pilot wasn't night rated. During the flight, the ETA was amended to seven minutes before last light.

En route weather was good and the pilot decided to continue (or did he not decide — just pressed on?)

About 10 kilometres from the destination he encountered rain showers and reduced visibility to the extent that he considered it unsafe to continue. At this time there was insufficient daylight left to divert to the planned alternate and the pilot decided to land on a stretch of sealed road.



Touchdown was normal but the aircraft began to drift to the right-hand side. The pilot tried to go around but the tailplane struck a fence post. The force of this impact almost tore the tail section from the aircraft.

The pilot felt the impact but was unaware of the extent of the damage. Even so he elected not to attempt a go-round but immediately landed in an adjoining paddock.

The road was narrow and there was a crosswind.

The six people on board escaped injury.

To continue or not to continue?

- the weather seemed OK
- time was running out
- after he was committed he encountered poor weather — but was there no prior warning or hint of problems? — the weather report did indicate a probability of Ballarat's weather turning bad
- his decision to land on the road was forced upon him — he no longer had the luxury of an option
- after the impact the pilot put it down in a paddock

This pilot's approach to decision making was pretty good and he was caught out at the last minute. Even then he kept his cool and decided to land on a road.

We can second guess his decisions and say that perhaps he should have returned to Maryborough — that would have been a marginally better decision — or that he should have found a better landing strip (a road isn't necessarily a good landing strip) but overall, he did land safely and he made those decisions under the pressure of time. Not bad going. His decision to land immediately after the impact was spot-on.

## Decision two

The ag pilot had flown about twelve sorties in the Beaver that day. After takeoff he reduced power but found he couldn't trim the aircraft although he could move the trim wheel. He thought the tail cone was coming off — it had happened before. Then the elevator jammed.

He looked back and saw the elevator horn was hanging down about three inches below the tailplane. *He dumped the load slowly and gently as he turned back towards the strip.*

The nose kept dropping and he used nose down trim to keep the nose up [with a fixed elevator the trim tab was acting as a mini elevator].

Half way back to the strip he ran out of trim. He then used flap to keep the nose up. As he turned final he had full flap but the nose dropped further even with full power applied. He then reefed on the controls and the elevator came free. The elevator fell from the aircraft at a height of about 50 feet. The aircraft hit the ground straight and stopped safely without the pilot having any remaining elevator control.

This pilot knew his aircraft and every means of gaining some degree of nose trim. His decisions were optimum. Any other decision or delay in making a decision would probably have been catastrophic.

## Decision three

The Twin Comanche was cleared for a straight in approach. When the pilot lowered the gear the in-transit light illuminated and stayed on. After a flypast of the tower, it was confirmed that the wheels were only partially extended.

As the aircraft climbed through 700 feet there was a surge of power and the aircraft yawed. The pilot assumed the right engine had failed and closed both throttles and made a wheels-up landing on the grass next to the runway.

It was found that the circuit breaker had popped. [This was a known fault with this aircraft but no-one had told this pilot.]

The left main fuel tank and left engine were devoid of fuel.

The pilot had limited experience on twins and had not been formally checked out on asymmetric handling for some four years. Under the circumstances he chose to close both throttles and put it down under control rather than risk loss of control of one engine.

Apart from the issue of the known defect and the pilot's lack of confidence due to lack of currency on engine failures in a twin, he did make a sound decision. He shouldn't have been there in the first place, but under the pressure of the situation his decision making was pretty good.

## Decision four

The C182RG was cruising at 3000 feet near Mittagong when it encountered a patch of severe turbulence. Shortly after, the engine started to run roughly and the pilot could not maintain altitude. He was planning to put it down on a freeway but then noticed an ALA nearby and positioned for a left-hand circuit. He had to stay higher than he would have liked because of tall trees on final. He decided not to lower the undercarriage as he judged that this would prevent the aircraft from running off the end of the 550 metre long sealed strip.

He touched down some 350 metres in from the threshold and slid for less than 150 metres. There was no injury to the pilot, his wife or their four children.

Again not bad decision making. He conducted trouble checks while heading for the freeway and then spotted the strip. His forced landing was safely high. Perhaps he would have been better to have lowered the wheels even if it meant running off the end at low speed. However, under the pressure of time he coped pretty well.



**Decision five**

Shortly after takeoff the pilot of the Navajo noticed a 10-15 cm gap between the forward ends of the upper and lower cowlings of the left engine. He decided to continue to his destination at reduced power and speed. [This was some 25 minutes away.]

At about 10 nm from Broken Hill the top cowl lifted and was torn off. There was then a massive vibration through the controls and the airframe and the pilot temporarily lost elevator control. Control returned on long final.

[The cowling had been wrapped around the tailplane and had departed on final allowing normal control to be restored.]

The aircraft and its nine passengers arrived safely.

To me this is not an optimum decision. In fact it is close to a wrong decision if there were such a thing. The pilot did not land at the departure strip because it was rough and yet he had previously landed there in a routine pick-up.

The choice between a normal landing on a rough strip and the possibility of losing a cowling in flight should be clear-cut. The fact that the cowling was still there at say 150 knots does not mean that the cowling will withstand 20 minutes at 100 knots. In the airflow any loose object will vibrate or flutter and that causes fatigue, wear, tearing and possible failure. There is no valid way to judge how long a loose object will stay attached and the consequences of in-flight separation need to be carefully considered indeed. Many aircraft have been lost for just this reason. You can't take these sort of risks and expect to survive for long.

The day will come in each of our flying careers when we will be confronted with a situation similar to the ones described above. How good will our decisions be I wonder? If there is any doubt the time to do something about it is now. We can prepare ourselves for these eventualities and we can increase the probability of making a more correct decision. It's a little like day-dreaming — mentally going through the likely situations and the optimum actions. That saves time in the critical situations.

However, many of our decisions are not under duress. There is time to adequately consider the options. In these situations it is more important to:

- consider all the factors
- examine all the options
- make a decision (and you would be surprised just how many problems arise because a pilot failed to make a decision at all — he just allowed events to take their course).

But it doesn't end there. There is one more aspect to decision making. A tip I learnt many years ago is to go one step further.

I went to school at St Joey's in Port Melbourne, where we were taught by nuns, very positive nuns. I'll never forget Mother Loreto trying to instil in our group of little heathens the difference between right and wrong and the concept of a conscience which tells us which is which. We considered guardian angels and the voice in the ear which tells us if we are about to tread the path of sin. If we weren't sure whether the action we were considering was the right thing to do, the final yardstick was, 'If you did this, would you be proud to tell your mother and father what you had done?'

A similar aspect applies to aviation decision making. Having made a decision, it is a sensible precaution to examine that decision for its wisdom or correctness. The final yardstick in this case could be, 'Would a respected aviator make the same decision in these circumstances?' If there is some doubt then the decision should be re-examined.

For example, we are approaching an ALA that we haven't used before. The wind is gusty and we have only flown this aircraft once before, last month. The strip length is marginal but legal. There is a clump of trees on the upwind side of the threshold. The aircraft is fully loaded and our passengers are keen to visit their relatives who live nearby.

We have an uneasy feeling about the whole thing. All the small factors are stacking up against us. Now, instead of continuing the approach and seeing if we can cope, we decide to make a conscious decision. We consider the factors and the options. The odds are not as good as they should be. We can continue, hold for a while or divert to another field some 10 kilometres away. The temptation is to give it a go. A diversion would be embarrassing and inconvenient.

We are about to 'have a go' when we examine the decision from a less involved viewpoint. The conditions are not favourable. The pilot is neither current nor confident. It would not be wise to even attempt a landing. The 'right' decision would be to hold or divert.

We reconsider and advise our passengers. Surprisingly, they are relieved rather than critical. One of them later comments that they could sense our uneasiness about the landing and if we were uneasy, they certainly didn't want to continue.

See how this decision analysis works? It's as if we had a judge sitting on our shoulder, saying that what we had decided was wise or otherwise. Just like Donald Duck's alter ego . . . or Mother Loreto's guardian angel □

## Ratbaggery

**Y**OU HAVE all heard the song, 'Do the right thing'. As pilots we are part of a community — a rather special community. I cannot understand how one pilot can treat a fellow pilot as something less than equal — someone who has shared the dangers, fears and struggles to become a member of an exclusive family surely deserves some recognition — especially a student who is struggling up the experience ladder just as we all had to in the beginning.

Similarly a pilot who mistreats his aircraft is no different from a drover who abuses his horse — he is both a fool and a ratbag.

We have all seen the high-speed taxier. At the recent World Gliding Championships, I saw a Pawnee taxi through a public access parking area at a speed that precluded a sudden stop if a child had run out in front. I have seen a commuter taxiing at a speed where he could have raised the nosewheel off the ground — again through a parking area.

Not long ago I watched a Nomad pilot taxiing for some time behind a Tobago which had a student pilot at the controls. It was so close that as it approached the parking area, the student pilot became flustered. Sounds petty but he was close — close enough to hear and almost feel the twin turboprops spinning behind his head. Instead of controlling the ratbag in the Nomad, the tower cautioned the student that there was an aircraft close behind and asked him to expedite!

I watched a light twin on a charter flight cut inside a Tomahawk turning base — presumably to save a couple of minutes. The Tomahawk's circuit was a little wide. It was her second solo.

I attended a country air show last year which was well organised and had a pleasant atmosphere of fellowship. In the middle of the day, a helicopter carrying a TV crew landed in the middle of the parking area, scattering the spectators, rocking the ultralights and covering everyone and everything with a liberal coating of dust.

At another country show I watched a Navajo land fast in a strong crosswind and you could see the oleos bending under the stress as he braked hard and simultaneously tried to turn off at the taxiway halfway along the strip.

If the aviation community loses its sense of courtesy, consideration and fellowship and pilots become mere 'airspace users' rather than pilots, then there will be little pleasure and much danger in continuing to fly aeroplanes.

Up till now the aviation community has been responsible and mature. There has been the occasional ratbag but he was a rarity — he was chastised by his colleagues and left in no doubt that his behaviour would not be tolerated.

It is up to all supervisors to keep an eye on operations in their area and to speak up when these situations arise. It's not being a 'policeman'. It is being responsible. After all, what right does the ratbag have to spoil everyone else's pleasure and even to threaten people's safety?

A CFI friend of mine was recently describing a student he had some years ago. A rarity but a ratbag. This bloke was so selfish and so one-eyed that he would go from A to B and to hell with anyone or anything that got in his way. He bulldozed his way through the sky irrespective of circuit areas, controlled airspace or whatever else was there. He was eventually barred from the club but carried on flying elsewhere — in fact he gained his licence and was building quite a reputation for himself when finally, due to illegal charters, airspace infringements, flying overloaded aircraft, and landing with hardly enough fuel to taxi, he was grounded.

There are few of these people about but they do exist. We accept the Aussie battler who is out to make a quid. However, in aviation there isn't room for the selfish attitude □

# DO UNTO OTHERS .....





# Attitude — the most important ingredient

**W**HEN I WAS a lad I was a fanatic about everything connected with aeroplanes. When the opportunity arose to actually start learning to fly I devoured every book and magazine I could lay my hands on. I wanted to glean every secret, memorise every tip and absorb every ounce of aeronautical wisdom that the previous generations of pilots had learnt the hard way. I had heard that flying was a natural talent that you either had or didn't have. I wasn't sure that I had it and I wanted everything going for me. I didn't appreciate the donkey work that had to be done by every pilot who wanted to become something more than just an average pilot with an average chance of survival and an average chance of an accident-free flying career. I wanted more. I wanted to be a respected pilot — a 'pretty good' pilot in the eyes of my peers.

At about that stage I read an article in an American magazine called 'FLYING'.

It was 1963 I think, when they ran a feature on 'pilot improvement'. It left an indelible impression on me. It confirmed there was no easy way to becoming a good pilot. Every pilot had to work at it. No-one was 'blessed'. I realised for the first time that I held the key to whether I was going to be a good pilot — it wasn't a gift of the gods, or fate, or luck. I could be a good pilot if I wanted to be — if I was motivated — and if I applied myself to learning every facet of aircraft operations.

Looking back on this it sounds insignificant but at the time, the realisation was staggering.

I bought two copies of the magazine and treasured them for years. I finally passed them on to young pilots who asked me the key to success. Let me summarise the main points of the article as best I can remember them:

- The key to success was your attitude — not just the attitude of the aircraft but your mental attitude to the task of flying. We would call it motivation, and if you ask any CFI he will tell you that it is the most important ingredient in the trainee pilot's make-up. It's a combination of a willingness to learn and a sort of inner drive. The article cited a case of a pilot who was respected by his peers but did not apparently have to work at it. It seemed to come naturally. He was later discovered working at the books in his room when his mates were at the pub. He prepared special performance charts for his aircraft that were easier to interpret than those in the flight manual and it took him many late nights to do it. This pilot was motivated to do his job well as he possibly could and for him that meant not just sitting in the bar talking about flying but applying himself to becoming a better pilot.
- You have to love what you are doing and you have to have the determination to work at it until you reach the highest possible standard — to realise your full potential. You find out how and why the aircraft flies, how the nav aids work, the best way to cope with emergencies, how to eke the optimum performance out of your aircraft, how to treat the aircraft and its systems properly, how to load the aircraft and how to look after a sick or nervous passenger. You learn the rules of the air and the procedures so that you know the ones that affect your operations intimately. You don't do this to pass exams. Nor do you wait to be told to do it. You do it because you take a pride in being a member of the most exclusive family in the world — aviators — and for you near enough is not good enough. That is if you are motivated.
- Pilots who fly only for pleasure may feel that such an attitude could take the fun out of flying. Nothing could be further from the truth. You are more relaxed and have more fun if you are current and know exactly the checks, procedures and techniques relevant to your aircraft. Your passengers and colleagues will also sense this confidence and they too will enjoy their flying more.
- This attitude, this motivation must be sustained not just through your learning phase but through your whole flying career. Flying is a profession where you have to keep learning just to keep pace. To stay ahead you have to work at it. When you pass your licence test, that is not the time to relax and forget everything you have just learnt. It is critical that you make the best use of the consolidation period after you are licensed to become more than an average pilot — to become a good pilot.

- This motivation, this attitude applies equally to the 10 hour student, the 100 hour club champion and the 1000 hour commercial pilot. It becomes a way of life and in that sense, it has a very real value — it is a way of ensuring the best probability of your survival and of avoiding accidents.

Remember that flying, even private flying, is the profession where you lay your life on the line. You and your passengers directly gamble on your attitude to safe flight.

The pilot who approaches each flight with the objective of learning something new or accomplishing something a little better than he did it last time has the magic ingredient. He or she will become a 'good pilot' — no risk □



## Interruptions . . . interruptions . . .

**O**NE OF THE most insidious causes of accidents is an interruption to the normal routine. Checks are particularly vulnerable. And the interruption doesn't have to be a major event.

A plot of a Mooney was flying to Kooralbyn on a pleasure flight. He normally uses a headset and a press-to-talk button, but on this occasion the press-to-talk was U/S and he had to use a hand-held mike.

The pilot tried to contact Flight Service and received no reply. He called again and was asked to stand by. The pilot continued to hold the microphone as he started his prelanding checks. He deliberately left the undercarriage up as the aircraft was above maximum gear speed. He then cancelled SARWATCH, returned the mike to its holder and lifted the right earpiece clear of his ear. He always did this so that he could hear the stall warning on flare-out should it operate.

By now the aircraft was overhead the strip. The pilot checked the windsock and joined for a left-hand circuit. The nearby mountainous terrain caused the pilot to devote more than usual attention to the approach.

The approach felt a little high so he closed the throttle, selected more flap and flared for landing. The aircraft settled very gently on to its belly. The gear warning did not sound.

The pilot was not distracted to the extent of forgetting the checks. He elected to leave the gear up. However, he continued the checklist without the gear rather than deferring the com-

plete list. If he had deferred the whole list it is more likely that this would have remained prominent in his mind as a significant outstanding event. As it was, the delayed gear was not attributed sufficient value to remain prominent. The relatively minor distractions of the mike, the terrain and the earpiece were then enough to displace the gear in the pilot's mental priorities.

A PUF check on final approach could have been the best insurance:

- P — Propeller — Full fine
- U — Undercarriage — Three . . .  
(Decision — continue or go round)
- F — Flaps — Set to . . .

The defence against these distractions is:

- Not to defer checks, i.e. if you are above gear speed at the time you wish to do the check, slow down there and then and don't continue with the checklist until that item is completed.
- Don't split checklists — defer the whole list rather than one item.
- Never go past a checklist item with the intention of doing it later.
- Associate checklists with specific flight stages, e.g. gear down abeam the upwind end of the runway — and don't continue without doing it.
- Always use a double-check for critical items, i.e. a Finals check such as 'PUF'. No matter how many times you have previously checked the item — check it again.

PUF — PUF — PUF — PUF — PUF — PUF □





# Pilots have a one-track mind

*Single-channel processing and pilot performance*

*Dr Rob Lee is an aviation psychologist and an Assistant Director of the Bureau of Air Safety Investigation in Canberra.*

THE PRIMARY function of the pilot in any aircraft (except the odd man-powered device) is to process information. That is basically all that the pilot does. Through the senses the pilot receives information from various sources, such as the instruments, the outside world, aircraft documentation, radio comms, and so on. This information must be correctly perceived, integrated and combined with reference information held in the pilot's memory, so as to make decisions regarding the safe operation of the aircraft.

Sounds fairly straightforward, doesn't it? Unfortunately, as is usual with human behaviour, the situation is not quite that simple.

The nature of human information processing first came to be properly researched during World War II, when the rate of technological advance in aviation began to accelerate so very rapidly. Higher performance aircraft such as the Spitfire and Fw 190 came on the scene and systems like airborne radar were introduced. It was soon discovered, much to the consternation and bafflement of the design engineers, that many of the new systems were failing to reach their expected performance levels. Detailed investigation revealed that the basic reason for these deficiencies lay not with the hardware, but with the capabilities and limitations of the human operators of these systems. The problems were not related to physical factors, rather they seemed to have something to do with the information processing characteristics of the human operators.

Obviously, it was simply not acceptable that new 'high tech' weapons systems were unable to meet their design specifications, and as a result of the potentially disastrous military consequences of this state of affairs, research programs were initiated to obtain data on basic human information processing performance. The aim was to apply the results of the research to the design of weapons systems so that they could realise their full potential.

Since those pioneering wartime experiments, research on human information processing has continued alongside the massive technological advances in aviation since the 1940s. As a result, we know a great deal about how humans process information and how this affects the performance of pilots.

There is now a large amount of research evidence, plus the results of a great many civil and military accident and incident investigations, which shows that there is a finite limit to the amount of information that can be consciously processed in a given time by the human brain. It has also been shown that conscious human decision making is sequential and not parallel. In other words, decisions are made one after the other and not simultaneously. Further, it doesn't matter how the information is received — through the eyes, the ears, the skin or whatever — if it is consciously processed, it all happens in the same 'place', in the brain.

When we appear to be performing two or more tasks at once, what is really happening is that our conscious attention is rapidly alternating between the separate tasks. It's somewhat similar to the way the central processing capacity of a computer is time-shared with several terminals.

Overall, the key finding of this research is that people function as SINGLE CHANNEL information processors of limited capacity. This limitation has enormous importance in flying, and many of its consequences are far from obvious.

In flying, the brain's limited single-channel, information-processing capacity must often be shared between different tasks, and it can very easily be overloaded — especially in emergency situations. Further, your individual channel capacity may be effectively reduced by many factors, such as stress, fatigue, currency and level of skill.

Whether we like it or not, anything to which we consciously pay attention, uses up part of our limited channel capacity and reduces the 'spare capacity' available to time-share with other tasks. For example, if you are concerned about the proximity of other aircraft in your airspace and you are scanning the sky intently, then you are using most, if not all, of your channel capacity in just processing the visual information from outside the cockpit. Conversely, if you are trying to sort out a difficult problem which causes you to do a lot of hard thinking — for example, whether to divert to an alternate given your marginal fuel state and the rapidly deteriorating weather conditions — then virtually all your channel capacity is taken up with this problem solving. This drastically reduces the mental capacity available to process visual information. In effect, your visual capabilities are severely reduced. To all intents and purposes you become partially blind.

It had been known for a long time that performing one task could reduce performance on another task performed at the same time, but the specific and much less obvious effects on visual perception of carrying out a mental task at the same time were not fully realised. Yet they are a direct consequence of the single-channel nature of human information processing.

Research on this problem carried out by NASA in recent years has shown that the actual range of eye movements of pilots in a situation where they are performing a flying-type visual tracking task while also performing a listening/identification task can be reduced anywhere from ten to sixty per cent. The researchers stated: 'Thus if a pilot were scanning through a visual angle of 20 degrees the onset of a difficult concurrent mental task could possibly reduce his range of visual tracking down to only eight degrees.' Ominously, not one of the pilots in the experiments was aware that his range of eye movements was narrowing.

Think very carefully about this finding in relation to 'see and be seen' conditions. As a rule of thumb, if there are two of you in the cockpit and a difficult situation comes up, let one do the hard thinking and the other do the looking, and you will have a better chance of avoiding a breakdown in separation. If you are the only one on board, be aware that your lookout will not be as effective while you are concentrating on solving a problem, even if you are looking out of the cockpit at all times.

A short article such as this cannot possibly cover all aspects of single-channel processing. However, one very important consequence is that certain characteristic types of error will occur when the single channel becomes overloaded.

Many pilots are familiar with the expression 'load-shedding'. This is a result of the single-channel limitation. What happens is that the amount of information to be processed becomes so great that the brain cannot cope with it all in the time available, so much of the information is simply ignored, or shed, and the pilot's conscious attention focuses, or 'channelises', on some aspect of the task that the single channel can cope with. Unfortunately, the information being ignored may be vital to the safe operation of the aircraft. So we have accidents where the pilot's total attention has become focused on maintaining airspeed. Vital altitude information is not being processed, and the aircraft finally flies into the ground!

One essential requirement of training is to ensure that under emergency conditions, when some of the demands on the pilot may have to be shed to enable him or her to cope, that those which are shed are not essential to safe flight. Priorities for load-shedding must be thoroughly pre-trained.



Single-channel processing has many implications for pilot training. If you have read this far, you may be worried about how we humans can do anything at all with this apparently debilitating limitation on our performance, let alone fly aircraft. Well, the reason why we can function 'normally' in our complex environment has to do with how we acquire complex sensory-motor skills — skills such as handwriting, driving, sports, playing musical instruments and, of course, flying.

We learn and master these skills through constant practice. As we gradually acquire the skill, it becomes progressively more 'automatic' — we don't have to think consciously about what we are doing as much as when we first started. Thus the amount of channel capacity required to perform this task is reduced as the task becomes more and more practised, or 'overlearned'. This allows spare capacity which can be used for other purposes. A good illustration of this is to try and write with the hand opposite to that which you normally use. This takes all your concentration, whereas with your usual hand you don't have to think about forming the letters and so on — you can think about other things, such as the content of a letter, while you write.

Most of the complex skills we use in our daily lives, such as walking and talking, have become 'automatic' and require little conscious attention — that is, they require very little channel capacity.

In flying, emergency procedures, for example, should be thoroughly practised until they become automatic, because at these times you will need as much capacity as possible free to make decisions. If you have to concentrate on the details of the procedure itself because it is so long since you practised it, your reaction time will be increased and the whole situation could get away from you. The expression 'getting behind the aeroplane' describes the result of lack of practice or currency, combined with the single-channel limitation.

So in times when flying is more expensive, when many pilots are flying only the absolute minimum of hours, it is important to use what time you do have to ensure that the most critical aspects of flying are as well practised and as 'automatic' as possible — to give yourself the maximum amount of thinking time when you need it most.

As pilots you have to accept that the limitation of single-channel processing is very real and that it applies to every human. Too many pilots think that they will survive when it comes to the crunch simply by 'trying harder', or words to that effect.



Remember that stress factors can effectively reduce your channel capacity. One characteristic of stress is that it is attention-getting. When the demands of the task at hand are low — on autopilot, no traffic, clear weather, plenty of nav aids, flying a leg you have flown many times before — this is the time that stress factors will grab your single channel. You start thinking about problems back on your desk, or domestic or emotional difficulties. These thoughts occupy the channel, which takes away spare capacity for monitoring the progress of the flight. Little things start to go wrong, they are not noticed, and finally a situation arises from which recovery may be impossible.

This sort of thing can happen even in multi-crew airliners, where every crew member's attention becomes focused on what may be a relatively minor problem (such as a faulty undercarriage warning light bulb), nobody is processing any of the critical information from instruments directly in front of them, and the aircraft crashes as a result.

## That's a load off my mind

*Don't dwell on the subject of stress*

**S**TRESS IS AN emotional issue. I don't mean to treat the topic lightly but there is much confusion about it and it can destroy a pilot's career if not approached properly.

Stress is a normal condition of life. Some of us are more sensitive than others. Some of us can tolerate it — some of us can't live with sustained stress for very long.

What is it? It is a heightened level of awareness and arousal, a readiness to act, a tensioning of the nervous and physical systems in preparation for action — one way or another. Stress is the response to perceived pressures.

Pilots are subject to a high level of stress due to the nature of the profession — the responsibility, the consequences of error, the tenuous nature of employment, the lifestyle and working hours, the separation from families and the continual pressure to maintain currency and medical fitness.

This short article has attempted to cover only some very basic concepts. The properties of short and long-term memory and their central roles in human information processing, for example, have not been covered at all.

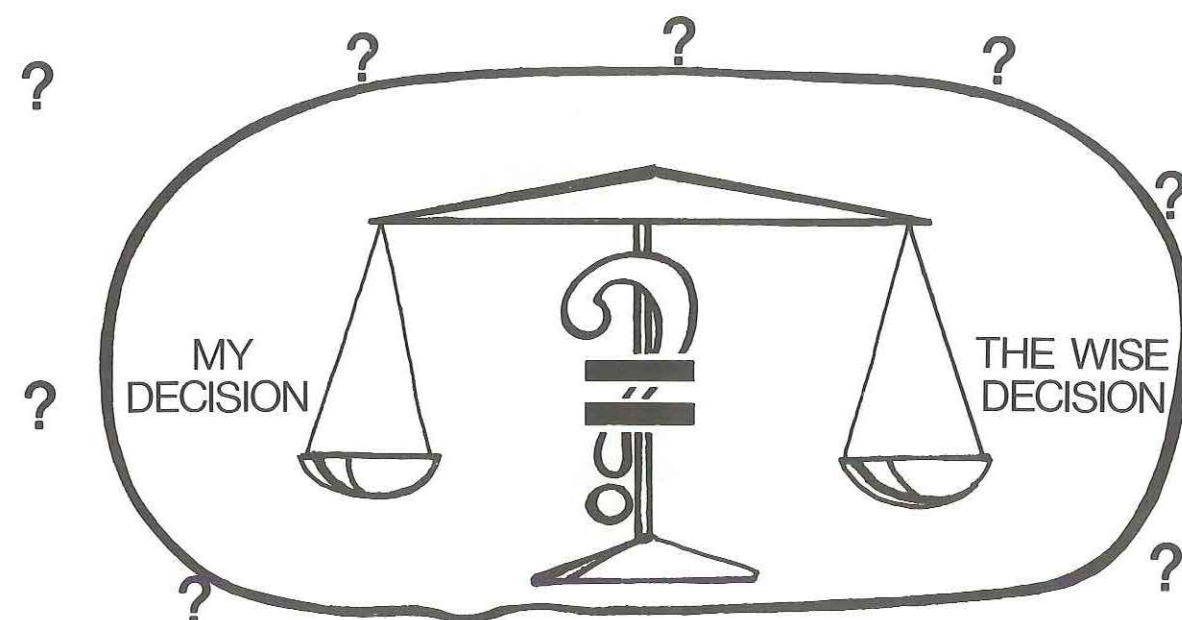
Please be aware of how this basic single-channel limitation affects your capabilities as a pilot, and that it applies to all humans. Use this knowledge in your operations and training, and never believe that your single channel cannot be overloaded. An instrument approach in bad weather, on a dark night with a rough-running engine and very little fuel is not the best place to find out that it can.

[I find this limitation staggering. I always realised that the brain could become preoccupied with one task and that other events would go undetected, but for this preoccupation to affect our vision is a shock to me. I wonder if the rock groups who make splashy videos realise they are distracting attention from the audio channel — the music. But then perhaps they do realise . . .] □

There are just two things I would like to point out, one precautionary and one curative:

- The level of stress can be lowered by many factors — thorough preparation for the flight (minimising the unknown), shedding non-aviation problems when you strap-in, maintaining a reasonable standard of physical fitness and following a moderate lifestyle, talking through a problem as soon as it arises (communication breakdown with the spouse is a major stress factor), maintaining an outside interest — a sport or hobby that you find relaxing (golf to some is relaxing, to others it is a battlefield), slowing down your activities (one thing at a time), taking the time to enjoy the minor events of life, such as meals and conversations, and playing with the kids.
- The danger with stress is that it is accumulative — it builds up to an unacceptable level if it is allowed to. You have to break the sequence and shed stresses just as you shed workload in an emergency. Above all don't bottle it up. Discuss it with someone and don't be too proud to ask for help. A high stress level compounded by self analysis can lead to the development of a phobia — a sort of fear reaction that we learn — that we develop in our mind in association with a particular event or environment. The mind can develop reactions that are not constructive. Even these can be corrected — with proper help . . . and the earlier it is treated, the better □

# THE MINDFIELD?



## DO THE RIGHT THINK



# MAC JOB

To established readers of the Digest, Mac Job needs no introduction. Newcomers to General Aviation will know him almost as a legend. Mac was not just the Editor of the Digest. He was a part of GA and is still active in the Missionary Aviation Fellowship. Mac was well known for his empathy with the community of pilots and with little aeroplanes, particularly vintage aircraft. He was frequently seen at the controls of the Departmental Cessna 170 or a beloved Dragon or Tiger Moth.

I asked Mac for this interview so that he would have the opportunity to express his feelings and observations about the changes in GA that occurred during and since his time as editor of the Digest. I believe we all have much to learn from pilots such as Mac.

Mac, where did it all begin?

WELL David, I've been mad about aeroplanes since childhood. I was in the Air Training Corps towards the end of the war, and when I was 18 I joined the Air Force. I was scrubbed from aircrew, allegedly on a colour vision defect, but after convincing the Director of Aviation Medicine that I was safe, I learnt to fly on Tiger Moths at the Royal Aero Club of N.S.W. My first full-time flying job was aero-medical work in South Australia, based at Ceduna. The operation was run by the Bush Church Aid Society, which at the time was responsible for all Flying Doctor operations in South Australia. They had two aircraft, five hospitals, two medical officers, a radio station and a radio network — and I mustn't forget ... a pharmacy (I married the pharmacist!). Esma and I stayed there happily until 1958. Later we moved to the south coast of New South Wales where I started flying charter and then fisheries patrol for the tuna fishing fleet.

It was while I was doing that job that I started writing seriously. I'd always had an interest in writing and I actually began by writing an article for the American magazine, 'Flying', about an engine failure I had in the Dragon with a load of passengers. When the article was published and the cheque arrived from America, it gave me a lot of encouragement. Aviation had given me something to write about and I thought it worth recording anyway. Getting something published was an enormous boost. So I started writing part-time for the local press and I sent articles to The Sydney Morning Herald. I did some work for the ABC too — news reporting and so on, and I became their local correspondent.

One article on tuna fishing, called 'In Quest of the Blue Fin', was published in the magazine section of The Sydney Morning Herald. That too was a great encouragement. Then in June 1963 this big advertisement came out in The Sydney Morning Herald for a whole lot of air safety investigation positions, including a particular one to be Editor of the Digest. I thought, 'Gosh that's just what I'd like to do!' I sent off an application immediately. After an interview and months of waiting, a letter finally came from the Department saying — 'We have much pleasure in advising you that you are appointed, etc., etc.'

Mac, many people from the industry have said to me that the Digest was more readable, had more information and related more to their own personal experiences when you were editor, than at any other time. How did you establish that relationship with the aviation community? Did you consciously promote it, or was it a result of your previous experience?

I guess it was both. You know I was first and foremost a general aviation pilot. My heart was in general aviation. I had an empathy with general aviation. I felt sorry for general aviation. I could never relate to any Departmental 'big brother' attitude. In all my writing, I set out to establish a rapport with the readers and to talk to them in their own language, in their own terms, as one of them. I always said the first requirement of the Digest, before we did anything else, was to make it readable. We had to not only talk the language of GA but we had to speak it in a way that would make it interesting to read — and to do that you have to have been in those situations.

Some people have said to me that the time of magazines and posters is almost over — that we should be using television and videos. Do you think there is still a role for the Digest?

I'm one of the old school — I believe that people retain more of what they read and think about than what's presented to them on a screen.

So I don't think that the day of the magazine is over by any means. I do think the market is much more competitive than it was — and that the magazine has to present itself attractively. But I believe it is still an effective medium for conveying information — much more effective than the television because you don't really retain much of what you look at. After a day at work you look at the television as an excuse not to do anything. It's tempting to switch the TV 'on' and the brain 'off', and if the mind's not ticking over, then you can hardly be taking in what's presented. So for serious stuff, the written word and printed image are here to stay. But presentation is very important — both visually (with pictures that provide an impact of their own) and also the way that the written material is prepared — so it also conveys an image — a mental image in the reader's mind, so that he identifies with what's been written. It's vital that the reader is not just reading the words on paper but imagining the visual image, the situation that those words are



conjuring up, words that relate to the experience. In this way, the reader remembers the facts and the 'message' long after the actual words are forgotten.

Mac, you were editor for fourteen years. During that period did you notice any significant changes in aviation accidents or did the same old things recur?

There wasn't very much change. I came into the Digest in 1964, not long after General Aviation had established itself in the American pattern — not only with new American light aircraft but their attitude towards aviation. The era of the old British type aircraft — Tiger Moths, Austers, Proctors, Dragons and the like, had just ended.

A lot of attention these days seems to be on what is now called 'the human factor'. It used to be called 'pilot error'. Statistically, I think in about 65 per cent of accidents the human factor is the primary cause and in about 80 per cent of accidents, the human factor is one of the causes. The thing we're trying to address now, of course, is how to make the pilot better, not just in manipulative skills but to make better judgments, better decisions. How would you approach that?

Because of the higher performance of the modern light aircraft, the question of pilot judgment and airmanship is much more important in relation to navigation, landing at strange airfields, weather judgment and all those sort of things, than it used to be — and manipulative skill is of less importance that it used to be.

How would you tackle it though? I mean, we seem to have problems, for example, where people do things which you and I would consider to be 'unwise'. How do you put an old head on young shoulders, which is really what we're trying to do, isn't it? We're trying to get experience into young people who haven't got experience, so that they're aware of their limitations. Instead of learning the hard way, they learn from other people.

I think the only way to do it is through a continuing concerted effort in safety education to try and replace that lack of experience with ... with what shall we say ... 'guided' experience, with which is what the Digest has tried to do. There's no other way of giving them that experience unless you actually expose them to it, so the role of the Digest is an important one. Today's GA aeroplane is a very safe vehicle in the hands of a professional. The danger, as you say, is the human factor. It's the pilot who makes the incorrect judgments or decisions — which put up the accident rate. Very rarely does the aeroplane let him down. So you need to constantly guide the inexperienced pilot.

There is also a problem in pilot training. When we went to these easy-to-fly training aeroplanes like the Cessna 152, the Cherokee 140 and so on, we lost something. They were designed to be as easy to fly as possible and they don't demand good pilots. As a result they don't 'train' pilots — they make 'aeroplane drivers', not pilots. Beyond the 'driving' of the aeroplane, they do not produce sensitivity to the environment and the pilot doesn't learn how to cope with it. Because the aircraft is not demanding, there is a tendency for the pilot to become lazy and undisciplined.

What about that magic quality called 'airmanship'? How would you define it?

I suppose airmanship is a sort of innate understanding of the nature of what you're doing — not just unthinkingly following a set of rules, or following a set of procedures. It's a feeling for the whole aviation environment. It's having a basic understanding of the medium in which you're operating and a feeling for the flying machine within that medium.



A sort of an awareness, a sensitivity?

Yes.

Can you acquire it and can it be taught?

You can acquire it if you have the receptiveness, the motivation and the self-discipline. I think you can teach it with the right sort of aircraft. I don't think you can teach it with a modern docile aeroplane because the modern training aeroplane insulates the pupil from the environment, unless of course the instructor assumes the role of the taskmaster by setting and demanding a high standard.

Let me explain: a Tiger Moth for example was always at the mercy of the environment. They used to say that if you could fly a Tiger Moth you could fly anything. They meant that if you could fly a Tiger Moth, you had the basic ability to learn to fly — the receptiveness, motivation and discipline that I mentioned. They didn't mean you could jump from a Tiger Moth into a Boeing 707, but that you were equipped to learn. The Tiger Moth had given you the equipment — the understanding of the medium. The Tiger Moth *demand*ed that you fly correctly. A modern trainer is too forgiving — so the instructor has to make the demands.

The instructor then, is vital?

I think the instructor is very important, and that's another factor I think we've lost today. In the old days, we had 'instructors' — senior instructors who had been instructing all their life, whose delight was instruction, whose delight was this quality of airmanship, who sought to train people to accept those standards of self-discipline and an understanding of the environment. The 'old school' instructor had a sort of mentality or attitude that was a product of that type of aeroplane, that type of flying. I think that the modern training aeroplane and the modern training environment, no longer breed that type of instructor. I think nowadays it's an attitude that has to be deliberately nurtured or it will die.

Do you think young pilots are motivated to become good instructors?

No, I don't think they're motivated at all. In many cases, it is seen only as a stepping-stone to the airlines — a way of gaining the necessary flying hours.

How would you change that? Can we somehow offer a career path?

Yes, I think we can and I think we have to make the role of the instructor a much more attractive one. I don't think that flying instruction as a career has ever been properly acknowledged in this country and it has never been given very high status, has it? It's certainly not a highly paid job. I think that's one of the basic problems with our flying training.

Mac, based on your fourteen years with the Digest and since, what do you predict for the future? Have we reached a stage where the accidents and the accident rates are almost inevitable, or is there something more that we can do?



It's very difficult to see how we can do much more because the cost of flying has become such that people can't buy the time to get the experience they need. I suppose it's unrealistic, but I think we would gain a great deal if we went back to a more basic type of training aeroplane. I really think that's the answer. I know it's a hard answer and economically it may be an impractical answer, but I think it is the answer, nonetheless. The basic aeroplane forces you to carefully plan where you are going, what you're to take, and where you're going to put it. Don't you think that sort of planning is good discipline? *You've got to do your homework first. You have to be aware of your limitations and those of your aircraft. You have to be sensitive to your environment — they're the lessons a good training aeroplane and a good instructor provide.*

Mac, we've concluded that the aeroplane used for training influences both the quality of instruction and the quality of the instructor and these in turn, directly influence the standard of the trainee. That magic quality called 'airmanship' is also influenced by the training aircraft in that it develops the student's sensitivity to the environment. With the current training aircraft, we rely heavily on the professionalism of the individual instructor to maintain the standards of piloting and airmanship in the current and coming generation of pilots.

As to the future, perhaps we could persuade Henry Millicer to re-introduce his Airtourer with a tailwheel.

Mac, thank you for this interview. I wish you well with your future flying.

The following is a facsimile of a letter that appeared on my desk in the form of a very poor quality photocopy. I have changed only the names to protect the innocent. Some aspects may be contentious and perhaps slightly less than 'legal' but the letter contains so much good common-sense that I thought it should survive intact.

Dear Dan,  
at the risk of boring you fartless.  
A Last Minute Brief - Bush Techniques / Survival  
A Random Potpourri

*You can't buy experience but you can buy time with correct techniques till you get it. An accumulation of hours means nothing unless it is correctly gained.*

### Main Causes of Bush Prangs

1. Lack of Airmanship - ignorance
2. Poor Personal Standards - laziness
3. Incorrect Handling - poor fuel control
4. Weather and Terrain (90% of the bush pilot's problems)

*Most of the following have caused prangs and damage to my associates, friends. They number 29 (deceased). Please don't make it 30.*

*To your best Dan. You're in good hands with Chris.*



## 1. Lack of Airmanship

spontaneous actions without thought/planning

- low flying, crowd or passenger pleasing - wires
- steep turns around ground observers, stalls in turns, over water illusions (watch speed and height on clocks)
- low manoeuvres, beat-ups (esp. wing-overs).  
Don't do it unless properly trained - which you're not.
- don't attempt to fly through minimum gaps in hills with low cloud, without sticking to the techniques.

## 2. Poor Personal Standards

- don't fly with a hangover - get adequate rest
- keep current on the books, aircraft type, rules, drills.
- keep current on IFR (above LSAKT, with map on screen)
- don't allow boredom to create sloppy flying
- think ahead of all situations, gather information
- don't short cut navigation procedures - use the computer for G/S, ETA's and drift angles.
- have pride (not over confidence), discipline and be your own harshest critic. Aim for your goals.

- never allow panic in the cockpit - healthy anxiety is okay. Even in the toughest situations (storms etc) if you have a plan of action and stick to the techniques, you'll come through safe.

- don't forget or ignore basic technique or airmanship - keep a good lookout, adhere to circuit procedures etc.
- before takeoff and before approach - a self brief
  - takeoff safety speed, decision speed, all up weight, landing weight, options in the event of asymmetries, escape routes, spot heights etc.
  - IFR - run through the approach.
- ground control - taxi carefully - inside markers
  - a pilot went through a mud hole at Bello (outside markers) and pulled a BN 2's leg back 18 inches.
- keep maps and P charts, last light graphs and nav. gear in good condition. Use a folder and book of info.
- don't be a smart bastard or a ratbag.

## 3. Correct Handling

I know of 2 crashes (fatal) where fellows have



tried a split-arse turn back to the field with asymmetrics and crashed. Latbag decisions can kill.

- inability to cope with emergencies is stupidly unacceptable. Know the drills, recognise the problem and at all times fly the aeroplane (No 1) cope with the emergency without shutting pants and have a plan of action. It's so easy.
- don't allow the aircraft to wallow all over the sky - normal or esp. asymmetric. Fly the bastard, make it do what you want. Strive for accuracy, smoothness.
- poor speed control is dicey. In WX, hilly terrain and steep turns - know what you require and get it with power / attitude, even in asymmetrics.
- avoid poor final approach control:  
speed, angle and rate of descent must be A1.  
Set up Finals early, with time to settle down - TRIM.  
The ideal is a constant attitude with speed and rate of descent controlled with power (REMEMBER THE WINDSCREEN TRICK). Stick to agreed approach speeds and get target threshold speed - exactly

use bursts of power on / right off if necessary though trying for smooth engine handling.

- watch for sink on Final. Don't delay power - eyes flicker to ASI and VSI with 90% eyes outside the cockpit.
- don't make a habit of crossing the threshold at dot feet - especially if an undershoot means a sudden stop.
- on Final, speed up brain and reactions by 200%  
- concentrate. Make fast, smooth, small corrections - relax after shutdown.
- use correct crosswind technique - crab down extended centreline to just above flare, then wing down / top rudder technique.
- crosswind landing - try to think of independence of controls - at the flare, the rudder is used to keep aligned with the strip and the wing lowered into wind to stop the drift. Vary quickly as required. Don't overdo it in light conditions and don't be afraid to get the wing way down with a lot of top rudder in a strong Xwind.
- don't 'pump handle' the elevators during the flare. Know the distance between your bum



- and the wheels (WITH OLEOS EXTENDED)
- after touchdown don't stop 'flying' until taxi speed.
  - after landing (remember to be able to have the correct threshold speed and land on a nominated spot). Keep straight regardless. With Xwind - correct use of controls is important. If you see ridges, bumps, mud or water - raise the nose.
  - if there's mud, slime, algae or water and therefore no braking - raise the nose high to create drag - be careful with asymmetric power - it can create swings (can also stop them if used judiciously).
  - absolute emergency - can't stop and you look like slipping off the end of the strip - apply asymmetric power, groundloop to the 'going backwards' position, apply full power to both engines. (Should never happen!)

### Fuel Control

- (remember Don G. and Joe B.)
- really know power settings and fuel flows for climb and cruise. Double-check until

you're positive.

- flight plan sensibly with adequate margins for diversions, for holding due WX, aborts and IFL approaches. Even then carry more than required (an overload of fuel is the only overload that makes sense but consider the reduced rate of climb on asymmetrics).
- Don't trust anyone with your fuel. Visually check it yourself. Dipstick contents on level ground yourself. Crosscheck residual with amount added, for correct total ie crosscheck residual with gauges, note drums added - do your sums - final checks, dip, gauges and sums.
- if weather is suspect carry even more fuel. Not more than 100 lb overload or single engine climb will be minimised. She'll still fly on one - but some won't.
- keep a fuel HOWGOZIT on paper / flight plan. Know fuel on board at all times - be accurate - esp. when WX is poor at destination. Know your loiter / approach times.
- in the tropics, be extra careful to do



- proper water drains - rock the wings before the drain check. Never take off after refuelling without a full water drain. (Telling you to suck eggs, I know but fellows have forgotten - with subsequent engine failures). If the seals on the caps are perished and ill-fitting have them changed - you can get water in very large quantities 'muy pronto' - even parked on a rainy turnaround.
- don't skimp on bonding (earthing). Don't use plastic near tank fillers. Static electricity is very real in the tropics.
  - have a good look at tank selection before takeoff.
  - keep an eye on PNR and Critical Point on long legs.

#### 4. Weather and Terrain (No 1 killer of careless or daring pilots)

- in the Australian Bush, VFR rules don't apply - the real one is: clear of cloud with manoeuvring space and an escape route i.e. sensible VFR - 'Bush' VFR

- don't mix VFR and IFR or you're in trouble. You can certainly change from one to the other:
  - to IFR when VFR becomes unsafe / impossible. On transition to the clocks, you must know:

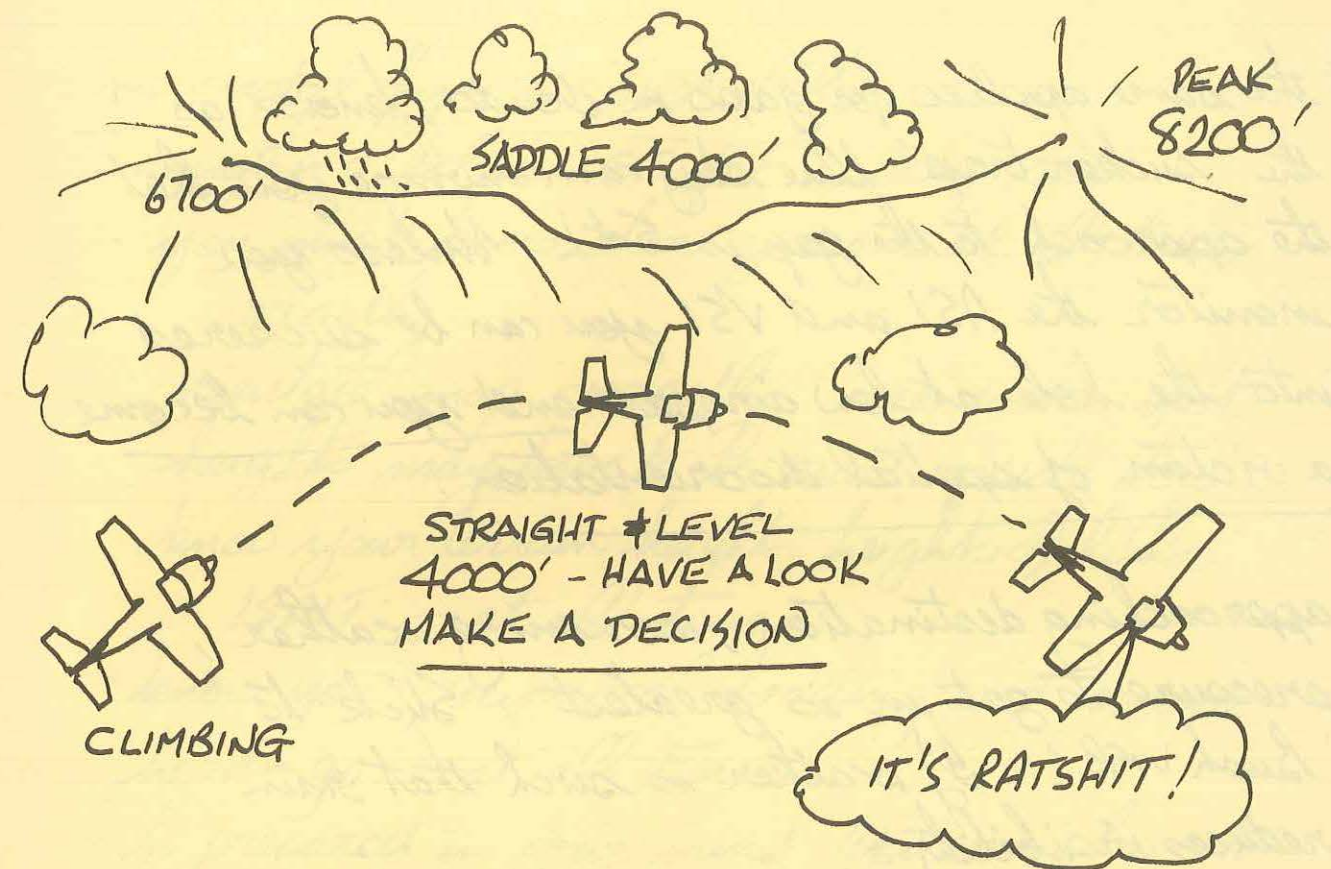
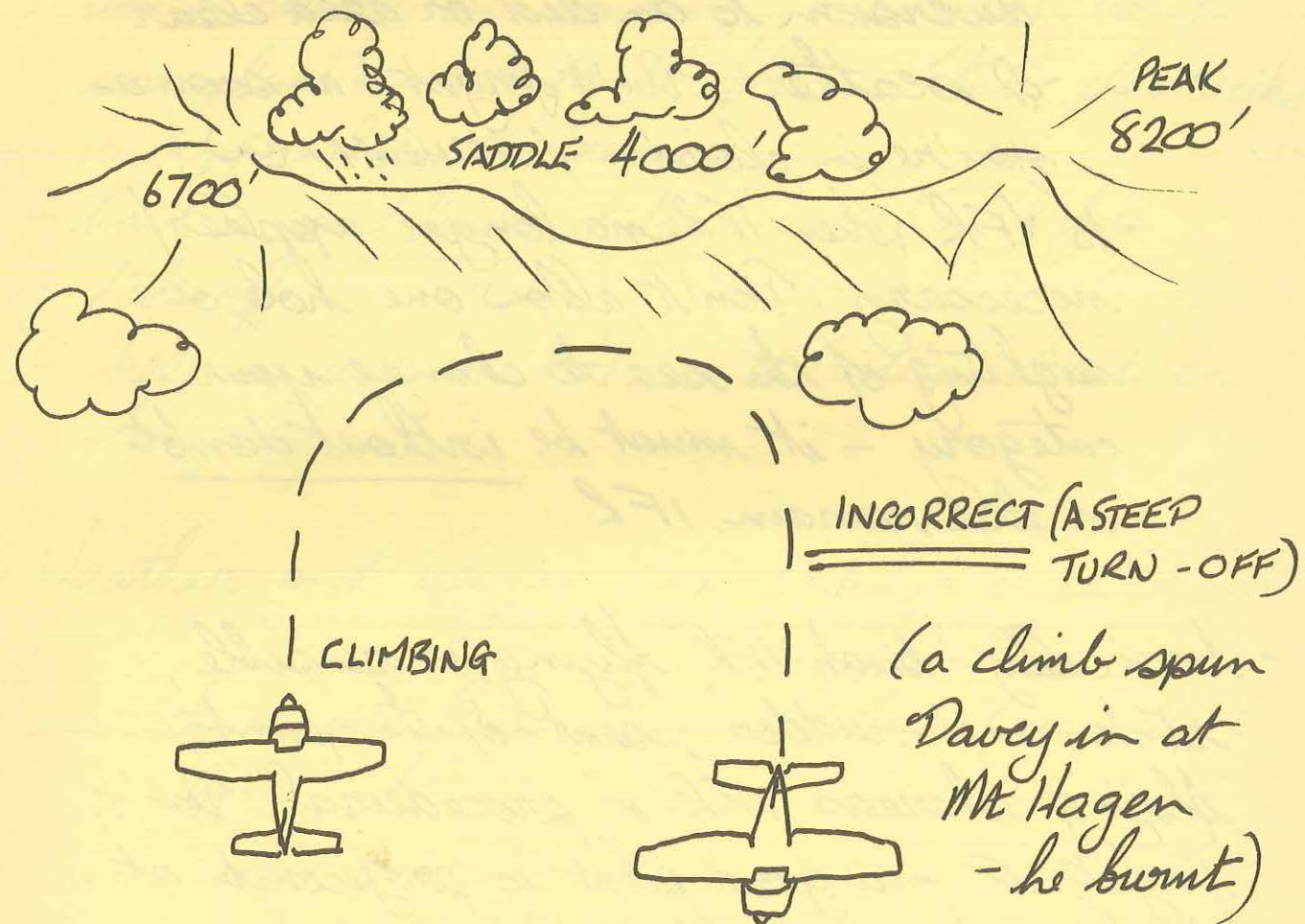
- the LSALT
- close spot heights and terrain heights
- a safe escape route on climb and
- a plan of action that encompasses diversion to an aid or area clear of weather. Don't forget - as soon as you're in cloud - NOT HEAT. ☹
- to VFR when IFR no longer applies / necessary. Don't allow one hole or sighting of the sea to change your category - it must be without doubt - or else remain IFR.

- basically 'bush VFR' flying is sensible, stick-and-rudder, seat-of-the-pants flying whereas IFR is procedural. Don't forget it - a good pilot is proficient at both. Keep practising!



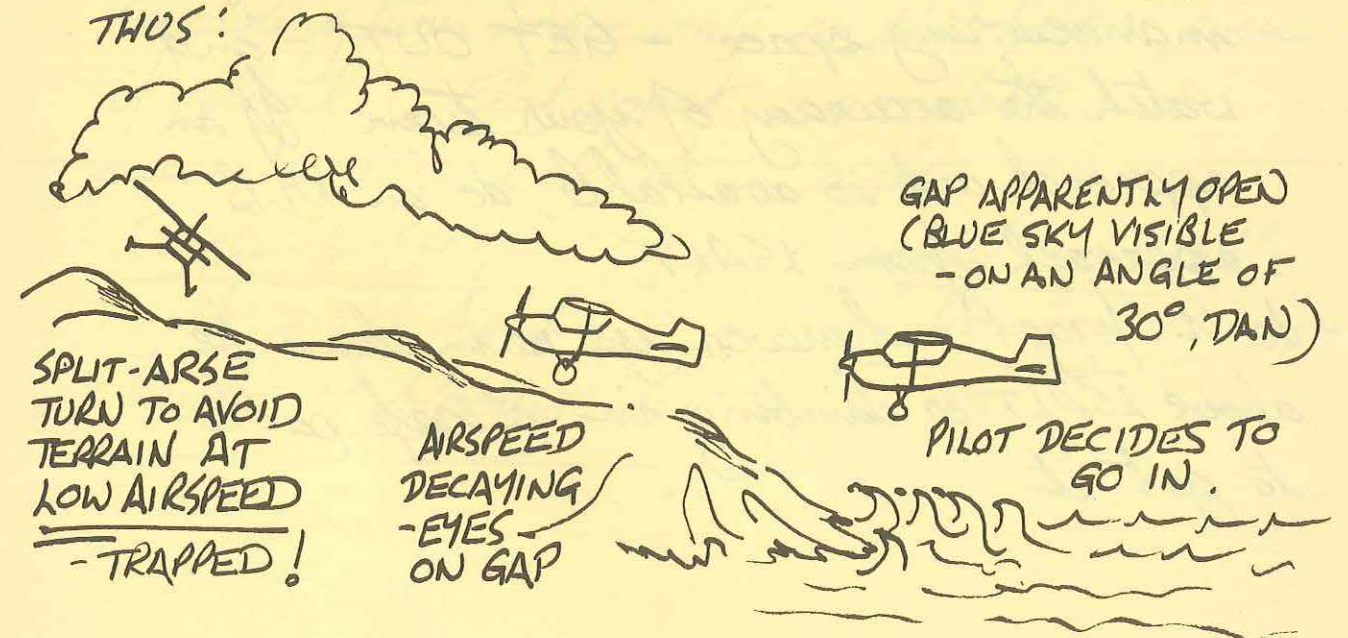
-be careful of boring through small gaps between cloud and terrain. You must be able to approach the gap on an oblique angle so that a downdraft, misjudgement or WX closure, requires only a slight turn to avoid it - whereas approaching straight-on, requires an 'one eighty'.

### LOOKING AT A MARGINAL GAP



CORRECT Watch speed control during 'Look'.  
Don't get dry gulched in terrain.  
If all okay - reverse turn - cross ridge.

\* BUT WATCH OUT WHERE THE CLOUD FOLLOWS THE TERRAIN  
THUS:



GAP APPARENTLY OPEN  
(BLUE SKY VISIBLE  
- ON AN ANGLE OF  
30°, DAN)



- If flying low over water, watch the illusion of thinking you're higher than you really are (check the clocks)
- in the tropics it's better to go through the rain below cloud base than in cloud battling up/down drafts. (ask Chris to show you how to pick wind direction and strength from the sea).
- over the water in poor vis - BEWARE OF SUDDEN ISLANDS
- make sure you're allowing the correct drift angle - and track wide of such islands in minimum vis conditions
- you're better off cruising IFR through the crap than dicing at dot feet below
- in wet weather always have a look at the strips pre-landing for locals, sheets of water or works-in-progress - or a V/S cross
- CHECK THE WINDSOCK

- know your own limitations - if you're not happy, sit it out or go home - but don't quit over buggers all.
- tropical weather changes quickly if due to convection. Slowly if stream (S.E.) weather.
- the equatorial storm is most fierce around dawn - sit it out.

- if you have V/S's that make IFR unsafe, give yourself safer margins, VFR, till it can be fixed.

- avoid storm penetration unless absolutely necessary. Then, once you are in it: do it correctly:

- set up power that corresponds to turbulence penetration speed in still air
- belts tight, pitot heat on
- don't panic into a 180° turn in a storm - GO FORWARD
- try to maintain a level fuselage attitude - don't chase airspeed or altitude - let it fluctuate
- strive to keep wings level and approximate heading
- control panic. If there's lightning around it's harmless

WEATHER PRIORITIES. In order of preference, go:

- UNDER IT
- OVER IT
- AROUND IT
- THROUGH IT

End of lecture, Dam, except for:

(see over)





## Some thoughts on airmanship

*Barry Carpenter is an experienced pilot and instructor in both the civilian and military environments. He was a member of the prestigious 'Roulettes' aerobatic team.*

**W**HEN I FIRST sat down to write an article on the subject of airmanship, I decided to start by defining what airmanship is. You see, there isn't a precise definition — not even the dictionaries mention it. I found 'airman' and 'airship' alright, but the obvious connection was missing. After much thought, I decided to make up a definition of my own. My definition of airmanship is simply 'the art of being a good airman'. To leave it at that, however, would be an injustice because that definition, although abridged and somewhat simplistic, belies the importance of airmanship in our flying lives. It isn't a word so much as a way of life.

### What does piloting entail?

First there are the cognitive skills learned through the briefings, flight manuals, training publications and the ubiquitous regulations.

Then there are the manipulative skills learned by practising the task itself so that tolerances are reduced to the point where we can concentrate on the application of the skill rather than the skill itself.

Cognitive and manipulative skills combine to become essential ingredients in our overview of flying. But airmanship doesn't start and end there. It's something more. It's like a tapestry with many inter-related threads combining to create an overall picture. For example, one of those threads is 'awareness'.

Awareness is a sensitivity to the environment which enables us to adapt our skills to environmental changes. Feedback that we get from the aeroplane and other sources is processed and we then respond. If we care to look hard enough we can usually find plenty of indicators that allow us to anticipate the appropriate response. For example, do you look at the wind

sock and other wind clues as you drive to the airport, or as you walk out to the aircraft? You should, because they're trying to tell you something — namely the duty runway, the extent of crosswind, departure procedures, possible windshear effects, engine failure considerations, terrain clearances, turbulence, and if it's gusting, how much flap to use on the approach and what adjustment you should make to your threshold speed and so on. This information is there if you are receptive to it.

Airmanship also encompasses preparation and anticipation. It's really common sense when it's all boiled down. Try sitting down with a pencil and paper, take every aspect of your proposed trip from preflight to shutdown and analyse them. Consider what should be done, i.e. your normal response, and also what might cause you to modify that response. I wouldn't be surprised if you identified many areas that you have either been taking for granted or that you've never seriously thought about. It's an exercise that will do wonders for your awareness and hence your airmanship. Don't be surprised if it also highlights areas of weakness in your knowledge base — there is nothing wrong with that. Remember that your response has to be appropriate to the situation and the task and therefore flexible enough to adapt to the constantly changing environment inherent in flying activities.

To fly is to learn, to learn is to develop.

One final word on yet another thread in the airmanship tapestry — integrity. How often have you heard it said that man is the weakest link in the chain? When it comes to flying he most certainly is — if he hasn't made a mistake he's going to, because he is, after all, only human. And being human, he would rather talk about his successes than his failures. There are a multitude of reasons why this is so — fear of ridicule, embarrassment, fear of punitive action and so on. Yet, how quick we are to highlight the mistakes of others, often without even knowing all the circumstances and facts. The bottom line is that in flying we owe it to ourselves and to each other to be open and honest. That may well involve 'biting the bullet' and accepting the consequences. If you can do that, then your airmanship is well and truly on the right track.

If I've opened a 'Pandora's Box' on the subject of airmanship then I'll be satisfied. Far too often in aviation we accept things at face value and don't question the substance of them. Airmanship must rank highly in that context because it is such an all-embracing subject. But since I started this, another look at that elusive definition might be a suitable point on which to finish. What is 'airmanship' — It is a combination of skill, knowledge, awareness and integrity. We each have it in varying degrees. It can be developed.

Above all, it is simply common sense, [or is it *un*common sense?] □





# Lifestyle — life with style

Doctor Harry Rance is a specialist in Aviation Medicine in the Department's Central Office.

Moderation in all things

## Introduction

**M**ANY PILOTS consider a medical examination as a necessary evil — a hurdle to be overcome to gain or renew their prized licence. It would certainly make me tense to have to go through a thorough examination knowing that the rest of my life depended on the outcome. However it could be a blessing in disguise, to be medically examined at regular intervals so that any untoward changes can be identified at an early stage and appropriate remedial action taken.

The medical examination measures certain parameters such as blood pressure, pulse-rate, weight, vision and urine and includes enquiries into general health and, to some extent, mental state or well-being — a sort of bodily 'howgozit'.

You may feel great — full of zest, always on the go. You may look healthy, with sparkling eyes and plenty of colour in your cheeks. Alternatively you may feel tired, in need of a holiday, rattled by the kids or worried about the future. In either case it is worth checking, as insurance for the future.

But there is more insurance that can be taken out before the 'medical' discovers there is something wrong. It's called 'lifestyle'.

Your body wasn't designed to operate in our modern feather-bedded way of life. It may survive for a while but the 'good life' eventually takes its toll.

Your body was designed to be active, to be fed a mixed diet and to cope with moderate levels of stress. As we grow older our bodies wear out, become less capable of achieving previous levels of activity and this process is seriously affected by the way we live — our lifestyle. We can be old at forty or young at sixty. It's a choice we can make if we make it early enough.

## The ageing process

We are all aware that with increasing age, we cannot run as fast, lift as much or continue activity for as long as we could in our 'teens and twenties'. Even sportsmen who train and remain 'fit' have to give way to up-and-coming youngsters. One day we have to accept that we are changing with age.

Our cardiovascular and respiratory systems become less effective, our arteries thicken, our maximum heart rate capability decreases and our breathing capacity is lowered. Because of changes in our cardiovascular system we may see changes in the functioning of our kidneys; this is particularly so if the blood pressure rises excessively with our increasing age.

Many of us notice deterioration at a relatively early age with respect to our vision and hearing. We can do little to help these ageing effects. (We can avoid noisy environments and protect our hearing so that our ears do not become affected by noise-induced hearing loss in addition to losses due to increasing age.)

Vision changes with age and probably the most obvious effect is the reduction in the ability to accommodate (adjust the focus) between distant and near objects. We complain that newsprint is fainter, the paper grey or that our arms are not long enough when we read the newspaper.

In addition to the lenses of the eyes becoming harder they also tend to become yellow and cloudy and eventually many of us will have cataracts which will grossly affect our vision.

One aspect of growing older which many people have come to accept is that as you increase in years so you increase in weight. Actuarial data does suggest that older people are heavier than the young but is this a reflection of the everyday thinking about life? Need we increase our weight? Some people claim it is only a redistribution of their fatty tissue. (My excuse is that my clothes shrink as they hang in the wardrobe.) Do we really have to put on so much weight as we get older? It certainly isn't good for our well-being.

## Nutrition

The average person swallows about half a tonne (500 kg) of food, excluding drink, annually. Although the body is efficient at extracting what it wants from the food, it does have some problems if the diet contains too much of one sort of food and not enough of some others.

We inherit how we react and cope with certain foods. Some people tend to put on weight easily, others do not. The effects of our genetic background can be influenced to some extent by our habits and our environment. We need to ensure that our diet is mixed and balanced for nutrients, energy and fibre.

Nutrients are the fats, proteins, carbohydrates, vitamins and minerals needed to build and repair our body. If we eat a mixed diet it is not likely to be short of proteins, vitamins or minerals. The chances are, though, we are eating too much fat and carbohydrates.

Energy (kilojoules or calories) is provided by our food to power the body machine. Again a mixed diet will provide our needs but if we put in more fuel than we burn up, the excess energy is converted to fat and laid down in stores around our bodies. This doesn't help our shrinking wardrobe!

Fibre has long been recognised as an essential element of our diet. For many thousands of years mankind has existed on a mainly vegetable diet with meat as an occasional delicacy. More recently animals have been reared to provide meat and this has replaced much of our vegetable and fibre diet.

Because we eat too much fat and carbohydrates, we should try to cut down on the fats, butter, frying, cakes and pastries, cream and red meats. We should strive to replace red meat with white fish or chicken and use low-fat cheese such as cottage cheese. We could increase our intake of fruit, seeds, and both leafy and root vegetables. If we follow these principles we would have a more balanced diet and not need extra vitamins or minerals in the form of pills.

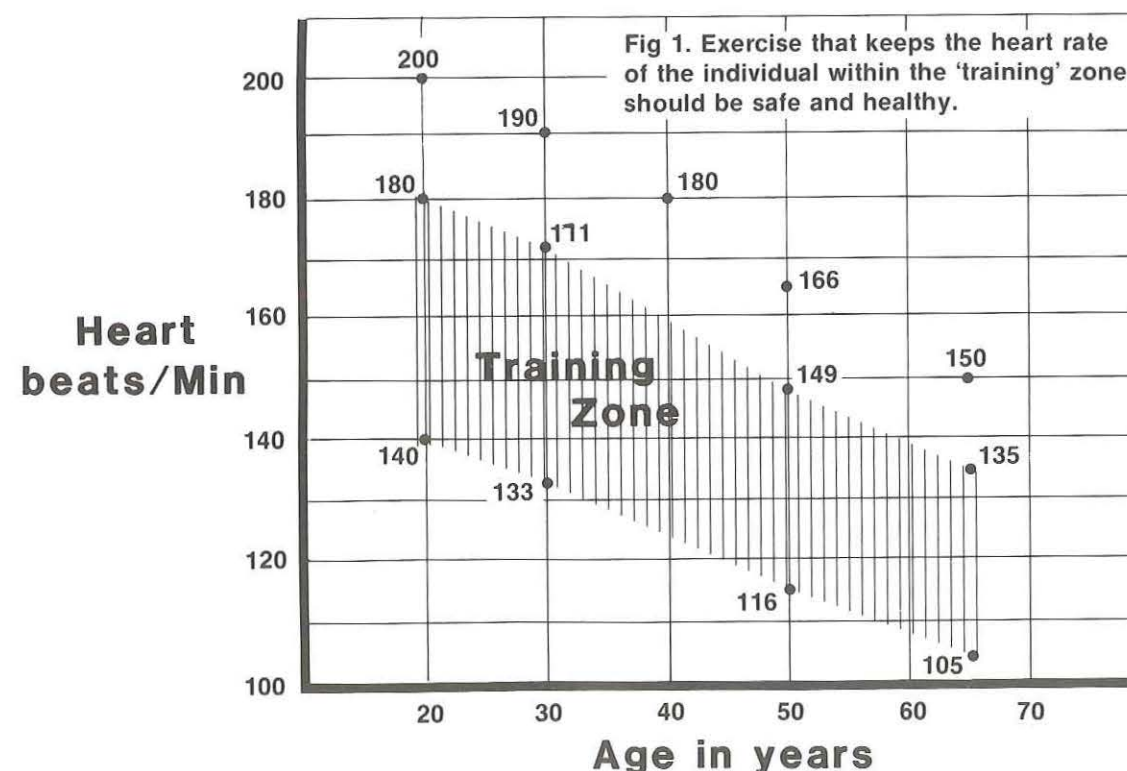
## Exercise

As stated earlier, the body was designed to be active — preferably throughout the day and every day, but many of us have sedentary occupations. I'm certainly not dashing around as I write this — I'm flying a desk. Our bodies need

exercise to stimulate the natural repair and maintenance system. Our bones, joints and muscles, and especially our heart, will actually stay younger if we keep them busy. The saying is that exercise will get you and keep you fit, but fit for what? That is the question. You do not need much exercise to sit in an aircraft, pull a few handles, flick some switches and fly (although you may need a lot of extra power in an emergency situation).

What we all need is some exercise to improve the staying power of our hearts and lungs and help to protect against coronary heart disease. It will make us feel better, help combat stress, improve muscles and posture — but how much exercise is enough?

During training most athletes do more than is required in their actual competition, and in the same way, we need to be a bit more energetic in our exercise than our usual work and leisure activities. A number of schemes have been promoted and I suggest you pick the one that suits you best. To improve your heart and lungs your exercise should make you rather breathless and raise your heart rate. The diagram gives an indication of the increase in heart rate required. If you have difficulty locating your pulse (let alone counting it while you exercise) I suggest you achieve a breathless state which makes talking difficult but not impossible. Work up to this level until you reach a program of 20-25 minutes at a time, three or four times a week. Get out of the office at lunch time and walk briskly for 30 minutes or so. This will stretch your legs, uncoil you from your sitting posture, and if you look at and think about the things around you, your return to work will see renewed activity.





Unless you are an athlete, or training for a specific sport, there is no need for you to pound the streets and parks every day. If you enjoy jogging then continue, but do not delude yourself that it's the elixir of youth. You may in fact have become 'addicted' to jogging.

## Smoking

There is no doubt that tobacco smoking is harmful for you whether you actively smoke or inhale someone else's tobacco smoke. Data collected over many years has implicated tobacco smoke as an agent in the causation or exacerbation of many conditions. Some, like lung cancer and coronary artery disease are life-threatening and others reduce the quality of life. The only way to effect an improvement is to stop smoking. There are many methods to do this and most require help from others with positive support by family and friends or organised 'quit smoking' programs. Once you stop smoking, your quality of life will improve and your life expectancy increase. There will always be a few people who reach 80-90 years and still be smokers, but the vast majority of smokers suffer illness or disease at an early age.

Another effect of smoking for the aviator is the effect it has upon the oxygenation of your blood and an increased effect on hypoxia. A cigarette smoked prior to takeoff takes enough haemoglobin, the oxygen carrier of the blood, out of useful circulation to be equivalent to breathing air at 4000 feet or more and to affect night vision. The smoker is severely disadvantaged, especially when engaged in flying. There really is no place for smoking in the cockpit — your mental processes may be impaired and you could become dangerous. Apart from the distraction, the inconvenience and the annoyance to the crew, you could start a fire!

## Alcohol

Contrary to popular belief, alcohol is a depressant of the brain and nervous system. Many claim it stimulates them and makes them more active, especially in a social context. What happens is that natural reserve and inhibitions are lost and this gives the impression of a happier and more active person. Because of this depressing or relaxing action, alcohol is useful in small quantities to overcome tension, anxieties and social difficulties. It is unfortunate that this beneficial effect quickly becomes a necessity for some people. They find they cannot face life without the artificial support of alcohol.

Very quickly they become dependent. This level of consumption causes devastation to the body physiologically as well as psychologically. The increased intake of energy will result in excess fatty tissue, damage will be done to the liver, which is used to eliminate many toxic substances, and to the heart and brain.

Alcohol and flying just do not mix, and this is recognised by ANR 247. The requirement that there should be a period of eight hours between alcohol consumption and flying is very much a MINIMUM time period. Indeed in many instances, alcohol can be measured in the blood up to 24 hours after the intake of large quantities. The after-effects of alcohol or 'hangover' may be as bad as the effects of alcohol. Though you may be 'legal' as defined by the ANR you are probably not safe if in a 'hung-over' state and should not fly. Alcohol degrades all performances and this is especially true of complex psychomotor tasks such as flying. [From my observations, Australian pilots are very observant of the drink-fly criteria but not so aware of the equally serious 'hung-over/have to fly' predicament — Ed.]

## Drugs

Most people consider 'drugs' to be the illegal drugs such as heroin and cocaine, but the medication you take to control a disease process or pain also includes drugs. Perhaps we can look both at 'legal' drugs and 'illegal' drugs.

'Legal' drugs are those prescribed by your doctor because you have an illness or problem which can be helped by medicines. In the same class are drugs which you can buy across the pharmacist's counter such as simple pain-killers like aspirin or panadol. Your pharmacist will not sell you potentially dangerous drugs, and provided you read and follow the instructions, you should not come to harm. It is obvious you should tell your doctor that you are aircrew and ask him if it is safe to fly while on medication.

If the doctor does not know the answer then you should approach your regular designated medical examiner for advice. It may be that the treatment will not reduce your performance but the condition being treated could give rise to a reduction in performance. Again seek advice from your doctor or medical examiner.

A class of drugs which can cause problems is that which is used in the treatment of sleeplessness and anxiety. This group includes such drugs as 'mogadon' and 'valium'. These drugs slow down the working of the central nervous system and will cause a considerable reduction in performance. Anyone who takes these type of drugs should not fly an aircraft. The use of these drugs should only be for short periods to overcome an acute problem. Long-term use leads to dependence and addiction, and in this situation no-one is fit to fly. There are other means to combat the stresses of life.

'Illegal' drugs are cocaine, heroin, cannabis etc. and their use is totally incompatible with flying. The disturbance to the functioning of your body is such that any attempt to fly is fraught with the greatest danger. The use of these 'illegal' drugs causes tremendous problems and the efforts of governments to suppress the trade in these drugs is an indication of great dangers inherent in their use.

In summary, if you need to take medication then follow instructions and seek advice about the possibility of interaction with flying. If in doubt don't fly. Don't use drugs any longer than necessary and once the underlying condition has been treated stop using the drug.

Be very cautious about mixing medication with the drinking of alcohol.

## Stress

'Stress' is a term which has recently come to the fore. Its definition is difficult but it results from conflict, indecision or psychological pressure. The stresses themselves may be small but they are cumulative and eventually produce a result on the individual which is recognisable as 'tension' or 'stress' or 'anxiety'. We can't go through life totally unstressed — unless we are held in suspended animation. Some degree of stress is necessary to produce a level of arousal appropriate to the task at hand. In flying a high degree of arousal is sometimes necessary, which will lead to maximum performance. The inverted U curve of performance compared with arousal demonstrates this well. The graph shows that some degree of arousal (stress, workload) is required to gain good performance levels — too little and performance is low, too much and performance is also poor. Between these extremes, performance is optimal.

It is useful, in considering aircraft operations, to discriminate between three kinds of stress: environmental stress, acute reactive stress and life or domestic stress.

Environmental stress includes those problems associated with noise, vibration, heat, cold and possibly even a mild degree of oxygen shortage (hypoxia). Also one would include sleep deprivation in this group of stressors. Rarely is it found that environmental stress, other than

sleep deprivation, is a major cause of an accident. Fatigue and sleep deprivation on the other hand have been suggested as possible contributory factors in some accidents. The matter of fatigue is very often an organisational problem as opposed to a personal pilot problem.

There is no alternative to a good night's sleep — if you don't get enough your performance suffers. It's as simple and as serious as that and it is a common problem in aviation.

Acute reactive stress occurs as a result of a gross provocative event such as an aircraft emergency. This emergency will increase the arousal level and almost certainly the workload. If the arousal and workload are too high then the pilot's performance will degrade and the difficulty or inability to cope with the emergency will compound the performance reduction. Many pilots have experienced severe emergencies and been able to cope very well — generally because they have been prepared by learning procedures and rehearsing responses to emergency situations. 'Practice makes perfect' does appear to work and those privileged to have access to simulators can of course practice repeatedly without risk.

Domestic stress is being recognised as a potent source of overloading for an individual. Most will agree that the death of a member of the family, divorce, loss of employment and other troubles can increase the level of stress. But so too can a win on Lotto, a wedding and even going on a holiday, raise the level of stress and consequently reduce performance. Conflict between members of a family or work group may also produce undesirable stress and the conflict may be carried into the cockpit and affect the flight.

This is especially so if the flying task is routine and to some degree monotonous. At these times one starts to run over the previous events, and if they have been unpleasant or difficult then concentration on the flying task will deteriorate. Also dwelling on a problem often makes it more stressful rather than solving it.

What are the answers to the stress problem? It's very difficult to give guidance, very easy to suggest you don't worry or not to get yourself worked up about things. Probably the best advice is to be aware of the problems that stress can cause. Above all else, *discuss it with someone — your employer, your wife or husband, your co-pilot or your doctor.*

THE ANSWER — LIFE WITH STYLE.

Moderation in all things — the sage once said. He was right. A long and enjoyable flying career starts with a sensible attitude to life and particularly to life's pleasures. A balanced diet, adequate rest, moderate exercise, honest discussion, professional pride and a conservative approach to 'indulgences' will bias the odds in your favour. You have to decide your priorities — you can't have it both ways.

IT'S YOUR LIFE — WHY NOT SAVE IT? □

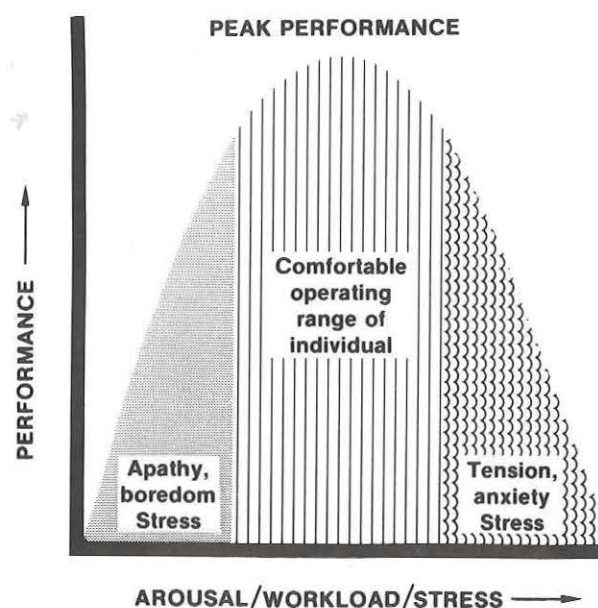


Fig 2. Relationship between performance and some other factors.



## Forwards — backwards land

Way out, man, way out

**H**OW MANY times have you had to stop quickly to avoid another vehicle approaching from your left side with no apparent intention of stopping and not having acknowledged your presence? By the time he has sighted you he probably can't stop without firm braking and so you defensively slow down to avoid a potential collision. The culprit then brakes violently and glares at you as if your slowing down had upset his finely judged interception and if you had continued at speed he would have slipped in neatly behind you. Alternatively he stares rigidly ahead to avoid eye contact with you altogether.

This type of bullying is a reflection of the state of mind of the driver — his attitude to his driving, his vehicle and his fellow road users.

There are obviously two ways to approach an intersection where it is not your right of way:

- Aggressively — whereby you 'attack' the intersection with the intention of driving through without stopping and brake only as a last resort.
- Defensively — whereby you approach the intersection with the intention of stopping and only accelerate when it is obviously clear.

The former is positive but without perfect judgment and reactions, it relies on the driver with right-of-way to give way if 'aggro' messes up his approach. The cyclist is a common aggressor as he doesn't want to dissipate the kinetic energy he has built up and so he spills around the corner often looking rigidly ahead so as not to admit to the conflicting situation. Big trucks are often in the same predicament of trying to avoid dissipating their energy and then having to struggle back up to speed.

The same situation arises at traffic lights. Why slow down and get caught by the lights when you can approach at a speed which will ensure you can't stop and therefore justify your continuing through if they change colour?

The same thing happens in a more subtle way in flying. I don't mean to say that pilots taxi around in this way but that we can approach each situation in an aggressive or a defensive way. It is the defensive way that is safer in that it always leaves you a way out — the aggressive approach is vulnerable to misjudgment or unexpected changes.

### Let's look a little more closely . . .

You are established on final and await landing clearance while an aircraft ahead is clearing the runway. In this predicament you can either press on with the intention and the hope of landing or you can continue the approach while mentally preparing yourself for a go-around — but still in a position to land from the approach if the other aircraft is clear when you reach short final.

As you roll on takeoff you can be thinking of the liftoff and initial climb or you can be mentally preparing yourself for an abort if it becomes necessary.

As you fly into worsening weather you can be desperately seeking a way through or you can be continuing while ensuring you have a way back if you can't get through — flying forwards, looking backwards. The difference is one of attitude — that word again. One way has you scanning the horizon looking and hoping for a way through — the other has you judging your ability to turn around as you go along. As soon as that ability to turn back is threatened you discontinue the flight. One pilot is thinking, 'Can I sneak through that gap between the clouds and the hills?' The other pilot is thinking, 'Can I continue to the next line of hills and still have the ability to "bug-out" safely? If so I will go that far and reassess the situation. If there is the slightest doubt about my escape route closing, I will turn back now.' One pilot flies more on hope than good judgment. The other will turn back more often but will never be caught in a VFR into IFR accident. In a way, he flies forward — looking backwards.

The sign of the professional is that he always leaves himself a way out. He doesn't commit himself until he is certain of success — nor does she.

The same attitude applies to emergency procedures. One pilot has the attitude that it probably won't happen so he'll take his chances when the time comes. The other knows his procedures and may never have to use them. But if he does, he will survive and probably not even damage the aeroplane.

Inevitably the 'positive' approach (the aggressive approach) is the one which causes the close shaves and the exciting life. It results in late decisions and high pressure and may seem like fun — 'life in the fast lane'. But when things don't go as hoped then there is no escape route. Aggro is committed.

There is a further subtlety. Aggro expounds his adventures in the bar and sounds like the colourful image of the daring young man in his flying machine. The student aviator may be confused into thinking that Aggro is the perfect image on which to model his own behaviour. That is a pity. He is not. The most competent fighter pilots in the world, and I have met several, are defensive pilots. That's right — defensive. They are aggressive in winning the battle but they always leave themselves a way out.

What's that saying? It's better to fly and run away and live to fly another day □

## One of these days I must get organised

**W**E ALL DO IT — put things off, file things in the 'pending' tray, defer decisions.

In aviation though, the problem doesn't go away. There is a tendency for all the little problems to accumulate until they all demand attention at the same time.

The workload for a pilot in a single-crew GA aeroplane is high — under some circumstances it is unacceptable. The only way to reduce this workload so that we can concentrate on the job at hand is to anticipate — to plan ahead and prepare for the tasks before we get airborne. The sign of a good pilot is planning, not just flight planning in the sense of navigation but planning and anticipating all aspects of the flight — thinking the whole thing through and then organising the cockpit accordingly.

After the usual flight planning, performance calculations and weight and balance estimates, the organised pilot will fold the charts to a manageable size [I use sticky tape to hold the folds and I don't mind cutting up a two-dollar WAC to make it more manageable], then put them in a place and sequence so that they are always to hand. She will then open the appropriate SID, airfield diagram and enroute comms section and have them ready. She will have a pencil and pad ready. She will have the checklist and flight manual handy.

It is tempting to kick the tyres, light the fires and sort out the problems airborne. It is very embarrassing to leap into the air and then have to fumble for the required paperwork. I know there is too much paperwork but that is all the more reason to have it in some sort of order.

Today I will be organised! □

## Finger on the pulse

Situation awareness and spatial orientation

**O**NE OF THE things that takes a while to acquire is a continuing awareness of our position in space. We are not designed for an aeronautical environment and it does not come naturally — we have to develop it.

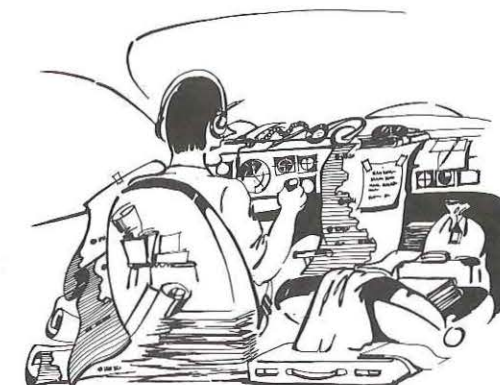
What I mean by situation awareness is that as we fly along, or especially around, we should retain in the back of our minds an awareness of where we are in three-dimensional terms — that is, which way is up, which way we are going and which way to turn to get home. The opposite of course is called 'disorientation'.

It is possible to teach and to develop this situation awareness by:

- instructors occasionally asking their students the general direction of home base as they proceed through the normal flying lessons — including navigation exercises
- students (and we are all students in a way) consciously asking ourselves which way is home

The technique can be further developed to the extent that a pilot can keep track of the way to home base, the way to the nearest airfield and the direct route to the destination — and this is very useful in the event of weather problems or a fuel or electrical problem.

The way to develop an awareness of which way is up is to do some aerobatic training. It's a marvellous help to all flying. I also recommend regular refreshers for those who haven't been wrong-way-up since basic training □



"ONE OF THESE DAYS I MUST GET ORGANISED"





## Losing the place

**Y**OU'VE HEARD the old saying that a pilot is never lost — just temporarily unsure of his position. It is true. You can catch a pilot out by asking his precise position and he may not be able to answer directly. But he will know where he has been and where he will be at a particular time. That is the art of navigation. Flying from one known point along a planned track to reach another point at a particular time. If you have established your position via a positive visual fix and have completed the CLEAR checks (or CLEARO or O'CLARE), maintain your heading and anticipate the next feature. In the meantime enjoy the flight and watch the time.

It is not uncommon to be flying along happily when the sudden realisation dawns that you're not absolutely sure where you're at. The heart misses a beat and the palms of your hands become slippery with sweat. There is a sick feeling in the pit of your stomach and a tendency to panic — I don't mean run around the cockpit but there is an urge to do 'something', to turn back, to orbit or to call on the radio. The feeling arises when we have doubts or if we have not been keeping track of progress or particularly when we are inexperienced and have not yet learnt to trust our own skill and judgment.

The student was on the second leg of a two-hour navex and was soon to do his unrestricted licence test. He was a thorough, even cautious pilot, and was well prepared for the flight. This particular leg was typical of many parts of Australia with fairly barren land and sparse features. There was no significant terrain and the few roads and creek beds did not really

relate to the WAC. The student was thorough with his CLEAR checks and was updating his fuel log when he started to feel uneasy. Something was wrong. He should have crossed a road and an abandoned railway line some two minutes ago and the problem was dwelling on his mind. Had he miscalculated the elapsed time? Was the DG aligned? He felt tense and nervously checked and rechecked his calculations. [In fact the feature was under his wing at the time and he missed it.] He found one error — he had applied the drift correction the wrong way but it was only two degrees on this leg and would not have had much effect. However, the error caused him to doubt his whole plan. He decided to orbit to gain some time — to stop the clock as it were, in case he was heading in the wrong direction.

The sun was high in the sky and as he orbited he became unsure of the general orientation of East and West. He even doubted the magnetic compass. As he looked around he saw a township in the distance and he immediately headed for civilisation — although he had no idea which town it was. On the way to the town he unfolded and refolded the WAC in an attempt to identify the features but he was now in a bit of a panic and he rushed through the process and could not establish his position.

He overflew the main street and couldn't believe his luck when he saw the name of the town on the roof of the Mechanics' Institute. There was even a nearby strip long enough for a safe landing and, feeling somewhat shaky, he decided to land and try for a cup of coffee and to stretch his legs.

The old timer who sauntered out to the aircraft for a chat couldn't understand why a smartly dressed city person had deliberately come to ... just for a coffee and a chat.

What went wrong? ... Nothing went wrong.

The pilot was on time and close to track. The features were simply not definitive enough to provide a positive fix and the pilot had insufficient confidence to continue on heading and time and to wait for his next feature or turning point. It is a common predicament and it is not limited to students. When I returned to flying after a few years behind a desk I fussed over my navigation to the extent that I was continually worried and couldn't relax. I kept looking for features long before they were due to appear. It took some time to relax back to the situation where I flew from a positive fix, did my CLEAR check and then watched the time until the next feature was due.

In these situations you have to trust your skill. If you become unsure you must stick to your heading and watch the time. Do your CLEAR check and if a feature does not appear on time maintain your heading and look for the next one. The main thing is to keep a general awareness of your position and orientation — that's the 'O' in CLEARO. Keep the big picture in

mind and don't become bogged down with details. In the bush, fly high so you can see a fair distance and hold the map up so that you are not drifting off heading while looking into the cockpit.

If you do the CLEARO check and discover the DG is out, don't immediately realign it. Note the heading you have been steering on the magnetic compass and plot the nil wind track and estimated distance from your last fix. If you know the drift make an allowance for it. If there is a prominent feature coming up maintain the wrong track until you reach the feature and plan a new leg from that feature.

Alternatively, after plotting your probable position, align the DG and turn to a heading which will take you to a prominent feature close to your original track or to an alternate airfield.

## Look before you leap

**L**OOKOUT' is one of those things that lapses. We actively look for other aircraft when we are in the circuit area or transitting near an ALA but after a period of non sightings, we tend to relax into a state of 'non-looking' even though we may turn our heads in the right direction. Clear left, clear right etc. etc. The eyes of course relax also — into a focal distance of about one metre. That is to say unless we consciously force the eyes to focus at infinity, they will set the focal distance to a metre in front and this can cause us not to see a distant aircraft.

We also become lazy and don't even bother to look for much of the time — until an aircraft or bird intrudes into our reverie and shocks us into a state of alertness. Then we return to our idle scan.

Of course this assumes that we were taught to look correctly in the first place. Sounds basic but aviation is not a natural environment for humans and we do have to learn how to make best use of our sight for flying.

For example, we were probably taught to look in both directions before turning, like crossing the road — and of course before and during a climb. How many of us still do it now we are licensed? What about descents? Were you taught never to descend in a straight line? Common sense, isn't it, to keep turning to avoid the possibility of descending on top of another aircraft? We were taught to clear below before aerobatics or stalling, but how about *during* an aerobatic sequence?

Navigation is not difficult provided you keep track of the situation — maintain your heading and watch the clock — most of the drift a student experiences is due to a wandering heading. As long as you maintain your heading and keep that DG honest you will find some feature that you can use for a fix as you fly along your planned route. Above all trust your own skill.

Remember the priorities:

1. AVIATE (fly heading and time)
2. NAVIGATE (know what is coming up and when — keep the big picture in mind — be sure of your position within 20 miles or so of a positive visual feature and then refine it as you progress)
3. COMMUNICATE (if you still have doubts — tell someone) □

The practice of scanning from the tail on one side right around to the opposite extreme of the field of view, above and below the horizon and then back again does seem to be designed to allow for the fact that we will relax to a less rigid scan after we are licensed. But what is enough?

Over the years I have developed a habit which I suppose you could call 'leading with the chin'.

As well as maintaining a normal scan, I move my head in the direction I am about to go before I start a manoeuvre. For example, I turn my head up and left and look, pause and then I enter a climbing turn left. I look up and left and then down and left as I go through a wingover to the left. It's like imagining that the control column is attached to my head by a rubber band and after I look in a particular direction, the aircraft then follows. It becomes a habit after a while — I do it when I am driving a car too. I look over my shoulder before pulling out to overtake another vehicle. Several times I have cleared the rear vision mirror and then looked over my shoulder just in time to discover a car in my blind spot. It's frightening. I have also found other aircraft in the training area as I went over the top of a loop or rolled out from a barrel roll during an aerobatic sequence.

Again this is a common-sense practice but it is one that has to be cultivated until it becomes second nature — until it becomes a habit.

It is not intended as a substitute for a normal scan — it is a double check immediately before each change of flight path to ensure I'm not about to run into someone or something.

And I always turn during a descent and clear underneath — particularly approaching an inbound reporting point going into a GA control zone. You can meet all sorts of traffic there □





## Anticipation — or saturation

**W**HEN WE UNDERGO a conversion onto a new aircraft type, particularly a higher performance aircraft, we are often 'left behind' — momentarily at least. It takes us a while to think ahead of the aeroplane, to know what to expect and to pre-plan our actions. This is anticipation.

In time we come to expect the next event and our workload is considerably reduced by being able to exercise such anticipation.

Similarly, our flying experience helps us to forecast what is likely to happen next in terms of weather, traffic or aircraft behaviour.

Thus, the ability to anticipate events means that we are forewarned. We are able to preconceive the problems and the optimum solution. We are able to make decisions in advance and this not only saves time, it increases the probability of making the correct decision.

However, there is a subtle pitfall associated with anticipation. *It is possible to over-anticipate.*

Consider the situation where we are on descent to our destination, the traffic is heavy and the wind is gusting across the runway. We have enough fuel to safely complete the flight but we would like to refuel the aircraft before nightfall, which is only minutes away. The refueller is unavailable after 5 o'clock.

We join crosswind, fitting nicely between a Bonanza and a slower Tomahawk.

The crosswind really is marginal and it is going to take some care and some skill to fly a steady, safe approach. We anticipate the behaviour of the aircraft on final approach: its reaction to turbulence, the probable airspeed fluctuations, the need for positive attitude control and a reserve of airspeed. We caution our passengers. The question of flaps is occupying our conscious thoughts: should we use full flap or restrict it to the takeoff setting? What was the recommendation in that magazine article — field length versus controllability?

Base leg is every bit as bumpy as we anticipated. Flying the aircraft is an effort. Airspeed fluctuations and turbulence are a nuisance but thanks to our planning, the approach is safe and the passengers are respectfully quiet.

There is an enormous bump as we turn base and the Bonanza ahead has decided to go around. Lined up on final now — the aircraft is crabbing nicely and the attitude is steady. The airspeed is oscillating through plus or minus 10 knots but we have anticipated correctly and our additional airspeed is covering the transients safely.

Right, PUF checks — Propeller . . . full fine, Undercarriage . . . three????

Hastily, unsteadily and surreptitiously, we lower the wheels and at the same time, select full flap to mask the noise of the gear going down. The passengers probably didn't notice but if they did, we could bluff our way out by saying we deliberately left the wheels till last so that we could assess the windshear before committing ourselves to a landing.

The rest of the approach is automatic. The arrival is presentable. The passengers have expressions of relief and joy-to-be-alive on their faces. There will be free beers all round tonight. The planning and the anticipation were sound but of course they occupied our thoughts to the exclusion of the immediate requirements — the downwind checks.

We can develop an association of ideas where the entry to the downwind leg triggers a thought of 'wheels' or 'checks', provided we always do it at the same place in the pattern. If our memory is accustomed to lowering the wheels at random places on the downwind leg, the association is not as direct and the cue may not 'flash'.

'Downwind leg — downwind checks — downwind call' is a strong association of ideas; strong enough to interrupt our train of thought even when we are preoccupied with other things.

The PUF check is also a lifesaver. Once again it is a more reliable cue if it is always associated with rolling out on final. 'Lined up — PUF checks' is another strong association.

Checks are a valid aid if they are used properly. This requires the correct use of the checklist, mental or written, and it works more reliably if associated with a fixed place or event.

Anticipation is good — provided it doesn't go overboard and exclude immediate priorities □

# Flying can be like Russian Roulette

**If we fly when  
we are:**

**Tired  
Rushed  
Hungry  
Thirsty  
Tense  
Uncurrent  
Unprepared  
Harassed  
Distracted  
Saturated  
Unwell  
Unfit  
Worried  
Hungover  
Unsure**



**... we are stacking the odds against us.  
We may get away with it for a while,  
but eventually there will be a live round  
in the chamber.**



## What 'pilot-in-command' is all about

John Staal is a retired RAAF pilot with considerable multi-engine experience and is now an active GA pilot. He lives in Bathurst, NSW.

IT HAPPENED in the late 1960s when I was captain of a Convair Metropolitan flying out of Canberra with 34 Squadron, RAAF. The aircraft was at maximum gross weight.

It was one of those days when the wind was blowing straight down the runway, in this case runway 30, at 20 knots. Couldn't be better. Obviously the duty runway was runway 30.

The co-pilot was flying the aircraft as captain-under-instruction and after copying the ATIS, he taxied for runway 30. Sounds straightforward, doesn't it?

But there was more to it. The Convair was at maximum weight, the terrain beyond the end of the runway rises towards Mount Ainslie and Duntroon and the headwind was not enough to ensure an acceptable climb gradient in the event of an engine failure.

The alternative runway (17/35) was 3000 feet longer and to the south, there was no rising terrain off the end of the runway. We would have to cope with a crosswind element of about 15 knots, and on RW 17, a slight downwind component, but these were not significant problems.

We taxied for runway 17.

On most occasions that would have been the end of the matter and my 'interference' may have been considered pedantic but — you guessed it — this time the engine did fail — just after we achieved V2 (takeoff safety speed). The single-engine climb performance allowed a safe climb to 3000 feet over the clear terrain to the south of Canberra. (Off RW 30 we would have flown straight into the hills.)

An emergency landing was made via a left base to land into wind on RW 30 (and we planned for a higher than normal decision height for a go-around due to the rising terrain off RW 30).

As you can see, there were many factors involved in the choice of runway. That one decision determined whether or not the aircraft survived the engine failure. If we had used the duty runway I would not be writing this today. Maybe the odds were against a failure at such a critical time but I was not prepared to take the risk.

[It is usually possible to plan an 'escape route' for critical situations — provided we take all factors into account and we don't blithely accept someone else's decision as being the most correct. As aircraft captains we must take the responsibility for decisions which affect our safety and we must question every piece of information. We must make the decision that we consider to be the best under the circumstances. That's what pilot-in-command is all about and it has nothing to do with being in a big or little aircraft or with being civil or military, it has to do with the human inside — you and me.

When you fly, you are confronted with situations which put you on the spot. Next time ask yourself:

Am I *sure* I can accept an intersection departure?

Am I *sure* I can carry that extra suitcase?

Am I *sure* I can arrive before last light?

Am I *sure* I have enough fuel and reserves?

Am I *sure* I know the emergency procedures?

Am I *sure* I know the airspace restrictions?

These are *command decisions* for which you are responsible. If you are not *sure*, it is your responsibility to say or do something about it. Your passengers or crew are counting on you to make those decisions and not to shirk that responsibility. You are the pilot-in-command.] □

*airmanship — the bottom line is*

**OUR LIVES DEPEND ON IT**



## Not feeling yourself today?

*The break-off phenomenon*

*From a NATO Handbook for Aircrew (AGARD A6+170, Spatial Disorientation in Flight) by Alan Benson of the Institute of Aviation Medicine, RAF Farnborough, U.K.*

THERE IS A particular form of disorientation which commonly occurs during monotonous flights, especially at high altitude (30 000 feet plus) when the horizon is ill defined. This is an altered perception by the pilot of his relationship with the aircraft. He feels detached, remote and isolated from the vehicle he is controlling. About 30 per cent of aircrew who fly at high altitudes experience this type of sensation, which has become known as 'the break-off phenomenon' because the aviator feels as if he has 'broken off' from the reality of his immediate environment — his aircraft.

Usually 'break-off' is no more than a mild feeling of detachment, though less frequently the dissociative sensation is more dramatic: the pilot may even feel as if he is outside the aircraft watching himself at the controls. Such 'outside the body' experiences can be very alarming to an aviator who has never heard of the 'break-off phenomenon'; to others, these somewhat unusual sensations are but one of the pleasures of flying. Although 'break-off' was first described by pilots of single-seat aircraft flying at high altitudes, more recently it has

been found that this type of sensory experience is not the prerogative of such aircrew. 'Break-off' occurs in helicopter pilots at much lower altitudes (500-10 000 feet), particularly when they fly in hazy conditions with an indistinct horizon over featureless terrain or a smooth sea.

The sensations of 'break-off' are usually short lived, and often disappear spontaneously when the aviator directs his attention to some other aspect of the flying task, such as change in heading or an R/T message. Less commonly the pilot has to make a positive effort to redirect his attention in order to dispel the sensations; in rare instances 'break-off', like 'the leans', may persist until reliable external visual cues appear, such as a clear sight of the ground.

*Doctor Benson has explained a phenomenon that can affect pilots, and not just military pilots. I myself have been through this process and found it to be quite frightening. I thought it was hypoxia at first and so it caused some concern. It is interesting that helicopter pilots have experienced it. I believe it is most likely when there is a combination of an unclear horizon and clear canopy which is not interrupted by structural members. The helicopter is also more difficult because of the lack of instrument coamings and structure in front or overhead the pilot. I would think that glider pilots could also be susceptible. Be alert for it, particularly on those hot, hazy days over the desert or over water.*

*If it happens to you — control the attitude of the aircraft, check the oxygen system just in case and tell yourself that it is a common occurrence and that there is not a risk of your losing control or consciousness. Gently fly the aircraft home and if you can change flight level or heading to point towards a more-clearly defined horizon — then do so □*



# Tie a yellow ribbon round the old oak tree

How to use a checklist

OVER THE YEARS, the checklist has taken many forms, ranging from memorised mnemonics through cards and booklets to metal slides and electronic switch assemblies. All have a common purpose — to prevent the pilot from forgetting some vital action or sequence. All have a common result — they failed at some point, and usually the human operator was the cause.

The problem is compounded by aircraft designers and specifiers who won't to agree on a standard cockpit configuration for lights, controls, switches and displays.

Also the purpose of the checklist has been corrupted. By that I mean that a large number of 'house-keeping' items have cluttered the list to the extent that the important items are lost in significance. Consider the pre-start checks. They are more a procedure for starting the engine and turning-on the various systems rather than a check of the correct setting and functioning of those systems.

This is understandable. An aeroplane and its systems have become more complex. To turn on, correctly operate and turn off a system, requires a series of steps that have to be carried out correctly, in a specific sequence. Further, the systems are inter-dependent, which necessitates the integration of their sequential checks into an even more complex litany.

But let's not lose sight of the purpose and value of the checklist as distinct from a procedural sequence.

To my mind there are very separate and functionally different items that the crew has to address:

- First, there are PROCEDURES. A procedure is a sequence of steps to bring a system into operation, to correctly operate that system and to shut-down that system. These could be termed engineering or house-keeping items.
- Second, there are CHECKS. A check is a functional test of a system to ensure that it is operating correctly and that the settings are appropriate.
- Third, there are VITAL ACTIONS. A vital action is a *double-check* of those items that are critical to the survival of the aircraft, crew and passengers.

What then makes a good checklist?

- It must discriminate between procedures, checks and vital actions.
- It must be designed so that the checks are easy to remember and the vital actions are unforgettable.
- It must be in a logical sequence for cockpit layout and for ease of memory.
- It must be easy, efficient and convenient to use.
- It must be *self-checking*, i.e. it must include a challenge and response, as I'll explain.
- It should be efficient in that it prepares the aircraft for start-up and has as much as possible completed before passengers board.

Logically, the pre-start and after-start items are *procedures*, designed to get the systems up-and-running. Next would be any functional *checks* or settings necessary for taxiing, such as brake pressure and function checks and the checking of data from the ATIS.

The run-up is a *functional test* of most systems and in some aircraft is subsumed into a pretakeoff *checklist*.

What is often called the pretakeoff checklist should be the *double-check* of the critical items. This list is almost universal and indeed most old and bold pilots have their own pretakeoff VITAL ACTIONS (VAs) which they complete immediately before takeoff in any aircraft and irrespective of any previous checks (remember they are *double-checks*).

I'm sure you have heard of TAFFIOHHHCC or TMPFISCH. They are mnemonics which have evolved over the years and are applicable to any aircraft. TAFFIOHHHCC is appropriate for aircraft with airbrakes, oxygen and hydraulics, whereas TMPFISCH is appropriate to GA aeroplanes.

'TeeEmPeeFisch' is a life-saving word if used as a *double-check*.

Let's consider a typical light aircraft 'checklist'. (Incidentally they are referred to as *Normal Procedures* in the Flight Manual.)

The 'before start', 'after start' and 'run-up' checks include a mixture of procedures and checks. They enable you to get the engine and systems up-and-running and they check the function of most systems. However, there is no emphasis on critical items. The Park Brake rates as much importance as the Flight Controls. Further, the list gives no clue to the correct response, e.g. Avionics — CHECK (Check what and how?).

There is no *double-check* of the critical items; not even in the pretakeoff checks. The list really functions as a cue-card to prompt the pilot as to which items to check and in what order. It does not tell him what the check should be. Nor does it provide an indication of the correct response.

What then is the solution?

There is none. No infallible one at least. I use a series of precautions with respect to checklists:

- I use the Flight Manual Normal Procedures for preflight, pre-start, after-start and run-up/pretakeoff procedures and checks;
- I use mnemonics for the airborne checks and for vital actions;
- If any list, whether written or memorised, is interrupted mid-stream, I start again at the beginning.

What are my Vital Actions?

- before Takeoff — TMPFISCH
- before Landing — BUMFF and PUF

You will hear many arguments for and against memorised checks versus written checklists. The ultimate checklist is one that calls out each item and won't let you proceed until the correct action has been taken and it checks that you have done so. A human operator can do the same if he designs and uses the checklist correctly, whether it is memorised or written.

The formal, written checklist was developed for multi-crew cockpits. It was a means by which the actions of several crew-members could be integrated and each could *double-check* the actions of the other.

The essential principle of the written checklist is 'challenge-and-response'. It will only work reliably if the left-hand side is regarded as a question and the right-hand side the response. Indeed, the RAAF, in conjunction with its checklists, publishes a checklist 'patter' which spells out the correct challenge and the correct response. In this way the lone pilot can keep himself honest. That is he challenges himself by asking the implicit question, he physically checks the item, he responds to the challenge (out loud is best) and then he checks that the response is correct (that he heard himself say what he should have heard himself say!). The 'saying' can be aloud or in your head.

This may sound confusing, but let's try it. Take the pretakeoff vital actions:

T — Throttle friction  
Trim

M — Mixture

P — Propeller . . . etc

Now instead of just reading them out, try it this way:

Challenge . . . 'THROTTLE FRICTION?' (question)

(check it and call what you see or feel)

Response . . . 'SET' (answer)

(ask yourself if that is the correct response — if so, go on. If not, check it again.)

Challenge . . . 'TRIM?' (question)

(check its travel and set it for takeoff)

Response . . . 'CHECKED AND SET FOR TAKEOFF' (answer)

(ask yourself if that is the correct response)

Challenge . . . 'MIXTURE?' (question)

(check its position and call what you see)

Response . . . 'FULL LEAN' (answer)

(ask yourself if that is correct)

It isn't and you will immediately recognise the mis-match . . .

. . . and so on. Get the idea?

The checklist is a cue-card which prompts you to challenge yourself to check something. If you then check it and call out what you see or feel, you are providing a mental or audio signal that the brain can verify for its veracity.

The mnemonic is a reminder, a cue. The FOUR important aspects are:

THE CHALLENGE

THE PHYSICAL CHECK

THE RESPONSE, and

THE CHECK THAT THE RESPONSE IS CORRECT

This is why the checklist was so successful in multi-crew environments.

There are still weaknesses in our system if the item on the cue-card is missed, whether due to an interruption or due to bad layout of a written list. The way around this is to use memorised cue-cards in flight and to *always start again at the beginning if a list or sequence is interrupted* — CHECK?

Ultimately, I don't think it matters so much whether you use a mental or written checklist as long as you use the challenge and response technique, that you physically check the item and that you call exactly what you see or feel (rather than what you expect to see or feel). I favour a written list for procedures and for checks that are done when the aircraft is stationary on the ground. For all airborne checks and for all vital actions, airborne or groundborne, I strongly prefer memorised mnemonics. I have seen many more missed items when a student read from a written list than I have from a memory system.



The reliance on a written list removes the double-check on the response as it is read rather than 'triggered'. With a memory system, the onus is on the pilot to develop a physical check and to call out exactly what he sees or feels. It is possible to respond automatically or unthinkingly but the double-check occurs when the position of the control, the memory of the action or the words of the response, don't coincide. It doesn't 'feel right'.

The written list is also an added burden which is not acceptable in some phases of flight. The workload in instrument conditions or in an emergency is high enough as it is. And if you can't use it all the time . . .

Ultimately it is your decision. Consider the analogy of the musician — if you play one instrument and one tune frequently then a memorised score is easy and accurate. If you play several instruments and several tunes and don't play very often, then probably the written list is for you. Either way, the list must be complete, the check must be physically carried out, you must call exactly what you see and you must compare that response with the known correct response.

(If you do memorise checks, I would still recommend that you also carry a written checklist.)

How could this attitude to checklists help?

The pilot-in-command of a charter flight had some difficulty locating the destination airstrip. He consulted several of his passengers, and after about five minutes, he located it in relation to a survey camp. The pilot joined down-wind for landing.

One of the passengers (all were experienced air travellers) noticed that the flaps had been extended and waited to hear the undercarriage electric motor running. He became apprehensive when, by Final, he still hadn't heard it. On final approach, the passenger who was seated in the third row of seats noticed that the landing-gear position lights showed that the wheels were up (three red lights). He shouted out and indicated the problem to the passenger in the seat in front of him. This passenger then tapped the pilot's shoulder and pointed to the indicator.

Almost immediately both propellers hit the ground. The pilot applied power and rotated the aircraft to a nose-up attitude. The left engine stopped due to the impact and the pilot adjusted the engine controls either to feather the failed engine or to restart it.

The aircraft climbed to between 150 and 300 feet agl and levelled out, before slowly yawing and rolling to the left. The yaw and bank angle increased and the aircraft descended.

First impact was the left engine and nose section and the aircraft then slid backwards for about 20 metres. There was no fire. The pilot was killed instantly and one passenger was seriously injured. The remaining six passengers escaped with only minor injuries.



Several factors were perhaps relevant:

- the landing gear was not selected down,
- the undercarriage warning horn was set to sound if the throttles were retarded below 14 inches MAP,
- it was company policy to maintain at least 15 inches MAP until touchdown,
- the pilot did not use a written checklist,
- the pilot was wearing a noise-attenuating headset,
- the pilot had been studying for his SCPL,
- the engine could not have been feathered because of the low RPM. (Latches in the propeller mechanism prevent feathering below a certain RPM.),
- the undercarriage indicator was of the type that showed 'three reds' when the undercarriage was retracted, i.e. it was almost always indicating 'three reds'. Thus the indication lost its attention-getting value.

Apparently this was a fatal combination of circumstances.

- the pilot may have been pre-occupied with thoughts of his exams,
- the pilot had difficulty locating the strip and this may have diverted his conscious attention,
- the company policy was to use a written checklist, but it is not clear if the pilot used one normally,
- the pilot did not use any prelanding vital actions — he had no double-check — no back-up,
- the protective systems were over-ridden,
- the aircraft simply landed 'wheels-up'.

The subsequent events show how an inglorious arrival escalated to fatal proportions. Why the pilot attempted to go-around after the prop-strike will never be known. Perhaps he reacted instinctively to what he thought was a rough runway or perhaps he thought he had only scraped the belly of the aircraft and could go-around with minimal damage. Who knows?

Why he then lost control under assymetric thrust is perhaps understandable when you consider the upset propeller shape, the windmilling engine that could not be feathered and the consequently higher minimum control speed.

It would be too easy to say with hindsight that he should have just shut down the engines and stayed on the ground as soon as he felt the first strike. I hope I do if it ever happens to me.

How could this situation have been avoided or minimised? It makes little difference whether the checklist is learnt or read if the pilot simply forgets or is distracted and omits the complete list of items. This is the critical element. To my mind the essence of the 'wheels-up' problem is not so much missed items as missed lists.

The list has to pop-up in the pilot's mind at the appropriate time, irrespective of his work-load or stress situation. The technique that works for me is to 'tie' the checks to an event or situation. For example, I have developed an association between passing abeam the upwind end of the runway — on the downwind leg — and the prelanding checks. As I pass this point, my mind automatically triggers the words, 'downwind — speed below . . . knots (gear speed), brakes off, undercarriage down. . .' etc. I have developed an association between a physical point and a checklist so that one 'triggers' the other. The danger, of course, is when I have to join the circuit in a non-standard way, e.g. direct to base-leg. I find here, though, that because the circuit is 'incomplete' I am alert for the unusual anyway and 'uneasy' until I have the wheels down and locked. I usually put them down way ahead of the normal point.

On Final, as soon as I roll out, I say 'Final — Prop, full fine, Undercarriage, I have three . . . (and I call out what I see), decision . . . (continue or go-around), full flaps.

Before takeoff, I always do another check of the flight controls as I line up and that immediately causes me to recall whether I have done the pretakeoff vital actions.

There are some items on the checklist which are critical to a safe flight. Conversely if they are missed it can lead to fatal consequences.

The use of a checklist can be effective whether it is written or memorised. The essential thing is to 'tie it to something' . . . and watch out for interruptions □

**If only  
I had...**



# I could if I wanted to . . .

- why is it so difficult to give up smoking?
- why is dieting so difficult and failure-prone?
- why is it so difficult to reject that one-for-the-road?
- why don't we get to a meeting on time?
- why don't we keep to a safe speed?
- why don't we achieve the threshold speed within 2 knots?

## How do we know if we have it?

There is often some degree of tension or stress whenever we avoid making a decision that we know has to be made or avoid doing something that we know should be done.

Our subconscious knows when we try to deceive ourselves by saying that 'I could do it accurately if I really wanted to,' or 'It can be left until tomorrow,' or 'I didn't really want to give up smoking,' or 'I don't need to check the fuel every flight.'

I think it was Socrates who first said that the essential thing is to 'know thyself'.

We must make the decision rather than have circumstances make the decision for us.

If we skip a check for water in the fuel, we are either saying to ourselves:

- it is not important,
- I don't care about the consequences of not checking,
- the odds are that it will be alright, or
- if I ignore the problem, it will just go away!

There are two problems here. What the Army would call 'Command and Control'.

The first problem is one of making a decision — 'Command'. The persistent temptation is to put off the decision until tomorrow or until it becomes unavoidable. It is a temptation we are all plagued with. The important aspect is whether we allow ourselves the laziness of avoiding the decision.

The second problem is one of action — 'Control'. Having made a decision do we then carry it out or do we put it off until another day or when we're feeling better? It is also a problem of accuracy or tolerances. Is near enough good enough?

## How much self-discipline is enough?

Is it unfashionable to have too much? Can you have too much? Is it irresponsible to have none? How much is enough for the captaincy of an aircraft? These are things we have to discover from training and experience. It is a matter of how little we can get away with and how much risk we are prepared to take. Having too much does not mean being humourless, sour or 'stuffy'. It means being in control of our own destiny. We can still enjoy a beer or a raging party *as long as WE decide*.

## How do we acquire it, learn it or teach it?

Self-discipline is:

- acquired by doing,
- learned by copying (by emulating a 'professional'),
- taught by setting an example (whether you are an instructor, captain, parent or colleague).

It is implicit in human nature that the more we exercise something, the better we become at it, the easier it becomes and the less consciously do we have to direct it, i.e. it becomes 'second nature'.

Take a physical exercise program — if you get into a routine of walking or running every morning then it takes little mental effort. But miss one day and . . . If we give in to our lazy side and stay in bed then we are done for. If we force ourselves to run no matter how heavy the rain or severe the frost, our second-self accepts the discipline and gives up arguing. It becomes an easier and easier task — and we become more confident, more in control and have more self-esteem as a result. Flying an aeroplane is no different.

The slacker we are, the lazier we are, the more effort it is to do something positive or accurately or on time, like mowing the lawn (as my wife would point out). When we learn to fly an aeroplane it is largely a matter of learning a new discipline. Certainly there are new manipulative skills, new problems in three-dimensional judgment, new terminology and new psychological and physiological experiences. But the significant lesson in all training is 'application'. That is to say the way in which the student applies or disciplines himself or herself to consistently meet the accuracy requirements, the captaincy requirements and the procedural requirements, to the standards of their instructor.

I am not saying that a strong self-disciplinarian will necessarily make a good pilot. I am saying that the exercise of some self-discipline is a necessary pre-requisite to assuming command of an aeroplane — even for a first solo.

In the process of learning to fly, we are exercising some self-discipline. If we have learnt well from a good instructor, we will know what tolerances are acceptable and what aspects are most critical. We will know the standards that we should achieve, the areas that are intolerant to error and the 'polish' that we should strive for. It's like learning music — from a 'Master'. (Note the similarities — application by the student, the example of high standards by the master and the acquisition of those standards by the student.)

Hopefully we will then carry those standards with us so that they become our own standards. Becoming 'rusty' is no more than relaxing those standards or flying so infrequently that we forget the standards that we seek.

There are a couple of provisos:

- our instructor had high enough standards, and
- we discipline ourselves to maintain those standards.

So we need not just currency and recency but disciplined flying and regular checks *with someone who has high standards* — so we can update or 'fine-tune' our own.

Every time we fly we develop our skills by exercising self-discipline. In the climb we hold the airspeed within 5 knots. Radio transmissions are clear, concise and correct. Planning and preflight preparation is thorough. Final approach is 'on speed', 'on glide-path' and constant attitude. Instrument flying is smooth and accurate. We become 'professional' — and the example 'rubs off' on our colleagues.

There is another, more subtle aspect. It takes self-discipline to look after ourselves and our aircraft. Similarly, it takes self-discipline to stay up-to-date with ATC procedures, to refresh ourselves on the systems and emergency procedures, to amend the publications and to keep abreast of developments in our field of expertise — our profession. Make no mistake about it — when we occupy the pilot's seat we are regarded as expert and professional. We have no right to be anything less — even on Sundays.

So (as I tell myself),

MAKE THE DECISION — DECIDE WHAT, WHEN AND HOW WELL . . .

THEN DO IT, DO IT THEN AND DO IT THAT WELL!

Self-discipline is not just for the military and it may not be significant for many of our routine daily activities — as I look at the front lawn I often wish I had more. But I think most of us realise that flying is a special circumstance and it is one in which self-discipline has a significant part to play.

Let's be professional about our profession — even if it's a hobby □



Do you have enough self-discipline to read this article from beginning to end?

or  
(How to do accurately, and on time, what you decide should be done, having not avoided the decision in the first place.)

**A**LTHOUGH IT is a somewhat old-fashioned term, some would even say militaristic (Rudyard Kipling and all that), self-discipline is an aspect of our characters that cannot be ignored. It does of course vary in degree from individual to individual. This variation is a function of heredity, school and home environments and our training.

In the aviation environment, self-discipline assumes enormous importance because of the relatively early stage that the individual operates independently of direct supervision and assumes the responsibility of command.

## What is self-discipline?

It is simply the degree to which we have control over our own behaviour, thoughts and actions. Sounds simple. It seems incredible that it is even doubted that we have anything but total control over our own lives. But we don't have total control, because we can't be bothered. It's too much of an effort. So we mostly drift along within the boundaries of the various influences in our daily lives and rarely do we take a stance on an issue unless we are directly threatened.