

# GLIDING – THREAT AND ERROR MANAGEMENT

## – OR HOW TO REDUCE MISTAKES AND FLY SAFELY

Arthur Gatland



Arthur Gatland started flying in 1963 at age 13 and has accumulated 17,000 flying hours including 2,500 hours in RAF fighters such as Harriers, Hunters, Hawks. He is currently a Boeing 777 Captain and instructor, and for ten years was Manager of Training and Flight Standards for Air New Zealand. He is an A Cat glider instructor, with a Gold C and 3 Diamonds, and was a previous CFI of the Auckland Gliding Club.



In Soaring NZ issue 15, George Rogers asked why our gliding accident rate has been so bad over recent years. The fact is that on average we have one fatality a year with all the tragedy that this brings to families and friends, not to mention the huge cost in damaged and destroyed gliders and associated increase in insurance costs etc. Yet gliding is inherently a relatively safe sport, and historically has been second only to airline flying as one of the safest types of aviation. To my knowledge, none of our spate of accidents has been the result of structural or mechanical defects – all have resulted from pilots unnecessarily putting themselves in a situation that for various reasons have resulted in a crash. Ridges, rocks and trees do not suddenly leap out and hit gliders – yet we manage to collide with them on a regular basis. And despite the fact that gliders are safer, have better handling and performance, better airbrakes, more comfort, and better visibility than those of 30-odd years ago, our accident rate is worse.

Why is this – and more importantly, what can we do about it?

**And despite the fact that gliders are safer, have better handling and performance, better airbrakes, more comfort, and better visibility than those of 30-odd years ago, our accident rate is worse.**

Already, I can see a number of pilots losing interest in this discussion – because “This doesn’t apply to me – I’m experienced / skilled / smarter / an above average pilot (delete where applicable) and I don’t make those mistakes.” If you really believe this of

yourself, then you can replace those descriptions with “arrogant / overconfident / unrealistic / unaware” (delete where applicable).

This series of articles applies to every glider pilot in New Zealand, regardless of experience.

I believe that, like many accidents where contributing causes are often small but multiple, there has been a lowering of our flight standards for a number of reasons. These include:

- lower average flying hours due to less leisure time and financial constraints.
- higher performance gliders that create an unrealistic expectation that we always get home from cross-country flights.
- changes to national culture where people think they have the right to be more independent which leads to less discipline, reluctance to ask for on-going training, less time to talk to and listen to more experienced pilots, and unfortunately a lowering of instructing discipline and standards.

We all – individually and collectively – need to look at ourselves and see where we can attack these issues and reverse the slide in our flying standards and safety.

One technique we can all use to improve our flying safety is the



**If someone talks to you when you are halfway through your pre-takeoff checklist, recognise that this threat is likely to result in your forgetting something, and start again from the beginning.**

use of Threat and Error Management, which I will describe in this and following articles. This is a simple technique of understanding the type of situation where we are more likely to make a mistake and to prevent making errors which might lead to disaster.

**“To err is human.”** (Cicero, 50 BC)

In other words, we ALL make mistakes. Accepting this is an important step to understanding when and where errors occur, and therefore how to prevent errors. Pilots who think they don't make mistakes are (a) seriously mistaken (b) dangerously over-confident (c) have a limited life expectancy!

Errors are most likely to occur when we are faced with a THREAT, that is, something that presents a change to what we are used to, or what we are comfortable with. To understand what constitutes a Threat, I will introduce the concept of a Pristine Flight (courtesy of Continental Airlines). In this first article, I will concentrate on a local soaring flight and discuss possible threats, and in part 2 and 3 we will expand this to cross-country flights, and competition and other specialised flights.

### **Pristine Flight**

This is a simple gliding flight where everything goes exactly to plan. You arrive at the airfield and the club glider you want to fly is available, already DI'd and at the launch point. Helpers are readily available to pull it out for you, and a towplane is waiting. You are current on type and an instructor is happy to authorise your local flight. There is no wind and no lift or associated sink. There are no other gliders flying and no delay to your takeoff. The weather is

pleasant; not too hot. You aerotow to 2000 feet and glide gracefully back to the circuit, practising a few turns and speed control. Your well-planned circuit is uninterrupted by other gliders or crosswinds and landing is uneventful. This is a Pristine Flight – arguably a bit boring, but with no real interruptions to your simple plan.

Now let's talk about likely variations – many of them very common – that can upset your plan. You planned to be at the airfield by 11.00am but you are annoyed that you are late because your partner was late getting back from shopping. No-one has bothered to get the glider out of the hangar and it hasn't been DI'd. You are short of time so you must hurry these processes. The only instructor is flying, and you haven't flown for two months so although you think you might need authorisation, you decide it'll be OK to go without. There is only one other person to help push the glider on to the start line, an inexperienced student who you need to brief. After the exertion of pushing you are hot before you even get into the glider. You strap in and as you are doing your pre-takeoff checks, someone interrupts you to ask for your tow tickets. It's a bit windy and you haven't briefed the towpilot, so after takeoff he annoyingly takes you downwind to what he probably thinks is a good looking cloud. You don't find lift, but you practice a few turns, then head back to the airfield, encountering unexpected sink on the way. Your circuit is lower than you would have liked and you are concerned about another glider on circuit at the same time. Your circuit is a bit rushed, and with a short finals, you don't quite sort out the crosswind so the landing is a bit untidy. After landing the next pilot points out that the DI hasn't been signed today.

All of these variations to the Pristine Flight constitute Threats that will increase the likelihood of you making a small slip, or an





A race to the finish and other traffic has created a change from pristine flight. The lead glider is about to land with his wheel up.

error in judgement, or forgetting something – regardless of your experience. Let's review what these Threats might include:

|                    |                        |
|--------------------|------------------------|
| Time pressure      | Frustration            |
| Impatience         | Procedural uncertainty |
| Heat discomfort    | Interruptions          |
| Weather changes    | Poor preparation       |
| Unexpected sink    | Outside interference   |
| Inexperience       | Lack of currency       |
| Fatigue            | Other traffic          |
| Poor training      | Poor health            |
| Inexperienced crew | Launch delay           |
| Turbulence         | Unfamiliar airfield    |
| ATC / airspace     | Technical issue        |
| Dehydration        | Hunger                 |

Cross-country introduces an additional list of threats which we will discuss in the next article.

Note that many Threats are normal and some even desirable. For example a moderate wind might be appreciated for ridge soaring, but results in a crosswind takeoff and landing, and results in a headwind when returning to the airfield. Good thermals can also cause unwanted sink on the downwind leg in the circuit. You may be aiming for your 5-hour endurance, but this will raise threats of thirst, hunger, fatigue, etc.

## Threats

All threats increase your likelihood of making an error. A proficient pilot can easily recognise all threats, and implement a strategy to prevent an error resulting. Some examples might include:

### Interruptions

If someone talks to you when you are halfway through your pre-takeoff checklist, recognise that this threat is likely to result in your forgetting something, and start again from the beginning.

### Procedural uncertainty

Any time you hear that nagging voice questioning something (are we clear for takeoff, did I do my checks, did I sign that DI, do I need instructor authorisation, did I remove the tail dolly) – then STOP and double-check. Observers always respect someone who acts professionally and questions some small detail, in stark contrast to someone who makes an assumption and is proven to be an idiot.

### Time pressure

Any time you feel pressure to hurry – for whatever reason – you should be aware that this is a major cause of errors, through forgetting processes (tail dolly removed?), forgetting to take essential equipment (maps, drinks, hat etc.), ignoring procedures (takeoff checklist) etc.

### Other traffic

A good pilot will always join the circuit assuming there will be other gliders rejoining, and have sufficient height to give way to a



Heavy landing.

lower performance glider. He/she will also know the rules regarding landing if there is a glider ahead on final approach – where to land etc.

#### **Unexpected sink**

Always anticipate sink in the circuit. However if a circuit is flown using correct techniques this should be self-correcting – don't rely on the altimeter, or ground features for turn-in points, but assess your angle to landing point. Any unexpected sink can easily be corrected by adjusting distance out and turn-in point – if a pilot is alert to the possibility of unexpected sink.

#### **Inexperience and Instructor Responsibility**

Early solo pilots cannot be expected to recognise all threats existing on any particular day. This is why an instructor must authorise and brief early solo pilots. It is the instructor's responsibility to assess all threats and brief an early solo pilot accordingly. The brief might be along the following lines (abbreviated):

I have checked your logbook and confirmed you are current on this glider type. Your aim of today's flight is to search for lift and practice thermalling. There are several other gliders airborne, so let's review how you join a thermal if another glider is there first. Remember when you are concentrating on thermalling and speed control that lookout is actually more important. There is a moderate northerly wind today, so stay upwind of the airfield. Always keep the airfield in sight and have a plan on how to rejoin circuit if you don't find lift. Be aware of the likelihood of sink in the circuit area. Where will you land if another glider has landed ahead of you? It's hot today – have you got a sunhat and sunglasses? Now make sure you take your time getting comfortable in the cockpit and doing your checks – don't let anyone rush you. Any questions – anything you have any doubts about?

The main ways that new pilots can gain experience and knowledge is by instructors or experienced pilots passing on these thoughts, OR learning by making mistakes! Which method is better??!!

**Any time you hear that nagging voice questioning something (are we clear for takeoff, did I do my checks, did I sign that DI, do I need instructor authorisation, did I remove the tail dolly) – then STOP and double-check.**



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Instructors and experienced cross-country pilots must help us lift our game.

In the last Soaring NZ issue, I introduced Threat and Error Management (TEM) as a simple yet powerful technique for assessing threats affecting any and every glider flight. Recognising threats allows pilots to predict situations where they might make errors or forget something, which increases the possibility of accidents.

As I said in the last issue, our accident rate in NZ is high and yet none of our spate of accidents has been the result of structural or mechanical defects – all have resulted from pilots unnecessarily putting themselves in a situation that for various reasons have resulted in a crash. Ridges, rocks and trees do not suddenly leap out and hit gliders – yet we manage to collide with them on a regular basis.

**This series of articles applies to every glider pilot in New Zealand, regardless of experience.**

In this article I will continue the theme of TEM as it applies to cross-country flying, an area in which we suffer a disproportionate number of accidents, many involving injury or death. Remember that to assess what constitutes a threat, we use the concept of a Pristine Flight and look for anything that introduces a variation to this theoretical flight. Let's look at a Pristine Flight in the cross-country context.

### **Pristine Flight (Cross-Country):**

This is a 'straightforward' cross-country soaring flight where everything goes exactly to plan. You are a current, relatively experienced cross-country pilot who has completed a number of good flights, and also have completed several successful outlandings. You arrive at the airfield and your private or club glider is available. The battery is fully charged and other pilots are readily available to help you rig the glider and complete the duplicate check. You are prepared with drink, food, hat, sunglasses, maps etc., and you have a retrieve crew readily available if required. At the launch point, helpers are readily available to help you line up and a towplane is waiting. You are current on type and have flown cross-country recently. On your last flight you practised a short landing. There is light wind and it looks like a great soaring day. The weather is pleasant; not too hot. You aerotow to 2000 feet and easily find good lift. You have set yourself a relatively short task for the great conditions and your route will not go through any controlled airspace. There are many wide flat paddocks available en-route and with very light winds you have a choice of landing directions if required. During your three hour thermal flight there is good lift everywhere and you never get so low that an outlanding is a real possibility. On return you decide not to do a 'final glide' and rejoin the circuit area at 1500 feet, followed by an uneventful circuit

**You are a current, relatively experienced cross-country pilot who has completed a number of good flights, and also have completed several successful outlandings.**



**You are prepared with drink, food, hat, sunglasses, maps etc., and you have a retrieve crew readily available if required.**

and landing. This is a Pristine Cross-country Flight – good fun with no real challenges for an experienced pilot and there are no real interruptions to your simple plan.

## Threats

Now let's talk about likely threats or variations to your planned flight with a hypothetical example. You are running late and rushing because you are concerned that the best thermals may die out within a few hours. You need to rig your glider but no-one is around to help, so frustratingly you have to muster a few helpers. During your daily inspection and rigging check, another pilot interrupts to ask you where you are planning to go. You had forgotten to check your battery charge level, but you think it will be okay for a three hour flight. Because you are short of time, you must hurry to get ready and you are annoyed there is a queue for takeoff. While strapping in, the duty instructor asks if you have a retrieve crew organised, and criticises you when you admit you haven't. You are annoyed that he has questioned you in front of other people as you don't like criticism from anybody. You also realise you have left your cellphone in the car, but don't ask someone to get it because you will look even more foolish. You forget to do your pre-takeoff checks as a result of this incident. The flight proceeds satisfactorily for the first hour, but then a moderate wind develops (you hadn't checked the weather forecast so this is unexpected). There is some overdevelopment with a few light rain showers, resulting in some water on your wings. You decide to try to head back towards home base, cursing your glider's deteriorated performance and annoyed that your late departure has spoiled the day a bit. You think you might have to land out so try calling home base by radio to organise a retrieve crew, but your battery is low and you have trouble contacting anyone. Distracted by this, you suddenly realise you are at 1,000 ft and haven't even started looking at possible paddocks. However the sun is shining on the ground a few kilometres ahead and you are sure that if you can just sneak over a ridge ahead, you should find lift. You take a chance and luckily it works out and you find weak but consistent lift and climb away. After a slow climb you make it back to home base, where you do your usual landing, halfway down the strip so you can stop by the trailer.

This hypothetical example illustrates a number of Threats, some external and some self-inflicted – and there are potentially many more. All of these variations to the Pristine Flight (threats) will increase the likelihood of you making a small slip, or an error in judgement, or forgetting something – regardless of your experience. Let's review what these Threats might include:

|                    |                        |
|--------------------|------------------------|
| Time pressure      | Frustration            |
| Impatience         | Procedural uncertainty |
| Heat discomfort    | Interruptions          |
| Weather changes    | Poor preparation       |
| Overconfidence     | Outside interference   |
| Inexperience       | Lack of currency       |
| Fatigue            | Other traffic          |
| Poor training      | Poor health            |
| Inexperienced crew | Launch delay           |
| Turbulence         | Unfamiliar airfield    |
| ATC / airspace     | Technical issue        |
| Dehydration        | Hunger                 |
| Difficult terrain  | Rising ground          |
| Few landing areas  | Risk of landout        |
| Navigation         | Water ballast          |
| Ridge flying       | Cloud flying           |
| High altitude      | Use of oxygen          |
| Cold temperature   | Icing                  |
| Motor gliders      | Pressure to get home   |
| No retrieve crew   | Overdevelopment        |
| Sea breeze         | Wind changes           |
| Rain               | Blue thermals          |

Ironically, carrying food/drink to mitigate dehydration and hunger introduces another threat: managing these items in the cockpit.

Cross-country flying by its very nature has a significant number of threats, including continual possibility of landout, weather changes, unpredictable lift, different terrain with changes in height above sea level, often areas of partly unlandable country, or flat but very small paddocks, use of unfamiliar hills to find ridge lift, navigation challenges, and so on. As flights are often of longer duration, dehydration and hunger are always present to some extent, and have an insidious effect on your decision-making. Wave flights introduce a specialised range of threats that require careful management. It is actually the presence of these threats that form part of the challenge and satisfaction of cross-country flying. However you must not underestimate the risks that these challenges present.

## Managing Threats:

All these threats increase your likelihood of making an error. In this context we are not talking about errors in speed-flying, like not picking the strongest thermal, or incorrect speed-to-fly technique. We are discussing errors that result in reduced safety margins, or ultimately could contribute to an incident or accident. Most pilots can very easily recognise all threats if they think about it, but a superior pilot will implement a strategy to prevent an error resulting from any of these threats. In Part One of these TEM discussions, I discussed threats occurring on local flights. Cross-country flights have all of these, plus the additional considerations discussed on the previous page. Some examples how to manage the threats might include the following:

| Threats  | Strategies   |
|--|--|
| There are many common cross-country threats as listed previously that can be mitigated by one thing – Good Preparation.                            | Good preparation:<br>Glider – careful rig, DI/duplicate check, batteries charged, clean canopy, clean wings, no dirt/grass in cockpit, etc.<br>Personal – rested, healthy, fed and watered, correct clothing, sun protection, warm clothing if required, take drink/snacks.<br>Flying readiness – current on type, current on short landings, BFR current, complete routine skills training, appropriate confidence in ability for the elected task.<br>Obtain a reliable weather forecast, but regardless of the forecast, be alert for weather changes at all times.   |
| Time pressure  | Any time you feel pressure to hurry – for whatever reason – you should be aware that this is a major cause of errors, particularly by upsetting the important preparations discussed above, or missing procedures (takeoff checklist) etc. Always give yourself plenty of time when preparing for cross-country flights. If you have hurried to rig and get your glider to the launch point, ask another pilot to double-check everything for you – the 2 minutes could save you from embarrassment and potentially save your life. If it is essential that you get home after your planned cross-country flight, stay local, give yourself a 3 x 40km triangle task within range of the airfield. |
| Procedural uncertainty, e.g. ATC, airspace heights, procedure for transit of controlled airspace, unfamiliar airfield, any operational procedures. | Ask for advice from instructors or experienced pilots. Pilots respect other pilots who make sure they know what they need to know and are not afraid to ask.   |
| Wave flying – threats include terrain, use of oxygen, cold, higher winds, glider limitations including IAS to TAS relationship, icing.             | Good training and preparation is essential to mitigate these threats. Decompression training is extremely beneficial – if you use oxygen at all you should make an effort to experience this training.   |
| Example:   | My parents (Frank and Anne Gatland) used to crew for Ray Lynskey at several World Champs. They were always first to have the glider on the launch grid, fully prepared and ready to go, and then go back and have breakfast or early lunch, which not only beat the rush but also removed all the time pressure, and ensured Ray was relaxed.  |

### Some Specific Threats And Errors:

There are two particular threats that I will concentrate on briefly, since New Zealand glider pilots have suffered more than their fair share of injuries and death in these situations.

#### 1 Ridge Soaring;

Particularly in high country. A number of very experienced cross-country pilots have crashed while ridge soaring. Why? By definition, if you are ridge soaring there will be wind, and ridges are never totally symmetrical, which means there will be areas of stronger lift, turbulence, and sink. And hills do not move – we effectively fly into them by getting too close and/or failing to allow for wind effects. Let's dig a bit deeper into this area of gliding.



| Threats  | Possible Strategies   |
|--|---|
| Irregular ridge lines  | Be aware of the probability of unexpected ridges and spurs appearing in front of you. Irregular ridges are guaranteed to produce strange wind effects. Always have a safety margin in distance from the ridge, and always fly at a minimum of your "safe speed near the ground." Trim for this speed and always have an escape route away from terrain.           |
| Inconsistent winds, giving stronger and weaker lift, wind shear, turbulence                    | There will be instances of loss of airspeed, one wing lifting unexpectedly, possibility of stall. Expect this to happen and allow safety margins. Remember, unlike the car ads – in gliding it is Lack Of Speed that Kills!   |
| Stronger winds due to funnelling etc.  | Recognise this as a serious threat! Often you will find yourself closing with the ridge faster than expected. Never fly directly towards the ridge, but close on it obliquely so you can always turn away when required.  |
| Difficulty in depth perception   | Ridges – particularly in the South Island – that do not have vegetation (trees) make it difficult to assess how far away you are. The rock you can see might be 5 metres wide or the size of a house – you really can't be sure. This has probably resulted in several pilots flying too close and dying as a result. Allow more margin than you think necessary! |
| Any nagging doubts or uncertainty about what you are doing ...                                 | Get out of there – pronto!  |
| Over-confidence<br>(This includes a level of confidence higher than your level of experience.) | Every pilot must acknowledge that we are all human and we do all make mistakes. Ridge flying is very unforgiving and over-confidence has proven repeatedly to be fatal.   |



## 2 Outlandings:

**Fact:** All cross-country pilots are quite capable of landing their glider in a paddock. **Fact:** As a generalisation, there are sufficient landing spots anywhere we fly, although in some areas extra height and gliding distance might need to be maintained to reach them. **Fact:** In the last 11 years we have had 33 major outlanding accidents with 4 fatalities and 1 serious injury. Many of these were unnecessary, and were caused by pilots leaving their decision to land too late, or failing to select landing spots until too late, or pushing on hoping things would work out. Contributing factors may have been dehydration causing poor decision-making. Let's discuss some of threats around outlandings.



| Threats   | Possible Strategies   |
|---|---|
| Outlandings in themselves are a threat, since they involve landing on unseen paddocks that can usually only be assessed from the air.   | Nevertheless, it is easily possible to adequately assess paddocks, including approach obstacles, slope, surface etc. – IF this is done diligently. Unfortunately often it is not until too late, when alternatives may be few.  |
| Circuit planning for unfamiliar paddocks.   | This should be easy, IF you have practised at home base. The skill is to not use your altimeter, but assess angle to the landing strip, and do not use ground features for base turn and finals, but always make your turns by reference to the landing point. Thus you are continually practising for a paddock landing. Instructors – take this important point on board when teaching!   |
| Requirement to carry out a short landing.   | The strategy is to ensure that this is normal. Every landing you do should be the same type of approach and short landing, especially if you only fly once a month. If you are one of those pilots who always lands halfway down the airfield near the hangar or trailer, then quite frankly you are an idiot!  |
| Motor gliders – attempts to extend the motor to avoid an outlanding.  | There is a serious skill required to extend and start the motor, with all the extra drag, while also flying a circuit and approach into a paddock. You must assume that the motor will not start – and on several occasions this is indeed what happened, resulting in accidents, some fatal. You must practise this skill at home base, with engine starting and simulating failure to start. Priority is always to fly the glider first.  |
| Error in judgement, or wind shear, or sink leading to loss of height or speed.  | This is unfortunately a common outcome in outlandings for a number of reasons – late decision, lack of awareness of wind, misjudging altitude above high terrain etc. The most important strategy is maintaining flying speed at all costs. It is infinitely better to land short, or land somewhere unplanned, with safe approach speed, than to try and stretch the glide, or to try to thermal at low altitude, which has led to stall/spin accidents which are often fatal. However these can normally be avoided by making the landing decision in good time.  |
| Push-on-itis, or “must get home at all costs”. This is very common with glider pilots – it is not uncommon for a number of pilots to head off on a cross-country and not one has organised a retrieve crew. Additionally pilots often have evening commitments (family, dinner engagements) with all the pressure to get home that this provides. A resulting error from this threat is making the decision to land far too late. | Your thinking should be as follows – every time I fly cross-country I am prepared to land out. I warn my wife/husband of the possibility, arrange a crew, ensure my car is full of petrol, take warm clothing for the cooler evening drive home – and if I have an important dinner engagement, I don't go cross-country! Being mentally prepared to land out is 90% of the strategy to achieve a safe outlanding.<br>To avoid making a late decision, you must have decision heights set in your mind. As an example, you might have the following Rules: “Above 2,000 ft AGL I am always aware of general landable terrain, and I know the wind direction. Below 2,000 ft AGL I have specific landing areas in sight. Below 1,500 ft AGL I select a specific paddock and decide landing direction. At 1,000 ft I have a circuit planned, while continuing to try to search for lift. At 600 ft AGL I make the irreversible decision to land and join circuit, lower the landing gear and turn the audio vario off so I am not tempted to try to climb away.” A surprisingly powerful strategy is to say out loud, “I am now going to land.” |
| Outlanding nervousness or under-confidence, leading to stress and often poor judgement.   | Maintain flying currency and make all landings practices for paddock landing. If unsure do a quick circuit and landing before starting cross-country flight (as Ray Lynskey used to do). The less confidence or experience in outlandings, the earlier you should make the decision and commit to carrying out a safe landing.  |

## Inexperience and Instructor Responsibility:

Once again, instructors and experienced cross-country pilots must help us lift our game. They should be aware that inexperienced cross-country pilots may not recognise all threats existing on any particular day. Even if a pilot is fully trained and cleared to fly cross-country without supervision, he/she can still learn from discussions with more experienced pilots. A short helpful chat to ensure they are fully prepared, and have a plan, and are mentally prepared to land out if necessary, may save their life.

As I said previously, the main ways that new pilots can gain experience and knowledge is by instructors or experienced pilots passing on these thoughts, OR learning by making mistakes! Which method is better??!!

## Consequences of Errors:

In Part One, I said that an important part of Threat and Error Management (TEM) is to understand the consequences of possible errors, and to make doubly sure the most consequential errors do not occur. Forgetting your map on a local flight may not be important at all, but forgetting your map on a cross-country flight could lead to navigation uncertainty, infringing controlled airspace etc. Stalling while pulling up into a thermal might be slightly annoying, but stalling on base turn or while trying to thermal from very low altitude will be the last mistake you ever make.

When flying cross-country, the most common safety-related errors – that of late paddock selection and/or pushing on below a safe height to join circuit to land in a paddock, and speed



maintenance when ridge flying – have consistently proven to have serious implications including major damage, injury or death. Yet collectively we persist in committing these errors. To be blunt – why are we that dumb? I don't know ... but I suspect it's gross over-confidence, or ignorance, or denial – "It'll never happen to me."

All I can say is that if this applies to you, then YOU need to wake up and realise how illogical your attitude is. Just ask your wife/husband what they think about your attitude to survival.

A number of years ago, a top overseas competition pilot who was well-known for pushing on at low altitude, was heard to say "I'm a lucky pilot, I've damaged 13 gliders and never been hurt." That was not too long before his fatal accident.

### Summary:

Every flight involves some threats, and all pilots must ensure they recognise these and have a strategy to manage the threats and prevent errors, and/or have a process to catch errors or slips that may have occurred. Remember we ALL make some mistakes on every flight – the important thing is to ensure they are not critical ones, or that they are captured before they lead to an undesirable position.

#### What are Threats?

Any variation to our straightforward Pristine Flight is a Threat

Every Threat increases the likelihood of an Error being committed

Every Threat requires a positive strategy to manage it and prevent errors

**Useful Strategies: A reminder that the following are just a few examples of TEM strategies that should become automatic to be a skilled and safe pilot.**

#### Tem Strategies:

Use SOPs / Procedures diligently

Don't succumb to time pressure

Always fly the glider first

When fatigued be more careful and conscientious

After interruptions, say "Where was I?"

Always carry out a Situation Awareness review after a period of high workload

Set limits and stick to them – particularly with respect to landout decision making

Don't "see what you expect to see" – look for errors

Listen to "that little voice" that questions what you are doing

Take advice from other pilots, especially experienced glider pilots

### To Every Glider Pilot:

Acknowledging your vulnerability to mistakes is actually a sign of strength. In flying, you never stop learning. Every flight, whether you have 50 hours, 500 hours, or 15,000 hours, presents us with the same threats that must be recognised and managed. On every single flight you need to ask:

What are my threats today?

Am I taking unnecessary risks here?

How will I manage and mitigate the threats I identify?

**In the next article** I will continue the theme of Threat and Error Management into competition and other specialist flying – which is an area that has resulted in a major number of serious accidents.

### CWF Hamilton Trophy – Awarded to Terry Delore

This trophy is awarded to a New Zealander operating in New Zealand for the most meritorious flight that is a New Zealand gliding record.

There were 4 New Zealand records broken during the year, but the one easily judged the most meritorious was also a World Record – for a few hours at least!

Terry Delore and John Kokshoorn flew a 2,500 km three-turn-point distance record in an ASH 25 out of Omarama in December last year. The 15½ hour flight reached 28,000 ft and involved a double crossing of Cook Strait.



### Air NZ Soaring Award – Awarded to Tim Bromhead

This trophy is awarded to the pilot who has shown the most significant improvement in their personal standard of competition or record flying during the year.

Tim Bromhead is in his late twenties and is an instructor with the Piako Gliding Club. In his first Nationals he won the Sports Class, passing more seasoned rivals along the way. At his second Nationals he flew in the Standard class and placed in the top 10 in a very strong field.

He is clearly a pilot with a great future in contest flying.



### Air NZ Cross-Country Awards

These awards aim to stimulate cross-country flying from club sites and particularly encourage those new to this aspect of the sport. Flights during Championships are not eligible.

#### Sports Class

(For pilots who have not previously flown a Gold distance.)

|           |                   |               |            |
|-----------|-------------------|---------------|------------|
| 3rd place | Ash Hurdell       | Glide Omarama | 482 points |
| 2nd place | Alan Belworthy    | Tauranga      | 514 points |
| 1st place | Edouard Devenoges | Tauranga      | 818 points |

# GLIDING – THREAT AND ERROR MANAGEMENT

## – OR HOW TO REDUCE MISTAKES AND FLY SAFELY

Arthur Gatland



Arthur Gatland started flying in 1963 at age 13 and has accumulated 17,000 flying hours including 2,500 hours in RAF fighters such as Harriers, Hunters, Hawks. He is currently a Boeing 777 Captain and instructor, and for ten years was Manager of Training and

Flight Standards for Air New Zealand. He is an A Cat glider instructor, with a Gold C and 3 Diamonds, and was a previous CFI of the Auckland Gliding Club.

In the last two SoaringNZ articles, I introduced Threat and Error Management (TEM) as a simple yet powerful technique for assessing threats affecting any and every glider flight, and discussed how to use TEM in local and cross-country glider flights. Recognising threats allows pilots to predict situations where they might make errors or forget something, which increases the possibility of accidents.

As I said in the last issue, our accident rate in NZ is poor and yet none of our spate of accidents has been the result of structural or mechanical defects – all have resulted from pilots intentionally putting themselves in a situation that for various reasons has

resulted in a crash. Ridges, rocks and trees do not suddenly leap out and hit gliders – yet we manage to collide with them on a regular basis.

This series of articles apply to every glider pilot in New Zealand, regardless of experience.

In this article I will continue the theme of TEM as it applies to competition flying, which of course includes all the threats for cross-country flying, but add a few important extra threats and pressures. Remember that to assess what constitutes a threat, we use the concept of a pristine flight, and look for anything that introduces a variation to this theoretical flight. Let's look at a pristine flight in the competition context.

### **Pristine Flight (Competition):**

Recall from the last issue of SoaringNZ that a pristine flight relating to cross-country flying would be a 'straightforward' cross-country soaring flight where everything goes exactly to plan. In brief, it involves a well-prepared glider, a current and healthy pilot, and ideal soaring conditions over friendly terrain, with no time pressure. Additionally you will have chosen the task and this is likely to be based on the best conditions (predicted or observed), and you have ability to select your launch time, length of task, and the choice of shortening it if the weather deteriorates.

Of course, in competition flying there are many differences from a weekend cross-country flight, and these constitute additional threats for the competition pilot, and you need to have a strategy or plan to manage these threats. Let's review some of these:



**Ridges, rocks and trees do not suddenly leap out and hit gliders – yet we manage to collide with them on a regular basis.**

| Threats                   | Considerations  | Strategies  |
|---------------------------|---|---|
| Unfamiliar airfield       | A percentage of pilots competing in any competition will not be familiar with the airfield or local area, particularly when entering the Nationals which will be out of region for many pilots.   | Arrive at the site early, check on local rules and procedures, fly a few familiarisation flights. Get used to finding the airfield from several directions. If you can't arrive early, try to arrange a short local flight early on day 1 of the contest (in a glider, or hire a light aircraft).   |
| Time pressure (ground)    | Pre-flight: this is present every day in a contest; you simply can't afford to be late getting ready for launch. This can lead to rushed pre-flight, distraction from simple tasks, and forgetting critical items such as drink, snacks etc.  | Always allow far more time than you think you will need to allow for likely delays. It is far better to get the glider to the launch point very early, allowing time for a relaxed drink / snack before earliest launch time. Use preparation checklists to ensure you have covered everything. Delegate this to your 'crew chief' if you have one!   |
| Time pressure (in flight) | In-flight: Time is everything. The pressure to keep pushing on is ever-present, and every time you do one too many turns in a thermal, or choose a cloud which doesn't work as well as you hoped, the frustration and impatience increases.<br>Time pressure can be compounded after what is perceived as a poor result the previous day. "I only came 3rd yesterday, I have to push on even harder today (i.e. take more risks)!!" | Preparation: on your weekend cross-country flights you should give yourself realistic tasks and timed challenges for practice. You quickly learn that effective speed-flying is surprisingly relaxed, based on good decisions made by thinking ahead all the time. If the thermals are weak, relax by realising it's the same for all competitors. Try to have a Plan B – "If this thermal isn't at least 5 knots, I'll go straight to that cloud over there."  |
| Launch delay              | By the nature of competitions, you can't launch exactly when you might like. Pilots can allow themselves to get frustrated by apparent delays in launching and by their place at the back of the grid.  | In fact this should make very little difference to the task success. You must accept that (a) you have no control so accept your start time and (b) it's unlikely to penalise you and it could actually be an advantage. Relax and don't stress about it.   |
| Navigation                | Navigating over possibly unfamiliar terrain or routes that are not of your choosing add considerable pressure.  | On your weekend cross-country flights, set yourself tasks over unknown country for training. At the competition, try to arrive early so you can fly a few local familiarisation flights. Consider hiring a light aircraft for a local scenic familiarisation flight (share the cost with other pilots).   |
| Risk of landout           | This increases in competition because you will try to complete the tasks regardless of the weather, whereas in weekend flying you would probably turn around and go home. When you start a contest, you should tell yourself that you will land out 2 or 3 times during the contest – and that you will make damn sure it doesn't result in a damaged glider or worse.  | Landouts should not present significant safety risk if you obey basic safety rules. Be practiced at short landings, ensure you are always within range of good landing areas, and continually monitor wind direction and local weather effects. Never take a risk where a safe landing is jeopardised.  |
| Pressure to get home      | Landing out on a cross-country flight is always inconvenient, but in competition it means loss of points, possibly cancelling any chance of winning the contest, and could mean a long retrieve resulting in a late night and fatigue for tomorrow's task, or even missing the start time. There is an overwhelming temptation to push the boundaries to prevent landing out.   | In your mind, carefully separate 'tactical risk' from safety risk. It might be smart to ignore a weak thermal and push on to a better looking thermal – albeit getting a bit lower – as long as there are good paddocks around. However NEVER defer the decision to land out hoping another thermal will appear by magic – because it won't. If you damage the glider, you can forget any chance of winning the contest! A safe landing is always highest priority for the competition points as well as your life!   |
| Few landing areas         | Many competition flights in NZ involve flights over areas with few landing areas. It is very tempting to just say "I won't have to land out" and push on regardless. This is called DENIAL and has been the undoing of many pilots in all forms of aviation. See also "impatience" below.   | Always always always have a landing area in mind at all times. Make sure you have sufficient height to reach your designated paddock, and know your minimum height required to reach it. Do not leave the area until you have enough height to reach the next landing area. To win a competition you first have to finish the contest. If you take risks that will eventually result in damage, you will miss out on several days flying which really wrecks your points total (apart from the minor detail of risking your life, incurring repair costs and increased insurance premiums). |
| Impatience                | Competitive pilots are always aware of the need to keep pushing on. This can lead to bad decisions based on impatience. You know you need 5,000 feet to move on, and be able to reach the next safe landing area. But at 3,500 ft the lift drops from 5 knots to 3 knots – you say "I can't waste time, I've got to go now – I'm sure it'll be OK..."   | Listen to the little voice in your head that is telling you the required truth – that you are pushing your luck. Safety is paramount at all times – no exceptions. Gliding is a sport and should never be a life-or-death situation, however the evidence proves that some pilots have allowed it to become exactly that.   |
| Frustration               | Impatience always leads to increasing frustration, as things never go as well as you would like.  | You must be self-aware and recognise when you are becoming frustrated. Then make yourself be careful, be methodical, and double-check all your decisions.   |
| Weather changes           | Unexpected weather changes have caught many pilots unprepared. "I didn't expect the wind to change direction"; "Unexpectedly the lift dropped from average 8 knots to about 2 knots"; "I didn't expect that sea breeze"; "Suddenly it started raining and I was forced to land in a rough area."  | The term "unexpected weather change" is a contradiction. Nothing is more certain than the fact that the weather is constantly changing. This is a threat that you must expect to occur, and be ready. How many competition pilots have won the day because they were alert to the "unexpected" changes in the weather? Why do other pilots moan that "he was really lucky!"?  |
| Inexperience              | We all have to start somewhere! Pilots who have never flown in competitions can easily be a bit overwhelmed by the event, and excitement or adrenalin affects their thinking.   | You must ensure that your first competition flight is the same as your last cross-country flight. Fly within your abilities and don't worry what anyone else is doing. (In fact, this is what the top pilots are doing anyway!) Set realistic goals for each day.   |



| Threats          | Considerations   | Strategies   |
|------------------|--|--|
| Fatigue          | As soon as you wake up and start your daily activity, you are starting to accumulate tiredness! This fatigue is more rapid when you undergo challenges, continual decision making, stress/adrenalin, heat or cold, dehydration and hunger.   | If you ever say that you don't suffer from fatigue, you are severely mistaken. Adrenalin enables many sportsmen to operate to a high level of physical activity for a period of time, but their decision-making often suffers. Glider pilots will always experience fatigue and their decisions at the end of a competition flight are often flawed. You must make safe conservative decisions and be aware of the risks of poor decisions.  |
| Cloud flying     | Instrument flying in gliders is a challenge, and requires training and practice. Threats include disorientation, navigation problems, rain or icing on the wings, procedural / radio requirements, inability to see where to go next etc. I won a day at the Nationals once with lucky cloud climbs, but more often it's been a mistake – examples include icing on my wings which turned the Discus into a K6, or compass / navigation issues which meant I lost any likely gain etc.   | Cloud flying, like any specialist skill, requires training and practice and we don't often get the opportunity. More often than not there is no advantage anyway. I have heard pilots say they can maintain orientation in clouds without instruments – which is utter rubbish – gliders do have some natural stability but humans' eustachian canals are very easily disoriented. If you're not an expert in instrument flying don't try it in a contest!   |
| Water ballast    | Gliders handle differently when carrying water ballast, including during take off, aerotow, thermalling etc. Additionally it is another threat that needs to be handled before landing in a paddock or back at the airfield. There are weight and balance limits to observe, and with high altitude flying a risk of icing.  | Don't underestimate the threat. Brief your wing runner, brief the tow-pilot, ensure you have clearance on both sides in case of ground loop. Know your best thermalling speed. Allow extra space from other gliders when thermalling because of reduced manoeuvrability. Have a contingency plan in case the water won't jettison correctly (or does so asymmetrically). Basically, practice flying with ballast routinely before you enter a contest. Also you must observe your glider's weight and balance limitations – do you know these?   |
| Overconfidence   | It takes a strong person to make an accurate assessment of their abilities and shortcomings, and over-rating your abilities can be fatal. Typically, all pilots go through periods of overconfidence in their flying careers – typically at 100 hours total time, then 100 hours on a new aircraft type or 100 hours after getting a Commercial Licence, or 100 hours of cross-country flying etc. Competitions tempt pilots to push their personal limits, and after one successful contest day you can easily convince yourself that you are a god and can handle anything. Well ... you're not and you can't.   | "Pride comes before a fall", Proverbs 16.18, which shows how long humans have been aware of the dangers of overconfidence. Ask any pilot who has flown 10,000 hours and they will openly admit you never stop learning about flying, and you will always make errors of judgement. Anytime you read accident reports and find yourself saying "what an idiot", or "I would never do that", or "I could have coped with that" – then YOU are overconfident. Always look for your mistakes – because they are there! The important thing is to recognise the big ones!   |
| Poor preparation | Poor preparation can stem from overconfidence. ("I don't need careful preparation because my experience or natural ability will see me through".) Or it can stem from laziness, or lack of organisation or lack of time.   | In all cases, don't underestimate the dangers of lack of preparation, which can lead to errors in rigging, forgetting essential equipment, not being mentally prepared, added time pressure, and finally that little nagging voice that says, "I think I've forgotten to do something" which is a huge distraction (but it's probably correct!).   |
| Final glides     | Final glides are a huge threat due to their nature – intentionally flying lower than normal, often based on a calculated glide distance which may or not be correct, through unknown lift / sink, coupled with fatigue at the end of a long flight and hours of adrenalin. There is a common threat of crossing the finish line and having no plan on how to actually land! This is partly caused by the phenomenon of 'anti-climax' – after stress or pressure is removed, particularly after a success, the earlier continual adrenalin causes an anti-climax, and people feel very flat and suddenly tired. This shows up as pilots finish a task but actually relax and forget to think about landing safely. I have personally seen several accidents after misjudged final glides, including trying to pull up into the circuit with insufficient speed. | Firstly, practise final glides regularly (this doesn't mean a beat-up – it means practising the judgement involved with appropriate radio calls and local rules etc.) Secondly, make sure you always have a safe speed, and plan how you will land. If your plan is to pull up into a circuit, you must always have a Plan B – usually landing straight in if you don't have over 100 knots at the finish line. Frank Gatland – who was still doing safe final glides at age 85 – was a firm advocate of always landing straight in – it is safe, just as fast, and removed the extra threats and challenges of a low circuit when you are tired. If you commit to a final glide and it is looking doubtful, don't wait until 500 feet to decide you're not going to make it. Start looking for lift at say 1500 feet, and commit to a paddock landing in good time. |
| Other gliders    | Competitions involve large numbers of gliders often in close proximity. Mid-airs are invariably fatal.   | Lookout, lookout, lookout. Particularly pre-start and at turnpoints – but just as important at all times.  |
| High altitude    | In Part 2, I talked briefly about some of the threats in wave flying. These include:<br>Use of oxygen<br>Cold temperature<br>Higher wind speeds<br>Icing<br>Terrain<br>Aircraft limitations – IAS/TAS relationship<br>Turbulence<br>In competition the threats are the same but the temptation is greater to push on when you are cold, low on oxygen, or otherwise uncertain about some aspect of the flight.   | Without overstating the issues, any of these can kill if you don't understand the issues and procedures. However with correct training, preparation, and self-monitoring and self-discipline, there should be no issues with any of these. Never be complacent with wave flying. Remember the 'catch 22' that hypoxia can lead to euphoria, overconfidence and loss of self-criticism – so if you find yourself thinking everything is fantastic, check your oxygen! All glider pilots should undergo RNZAF hypoxia training – it is an invaluable experience!   |

I could go on and on – but hopefully you have picked up the themes involved here. It's all about recognising threats on any flight and managing them so that they do not lead to errors or significant risks. In other words, AWARENESS of the Threats and the right ATTITUDE for safe competition flying. As I said in Part 2 of this series, cross-country flying by its very nature has a significant number of threats, including continual possibility of landout, weather changes, unpredictable lift, different terrain with changes in height above sea level, often areas of partly unlandable country, or flat but very small paddocks, use of unfamiliar hills to find ridge lift, navigation challenges, and so on. It is actually the presence of these threats that form part of the challenge, the fun and satisfaction of cross-country flying. Competition raises this to a higher level, as you test your skills against some very skilled and experienced pilots. However you must not underestimate the risks that these challenges present. Because of often longer duration flights, dehydration and hunger are always present to some extent, and have an insidious effect on your decision-making. In the Nationals at Omarama years ago, I pushed a bit too far past the last good paddock but didn't find lift and had to turn back to the paddock, and only just made it, ground-looping and giving myself a scare. I should have made the decision to land much earlier. I actually won the day but almost damaged the glider – why? – if I had landed in the paddock first time I would still have won and not risked injury or damage, apart from the embarrassment!

### Managing Threats:

All these threats increase your likelihood of making an error. In this context we are not talking about errors in speed-flying, like not picking the strongest thermal, or incorrect speed-to-fly technique. We are discussing errors that result in reduced safety margins, or ultimately could contribute to an incident or accident. Most pilots can very easily recognise all threats if they think about it, but a superior pilot will implement a strategy to prevent an error resulting from any of these threats.

### Inexperience and Instructor Responsibility:

Once again, instructors and experienced competition pilots must help us lift our game. They should be aware that inexperienced competition pilots (and even experienced ones!) may not recognise all threats existing on any particular day. You can help these pilots by simple discussions about the task, the weather, the terrain etc. A short helpful chat to ensure he is fully prepared, and has a plan, and is mentally prepared to land out if necessary, may save his life. It will actually help you to think about the Threats and focus your own mind on safety.

As I said previously, the main ways that new pilots can gain experience and knowledge is by instructors or experienced pilots passing on these thoughts, OR letting them learn by making mistakes! Which method is better??!!

### Consequences of Errors:

When competition flying, the most common and most serious safety-related errors – that of late paddock selection and speed

maintenance when ridge flying – have consistently proven to have serious implications including major damage, injury or death. Yet collectively we persist in committing these errors. To be blunt – why are we that dumb? I don't know ... but I suspect it's gross over-confidence, or ignorance, or denial – "it'll never happen to me."

All I can say is that if this applies to you, then YOU need to wake up and realise how illogical your attitude is. Just ask your wife/husband what they think about your attitude to survival...

### Summary For All Glider Flying:

Every glider flight, whether local, cross-country or competition, involves some threats, and all pilots must ensure they recognise these and have a strategy to manage the threats and prevent errors, and/or have a process to catch errors or slips that may have occurred. Remember we ALL make some mistakes on every flight – the important thing is to ensure they are not critical ones, or that they are captured before they lead to an undesirable position.

#### What Are Threats?

- Any variation to our straightforward pristine flight is a threat
- Every threat increases the likelihood of an error being committed
- Every threat requires a positive strategy to manage it and prevent errors

#### Useful Strategies:

A reminder that the following are just a few examples of TEM strategies that should become automatic to be a skilled and safe pilot.

#### TEM Strategies:

- Use SOPs / Procedures diligently
- Don't succumb to time pressure
- Always fly the glider first
- When fatigued be more careful and conscientious
- After interruptions, say "Where was I?"
- It is important to carry out a Situation Awareness review after a period of high workload
- Don't 'see what you expect to see' – look for errors
- Listen to 'that little voice' that questions what you are doing
- Take advice from other pilots, especially experienced glider pilots
- Check your ATTITUDE – safety above all else – it is after all a sport and should never become a life-or-death situation.

### To Every Glider Pilot:

Acknowledging your vulnerability to mistakes is actually a sign of strength. In flying, you never stop learning. Every flight, whether you have 50 hours, 500 hours, or 15,000 hours, presents you with the same threats that must be recognised and managed. On every single flight you need to ask:

- > What are my threats today?
- > How will I manage and mitigate these?

**Have fun out there – but be safe!**