

GLIDING – THREAT AND ERROR MANAGEMENT

– OR HOW TO REDUCE MISTAKES AND FLY SAFELY

Arthur Gatland



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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: Glider – careful rig, DI/duplicate check, batteries charged, clean canopy, clean wings, no dirt/grass in cockpit, etc. Personal – rested, healthy, fed and watered, correct clothing, sun protection, warm clothing if required, take drink/snacks. Flying readiness – current on type, current on short landings, BFR current, complete routine skills training, appropriate confidence in ability for the elected task. 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 (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. 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