

GLIDING – THREAT AND ERROR MANAGEMENT

– OR HOW TO REDUCE MISTAKES AND FLY SAFELY

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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:



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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. 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-air 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: Use of oxygen Cold temperature Higher wind speeds Icing Terrain Aircraft limitations – IAS/TAS relationship Turbulence 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, over-confidence 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!