The Gliding Federation of Australia Inc

(ABN 82 433 264 489)

Competition Safety Briefing Pack

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FOREWORD

This document has been prepared by The Gliding Federation of Australia Inc (GFA) as an aid to all pilots, but particularly those involved in cross country or competition flight. It is anticipated that in future additional items will be included in the Pack.

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GLIDING AND VISION

By David Wilson

Introduction

Avoidance of mid-air collisions in our sport is primarily dependent on pilots using their eyes to see and avoid. The eyes are our most important safety asset, and we owe a duty of responsibility to all other users of the air space to make sure that we can use our eyes as effectively as possible.

This article describes some of the important features of the human eye and makes recommendations about what you – as a pilot – should be doing.

The key recommendations are:-

- Get your eyes tested, and get glasses if your eyes do not focus on infinity when at rest
- Practice a scanning technique which recognises that you only see detail while the eye is directed at a stationary point, and then only in a very small arc of the sky.
- practice making a mental 3D image of the sky around you, and where all the other objects you see will be next time you look for them
- Sunglasses should not have a dark tint.

Understanding the Eye

Only a small spot about 1.5 mm diameter on the back of your retina is capable of high resolution, i.e. seeing the fine detail in distant objects. In this area, the light receptors are packed very tightly, with each one connected to the brain by a separate nerve fibre. Provided the eye is focused, this area can spot a glider at a distance of about 8 km. However the fovea must be pointed towards the glider and the field of detailed vision is only about 5 degrees wide.

If you watch someone's eyes while they are reading a book, you will see that the eyes make small jumps from left to right. At each momentary pause, the brain takes in a few words, and then the eye jumps across to another point for a momentary pause while the brain reads the next few words. This is because the fovea is not big enough to absorb an entire line while looking at only one point. Our scanning technique when looking for obstacles in the sky needs to adopt a similar technique, for reasons explained below.

The remainder of the back of your eyeball has light receptors spaced further apart, and with several adjacent receptors connected together to one nerve fibre, particularly out in the peripheral vision area. This part of the field of view cannot see the fine detail, and in general sees only in black and white. However, the brain image processing system is programmed to pick up any movement in that area, and we can then move our eyes so that the fovea points to the region where the movement was detected.

Each eye has a rather large blind spot because there are no light receptors in the area where the optic nerve joins the eyeball. For the right eye, the blind spot is about 15 degrees to the right of the straight ahead point, and for the left eye it is left of the straight ahead point.

Auto Exposure

The eye has a diaphragm at the front called the iris, which can adjust the size of the aperture (pupil) so that the amount of light getting to the retina is optimised. This happens automatically, with the pupil adjusting from about 2 mm in very bright light to about 8 mm in its fully opened state.

The size of the pupil has an important side effect for focusing. When there is a small aperture such as happens when the light is very bright, the "depth of field" or the range of distance within which focus is acceptable increases. You get much sharper images in bright light than you do when the light is dull and the pupil opens. Furthermore, any defects in the lens such as astigmatism will be less significant

when the pupil is small. (Astigmatism means that the lens of the eye has a different focal length in the vertical plane compared to the horizontal plane or sometimes at an angle)

The Brain as an Image Processor

What we perceive when we lookout is not what the eyes see. The information from our eyes is processed by a powerful computer with an image processing program far more powerful than the best programs owned by the CIA for looking a spy photographs. The brain:-

- integrates the images received from each eye into one perceived image
- if it gets only information from one eye, fills in detail in the blind spots based on the most likely features from what it can see
- adds colour to the peripheral field so that images are not perceived as black and white
- does the best it can to sharpen the images where images are blurred
- sends information to the iris to adjust the aperture.
- sends information back to the eyes auto focusing mechanism to adjust the focus if the image appears blurred.
- detects movement in the field of vision where something is changing relative to the background.
- directs both eyes to point their fovea at the same object

The image processing system uses an enormous amount of computing power, and we must be aware that the image processing operates only while the eye(s) are stationary looking at an object. While the eye moves, the processing is turned off.

This implies that our scanning technique must allow pauses so that the information being collected can be processed. During a scan, you can probably allow for each pause to take about a quarter of a second, and each pause will see the detail over about 5 degrees of arc.

While it is carrying out all these image processing tasks, the brain is also doing many other things. One important one which needs practice is to develop a mental 3D picture of the sky around you, with plotted positions of where all the other objects you saw in the last few scans are, and which way they are moving. If you cannot see an object on this scan which was there last time, then that object might be moving straight towards you, so that movement relative to the background is not detected. Look particularly hard to find that object!

The Auto Focus

Muscles within the eyeball can change the shape of the lens. When these muscles are relaxed, the lens will focus on more distant objects (but see below about long and short sightedness). Tensing the muscles allows focus on closer things. (After the age of around 50 years, the lens becomes stiff, so that ability to adjust the focal length is reduced. This is called presbyopia and should not be confused with long sightedness)

The brain sends signals to these focusing muscles based on the sharpness of the edges of objects in the foveal section of the field of vision. The muscles are adjusted to achieve the sharpest image possible for the thing we want to look at.

While we are on the ground, and looking at features on the ground there will always be objects within the field of vision for the brain to detect and for the autofocus mechanism to operate. However if we look at something without any features, such as a blank wall or the blue sky, there is nothing in the picture to use. In these circumstances, the muscles of the eye relax, and the lens of the eye assumes it's at rest focus position. Relaxation occurs within a fraction of a second. For pilots dependent on seeing obstacles in the sky, it is essential that the eye remains in focus for long distance when it is at rest.

Long and Short Sightedness

Nature being variable as it is, the at rest focal length of the population varies, from very short-sighted (myopic) persons at one extreme, where the image is in front of the retina, to extreme long-sightedness (hyperopia), where to image forms behind the retina. Only about 10% of the population have the desirable condition that the image forms focused on the retina when the focusing muscles are relaxed.

Those who are short-sighted cannot make their eyes focus on the distance, since the muscles of the eye can only move the image further away from the retina. The more severe short-sighted will probably have already been to an optometrist, and will have corrective glasses.

There are however many persons with mild myopia who are quite unaware that their distance vision is not as good as it should be. They cope quite well with normal tasks such as driving a car, and believe that their vision is normal.

Those who are hyperopic can use the eye muscles to bring distant objects into focus, so that it is only those with extreme hyperopia that need glasses to perform normal living tasks (As they get older and lose the ability to focus their eyes, they will need glasses for reading. They too will often not be aware that their distance vision has deteriorated and that glasses could improve their vision dramatically). Persons of any age with hyperopia who look at a blue sky with gliders or aeroplanes in it will not see the obstacles until they are quite close (perhaps only 1 km away) because the at rest eye image is too blurred for the autofocus mechanism to work.

In summary, about 10% of us do not need any glasses for flying, about 20% of us are so short-sighted that we already have glasses, and the rest of us think our eyes are normal and do not realise how much more we could see with appropriate glasses.

The message is clear. Go to an optometrist or ophthalmologist, tell them you are a pilot and that distance vision is critical to your safety, and then ask them to test your eyes. Get glasses unless your at rest eyes focus on infinity.

When you have glasses, keep them clean. Any smears of sunscreen on the lens can cause the autofocus mechanism to try to focus on the smears, making the distant vision blurred. And remember, you must carry a spare pair of glasses in the glider.

Sunglasses

There are numerous reasons why pilots should wear sunglasses when flying. These include:-

- Protection from ultra-violet light damage. UV is a cause of cataracts.
- By filtering out some of the diffused blue light, while allowing the longer wavelength reds and oranges through, distance vision is enhanced
- Polarized sunglasses eliminate a lot of glare, because the diffused light coming from the sky is polarized. This again improves the ability to see distant objects

However we must recognise that cutting down the amount of light entering the eye degrades our distance vision. Polarized glasses cut out 50% of the light, and if the glasses have a dark tint, they may cut the light by a further 50% or even more. If only one quarter as much light reaches the eye, the automatic exposure mechanism doubles the pupil size to let more light in. This reduces the depth of focus, making it much more critical that the eye has at rest focus on infinity. It also increases the degrading effects of astigmatism.

Sunglasses are therefore a compromise, and the main recommendation is that you should try to get ones that are not tinted dark. A reddish or orange tint is fine, but only to filter out the blue end of the spectrum, not to make the lens dark.

Prescription sunglasses are highly recommended rather than clip-ons or over-glasses, since the more layers you have in front of the eyes, the more likelihood of dust or smears.

LOOKOUT FOR GLIDER PILOTS

The following will be familiar to most. It is the application that needs improving. This should be an invariable habit for all.

Recommended Procedures

Be conscious of your Lookout responsibility 100% of the time.

Set up your cockpit to maximise your time outside the cockpit. Instrument layout, GPS operation, map handling and etc. should be set up to allow maximum time outside.

HINT! - Put a sticker next to your main vario which says – "LOOKOUT".

1. Use a scan technique appropriate to what you are doing. Good situation awareness is essential.

   CRUISING SCAN – Straight glides.

   FULL SCAN – Cruise scan plus appropriate priority to the flight situation, e.g. in circuit or when establishing climb in lift.

   TARGETED SCAN – Cruise scan plus targeted priority to the flight manoeuvre before initiating e.g. Pull-up into thermal.

2. Look in particular for turning gliders indicating a gaggle thermalling ahead.
3. Slow down before entering an identified area of lift especially if it already contains gliders.
4. When thermalling at turnpoints and in the circuit, experience will readily dictate where to look for potentially conflicting gliders so here particularly use a priority scan.
5. In particular when pulling into a turn, remember that you have changed the situation significantly so you need to take primary responsibility for remaining clear of other gliders. Particularly scan back along the tack direction when entering a thermal looking for expected and unexpected gliders on that same track.
6. Because gliders around us will sometimes be easy to see and other times will disappear as we look, it is necessary to make a conscious effort to maintain situation awareness – i.e. keep track of the gliders around you and what they are doing.
7. Remember modern gliders in particular have high energy. Speeds are higher than before. Height gain in pull-ups is significant, and rapid.
8. Hazards are greater on cross-country cruise/racing. Stay alert.
9. Increased stress at contest start points, getting low on track, approaching a turn point, navigation checks and etc. force pilots back into the cockpit. Be particularly aware of this and force yourself to lookout!

Physiological Effects

Finally be aware of and allow for the effects age, fatigue, low blood sugar, dehydration and mild anoxia. If you have any of these be sure to concentrate more than ever on technique.

Lookout Processes

1. Process of Lookout

The table below shows the visual target size and time available to avoid a conflict at various target distances. The visual target size is defined as the apparent wingspan of a 15 m glider subtended at 1 metre (i.e. arm's length) at the chosen range.

Actual distance to glider	Apparent 'Arms Length' Target Size	Time to collision at closing speed		
		50 kts	100 kts	200 kts
100 m	30 cm	4 sec	2 sec	1 sec
500 m	6.0 cm	20 sec	10 sec	5 sec
1000 m	3.0 cm	40 sec	20 sec	10 sec
1500 m	1.5 cm	60 sec	30 sec	15 sec

- Image size of a glider (at arm's length as above) at initial detection is rarely much smaller than 1 cm so normal first detection range is about 1500 m. This means that, even at 50 knots, proceeding longer than 60 seconds without a visual scan is equivalent to flying blind!
- Clearly, the high closing speed and small target area of head-to-head conflicts make such conflicts more difficult to see than other conflicts.
- Analysis of glider collisions tells us that one glider would have had a clear view of the other.
- The picture we 'see' in our brain is not updated by any automatic process. It is all too easy to 'look' without 'seeing'. In order to 'see' the small target provided by another aircraft we need to make a conscious effort to 'see' when we look 100% of the time.
- Focus on the horizon and notice some detail.
- Examine each section of the sky with the eye focused on infinity and stationary for a short period of time before moving to the next segment. A moving eye will not see any detail.

2. Priority of Lookout

- Consciously retain good situation awareness by being aware of the likely traffic patterns and any known aircraft in your vicinity. Target the scan to the areas of potential hazard. "Think of the possible even if unlikely."
- Where the traffic pattern is random (lone cross-country or in the terminal area, i.e. local soaring) concentrate the scan on straight ahead and then to about 60º to each side. When flying fast, concentrate more on straight ahead; when flying slower expand the area of concentration. Regularly, but less frequently, do a full scan to the side and as far back as possible, especially where slowing, weaving or to achieve situation awareness when (say) heading off from the top of a thermal or approaching the airfield. However, the highest risk of collision is glider-to-glider, cross-country flying.
- The terminal area (within, say, 5 miles) at a crowded site is a high traffic area with random traffic. This is particularly dangerous airspace and lookout needs to be excellent. High speeds in this area are not appropriate. Flying pre start in a competition is a particularly hazardous situation of this type.
- Gliders on a reciprocal heading are very difficult to see. Avoid such circumstances and where this is not possible take special care. Examples are; in obvious streets and to from an obvious thermal close to a turn point.
- When gliding in a group or on a set task, much of the traffic will be on a similar heading. Head-to-tail conflicts are easily avoided – however this traffic provides an ongoing hazard from gliders doing a pull-up, weaving turning or backtracking.
- Do not fly in another aircraft's blind spot; for example, do not follow another directly astern and higher. A glider doing a pull-up can be in a double blind situation – there is no obvious fix for this so prevention is the only defence.
- When weaving or entering make sure the lookout goes as far back as you can see. The responsibility for clearing the air remains with the turning glider for at least the first full turn. Subsequently the responsibility may be shared with other aircraft. Look over your head to see traffic conflicting with your turn particularly back along the mutual track. If necessary, roll level

to allow the conflicting glider to pass in front before re-entering the turn. Following gliders, particular if higher than the leading glider, must be aware of the likelihood of a turn associated with a pull-up and be ready to take appropriate action.

- Be particularly careful when back-tracking (in lift) as this creates a head-to-head conflict.
- Potentially dangerous situations are those where a following glider is a few hundred feet above the leading glider.
- Other areas of potential conflict are obvious traffic patterns, such as at turn points, when final gliding, when approaching the terminal area, and in the circuit. Be aware of these and scan accordingly.

Lookout Scan

This paper defines the different **SCAN** techniques recommended for use by glider pilots and indicates **WHEN** to use each technique and **WHAT** to do.

Name of Scan	Process
Cruising Scan:	Forward conical scan; 60 degree, left/right. Up and down.
Full Scan:	Complete visible sky scan. Each side, above and below, behind each side round to as far back as possible. Vital for situation awareness.
Targeted Scan:	Used in specific circumstances. Scan concentrates on that part of the sky where the hazard is expected.

When to Use Each Technique

Flight Activity	Scan Required
Cruising: **Constant Heading and Constant attitude.**	CRUISING SCAN plus regular FULL SCAN
Change Situation: **E.g. Approach gaggle, approach aerodrome, final glide, etc.**	Ongoing CRUISING SCAN plus regular FULL SCAN plus TARGETED SCAN specific to the situation.
Flight Manoeuvre: **E.g. Pull up, turn etc.**	Ongoing CRUISING SCAN plus regular FULL SCAN plus TARGETED SCAN specific to the situation.
Joining a Thermal:	TARGETED SCAN then FULL SCAN to search for other gliders, then TARGETED SCAN with periodic FULL SCAN to maintain situational awareness.

NOTE: The frequency of use of FULL SCAN and TARGETED SCAN in each Situation or Manoeuvre will be adjusted by your SITUATION AWARENESS.

Specific Examples

Flight Situation	Specific Requirement
Start point:	Full scan. Up/down. Left/right
Turn point:	Full scan. Up/down, Left/right. Check opposing, crossing tracks. Into and exit from Turn Point.
Approach airfield:	Full scan. Radio alert. Check crossing tracks. Approaches and Departures.
Final glide:	Full scan. Radio alert. Watch for finishing gliders. Circuit traffic.
Circuit:	Targeted scan. Radio alert. Watch for power aircraft. Watch for modified circuits.
Receive nearby radio Call:	Full Scan. Target traffic location.

Flight Manoeuvre	Specific Requirement
Veering:	Prior to veer, scan in direction of veer including behind and up. NB. This is more than clearing the airspace you are about to enter.
Turning:	Prior to turn - scan in direction of turn, behind and up and down. Continue to look through turn. Look for following gliders.
Pull up:	Prior to pull up, look each side, and behind each side and overhead as high as possible
Approach thermal:	Full scan above and below. Look for thermalling gliders and approaching gliders. Look for opposing gliders leaving or traversing the thermal.
Thermalling:	Maintain horizontal and vertical separation. Look for gliders joining.
Leaving thermal:	Full scan. Look down. Commence cruising scan plus full scan process.

JOINING THERMALS

Bruce Taylor

There are four important matters to consider when joining a thermal already occupied by one or more gliders, and every single one must receive your full attention.

1. You must have in sight all of the gliders that are in the thermal
2. All the gliders in the thermal must be able to see you
3. You must plan your method of arrival and entry to the thermal
4. All the gliders in the thermal must understand your plan

Sighting Gliders

Sighting gliders circling is not easy, and a variety of backgrounds and conditions can conspire to make it even more difficult. Gliders are like kangaroos on the road; where there is one, there will be more, and it is the one you don't see that will do the damage. After you decide that you have them all sighted, then start searching for the one(s) you haven't seen - don't get a fixation on the ones already in view. Keep your scan going over the entire width and depth of the thermal, as one aircraft in a particular stage of the turn may be impossible to see at first glance.

You must also keep in mind that there could be gliders close to you heading for the same thermal. Aim to keep your search going all around, especially above as you will usually be slowing down and gaining altitude as you approach the lift area. THIS IS NOT A TIME TO BE LOOKING AT YOUR VARIO – ALL EYES OUTSIDE!

Remaining Visible

A glider approaching a gaggle at high speed in a straight line will be next to invisible. The frontal area is very small, and we need to increase this and ensure some horizontal movement so that those gliders already established have some chance of seeing us coming. If we are making our own decisions we will want to sample the air as we approach the lift anyway, as it will be best to have an image of the thermal in our own mind. This will lead to some gentle weaving and "feeling" of the air that will make your glider more visible to those ahead. If not, you should attempt to avoid a direct head-on arrival. You should arrive at only a little above thermalling speed, and with consideration of all the established glider's positions so that they have a good chance to see you.

Arrival and Entry

A good concept of spatial awareness is vital in the arrival phase. While still well back from the thermal you need to have a good idea of where you will arrive in amongst the gaggle, in relation to all the gliders. There will need to be a space for you to fit into (!) and if not, you will start a gentle turn outside that of the gaggle until they have rotated further and you can see room to move in. DON'T PUSH!

Please, do not arrive at the gaggle at full cruising speed and attempt to pull up amongst them – this is extremely dangerous, as you will have considerable vertical velocity to judge as well as your horizontal position. It will also inevitably mean you are out of sight of one or more gliders, and they are out of sight to you at some stage. If you do this a couple of times someone will punch you in the nose, which will be a very good thing…

Be predictable

As above, you must always manoeuvre in a safe and predictable fashion. Try not to surprise the other pilots with any of your antics. As you fly at higher levels of competition, it is likely that you will have gliders flying at lesser separation, but the pilots generally behave more predictably. If the pilots of the gaggle see you approaching at a sensible speed and behaving as if you are having a good look out the front and working to fit in comfortably, they will be far more receptive and will often open out their turn a little to let you in more easily. Roll into the thermal smoothly and positively, and likewise when leaving keep all the changes of direction predictable.

Keep a good lookout as you leave the climb, especially below as you accelerate. Above all, be careful and courteous.

A note on Open Class Manoeuvrability

Open Class gliders are big, usually 25 metres or more in span, and heavy, often flying somewhere around 800 kg. This means that they have much inertia. They are slow to roll, and take some time to change speed. Their control response is worst at low speed, as when thermalling, and some account of this needs to be taken by other pilots when sharing airspace.

Give these gliders a little more room when you are near them. They will thermal at about the same speed as any heavily ballasted glider, around 55 to 60 knots. Try not to surprise them by doing something unexpected in a thermal, forcing any rapid evasive action. Generally they will not cause you too much trouble; because of their slow and graceful movements you will find their changes of direction quite easy to anticipate, and it is unlikely that they will manoeuvre into a position faster than you can manoeuvre out of it.

CONTEST AIRFIELD ARRIVAL AND LANDING

David Pietsch.

Introduction

The purpose of this document is encourage pilot thinking about (and preparation for) contest finishes, to remind/refresh the seasoned veterans and to perhaps educate the newcomers. This document is not exhaustive and tries not to be too prescriptive but aims to provide guidance and focus thoughts on issues and areas that need attention during this important part of a contest flight.

Final Glide Planning and Decision Making.

As your final glide progresses your available excess energy levels will vary in response to airmass movements, the traffic situation will develop, the airfield conditions might change, available landing areas might become crowded, etc… Accordingly, even though you may have planned on a particular arrival profile, do not be wedded to it. Continually consider the 'what ifs' and remain flexible in your thinking. You might be tired, elated/disappointed with your performance, have been expending a lot of nervous energy on a difficult final glide, be inexperienced etc, any of which might suck you into tunnel thinking, or one track mind syndrome. Guard against this by having practiced final glides in the recent past and paid attention to hydration, nutrition, urination so that your brain and its decision making is at its best.

Predictability.

One of the tenets of multi-aircraft operations in close proximity is that of predictability. The more predictable we all are, the easier it is to keep track of the participants and the more spare capacity that we have to look for and accommodate those who for reasons of (generally) low energy states might need special priority. This is not the time to be different or creative – just for the sake of it. We all need to be team players here.

Top of Final Glide

At a certain point in a contest flight sufficient height will be in hand from which a straight glide to the finish is possible. Depending on the day this glide might be quite short or could last for up to 30 minutes or so.

Bearing in mind that the end of the flight will be a high workload environment, about 20 – 30 minutes out, typically around the top of the final climb - it might be wise for the pilot to have a quick snack which has a reasonable glucose release for 'brain food' such as an apple, dried fruit or a breakfast bar, plus having another drink of water. Attending to urination is also a good idea. If you have been in the cool at higher altitudes it is good idea to drink regularly as you warm up in the descent.

Being in the good cerebral shape as you approach the airfield is important and may save you from embarrassment – or worse.

Visual Lookout - Control Points

Where practical, task setters will set the final leg to facilitate straight-in approaches. To achieve this, sometimes control points at around 10-20 km to run are established. Take particular care when

approaching and turning in these control points. Most gliders are at similar heights at this point, travelling and turning at speed. Maintain an exceptional visual lookout, listen to the radio for clues to the position of gliders in your vicinity and maintain awareness of the Flarm audio and visual display which may alert you to someone that you have missed.

There are potentially two types of control points – turnpoints, and assigned areas of small radius. (Current guidance suggests that control points should be a turnpoint of 2km radius. In the case of an AST, most pilots will be aiming for the shortest distance to the finish, by just touching the circle at what will likely be a pretty common point.)

Control Point – Turnpoint. Nearing this turn, aircraft will be converging towards a common point, likely from a range of directions. The primary threat initially can be lateral, so ensure that you are looking each side for converging traffic. As you get nearer the turn, the threats will converge and can end up immediately above or below, having the dangerous capacity to be in blind spots and sometimes mutual blind spots. Pay particular attention above and below as you are about to turn. Rolling your aircraft to improve lookout below is recommended. Looking outside the direction of turn, for someone who might be slightly ahead but blind turning into you, is also recommended.

Before commencing your own turn have a good look inside your turn, below and above, to minimize risk of turning into someone on the inside of your turn. As you turn, keep looking for the glider inside and initially behind you in the blind spot. Control points which are turnpoints will tend to align all finishing aircraft to single file following the turn.

Control Point – Assigned area. If the control point is a small assigned area then, as pilots fine tune their arrival times, turns can occur anywhere in the circle and high crossing angles and speeds can result. Here the threats are more random, but traffic is not concentrated at a particular point. Again maximum vigilance and exceptional lookout and situational awareness is necessary to minimize risk level. Departing this type of control point finishers can be spread laterally, so keep a good lookout to each side for gliders converging towards the finish.

Final Glide 'Tunnel Vision' or 'Target Fixation'.

These are terms for the circumstance where pilots become very engaged in their final glide to the detriment of maintaining awareness of their surroundings. Causes likely include:

a) Inadequate hydration and nutrition. (Already discussed, the importance of which should not be underestimated.)
b) Excessive concentration on watching the airfield to see how the glide is progressing. (The airfield should not be the focus of your attention – it isn't going to move! If the final glide is going to be "tight" your attention should be on flight path optimisation which will involve getting you head out of the cockpit, thinking about the optimum flight path and looking for other aircraft in, say, better air.)
c) Allowing oneself to tense up pressing hard on the rudder pedals and gripping the stick ferociously. (Consciously relax by taking a few deep breaths and exhaling deeply. Where your final glide is looking "tight" pre-contest knowledge of safe outlanding fields will do wonders for your peace of mind and reducing tension.)
d) Being incorrectly trimmed. (If the aircraft needs constant attention to maintain flight path your capacity for lookout is severely inhibited. The aircraft should be trimmed so that you can spend significant periods looking out, over your shoulder etc., knowing that the flight path will remain steady.)

Visual Lookout - Final Glide

Gliders ahead can be very difficult to spot during final glide, particularly if the final glide is into the west (up sun). Inside about 15 km flight paths start to get quite close. It can come as quite a surprise how close you can be to another on final glide before visual contact is made. Of particular concern is the glider below the nose of the following glider (double – blind). It is not a bad idea to make an occasional small clearing-turn to clear below the nose. Also these small clearing turns might alert following traffic to your presence as your wings flash or you create movement across following pilot's line of sight.

Three aids will help you to gain visual contact with aircraft in your immediate vicinity. FLARM, radio and water ballast.

FLARM. FLARM is not infallible but is a good aid so use it to cue you for aircraft that you might not have seen. Be particularly vigilant for aircraft directly ahead and below.

Radio. When entering the CTAF upon your return, make your call as close to 10NM as practical. Importantly, **DO NOT** give distance in kilometres. Often due to radio traffic you will not be able to make the call at precisely 10NM, so make your call when the airwaves are clear. This allows for nearby pilots to gain an appreciation of your relative position. Be ready to announce your height is queried by a nearby aircraft. This distance should be from the aerodrome reference point (usually the centre of the finish circle), so make sure that your navigation system is providing this value.

You may also be required to make a call approaching a control point. The above principle still applies.

Water ballast. Dumping water ballast is an excellent visual cue for following pilots, particularly in the up-sun case. Keep in mind the value of dumping water to assist in visual acquisition.

Energy Management on Final Glide

Most competitors use navigation systems which provide good theoretical final glide calculations for energy management. Know how your system works, and know how to insert and monitor the parameters. At long range, the navigation computer is an exceptional aid and, with careful monitoring of your progress taking any appropriate remedial action, long final glides can be completed with confidence. Eventually, at some point during the final glide the computed figures become of little use and the visual picture over the nose becomes the prime guide. The transition from instrument to visual judgment is generally quite instinctive and occurs further out with a higher energy final glide with a corresponding higher ring setting.

Finishing - from about 10km.

At 10 km out, you should already be using visual judgment for your finish. This is generally (though not always) a good time to have made your mind up between straight-in vs. circuit arrival. Wind conditions permitting, the straight-in approach is the preferred approach for a contest finish.

Finish circle

By the time that you are approaching the finish circle you will have decided on your approach. Since the finish circle is normally approaching the airfield boundary, crossing the finish line should be almost incidental to your thinking. At this stage your attention should be directed towards making a safe arrival. The finish circle is simply the point to which you are scored. Do not allow yourself to be seduced into concentrating on reaching the finish circle to the detriment of your safe arrival.

Straight-in Approach

If you have decided on a straight-in approach maintain flexibility for last minute hiccups by maintaining a reserve of energy until you must expend it in order to make a safe landing. You need to be able to approach the airfield boundary with the requisite energy level to be able to land short by using air brakes or be able to land well in to the airfield to allow for people to land behind you. You may have to land over gliders on the ground at midfield. You will need a safe energy level if you are forced into this, so that you pass well clear and are not initiating the flare as you pass overhead.

Managing energy. On a straight-in approach, a simple energy management technique that works well is to aim at the centre of the airfield and observe your speed. If it is stable, then if you do nothing you will fly onto the ground at that point. If the speed is increasing then you have excess energy and if it is decreasing, then you are low on energy and it would be very wise to immediately slow down to, if necessary, best glide speed for the conditions to preserve what energy you have. Sinking and rising air will affect the instantaneous appreciation of energy, but monitoring your progress over time will give you the idea.

Straight-in approach with excess energy. This is the case we all hope for, where we have enough energy to allow for unwanted patches of sink but not too much that it was wasted climbing time. Whilst this appears to be an easy case, it can turn hazardous if too much energy is retained in close to the airfield boundary. You must arrive at the airfield boundary as previously described. If by aiming at the airfield, airspeed increases, then you need to burn off any excess energy. If so, aim at a point about 1-2km or so short of the airfield, which will be around about, or just short of, the finish circle, then monitor your airspeed. If airspeed remains within placard limits then maintain your descent path until near the surface, say 150 ft or so, then raise your nose gently to fly towards the airfield boundary, bleeding off speed, using airbrakes as necessary to control arrival energy. If descent path has become steep and airspeed threatens to become excessive, you may need to deploy a small amount of airbrake (maybe

10-20mm protruding above the wing surface*) to stop speed increasing but maintain your descent towards the aim point short of the airfield, modulating your airbrakes as necessary to retain the appropriate energy level.

Be very careful when opening airbrakes on final glide. You may need to gently slow down, by flying level for a while before deploying the brakes (we don't need sudden flight path changes that will startle nearby pilots!). Never suddenly pull out a large amount of airbrake at high speeds unless you have practiced it before. There can be quite a sudden flight path change with the result that the pilot can be slammed hard into the canopy. Depending upon aircraft type, simply unlock the brakes and brace your arm, holding them from sucking open suddenly. Then very carefully open the brakes slightly until you feel the initial bit of drag (noise) and then modulate very carefully. You must practice this in your aircraft at altitude at progressively higher speeds prior to attempting this on any final glide. All types will be different in their characteristics. This way you can determine what is sensible and what you can do safely during the final glide.

Straight-in approach with optimum energy. If by aiming at the centre of the airfield the airspeed remains around your inter-thermal speed for the rate of climb in your last thermal – you are doing very well, but you may have little reserve. Using the same techniques as per previous paragraph still works, but pay particular attention to maintaining adequate energy to be able to land at the far end of the runway.

Straight-in approach with minimum energy. This is a potentially dangerous situation. If you are aware that you are on a low energy final glide, the first thing is to do is to tell oneself that an outlanding is possible and prepare for the possibility. Here pre-contest preparation is critical.

Knowledge of safe outlanding paddocks near the airfield will do wonders for your peace of mind and will allow a safe, if disappointing, end to the day. Landing 3km short in the last suitable field sure beats decapitation on the airfield boundary fence. When on a low energy final glide, pilots should fly at optimum range speed which is best L/D speed adjusted for sink/lift plus 1/3rd of any headwind component. From a visual perspective, expect any headwind to have, what feels like, a disproportionate effect on glide performance. Avoid the temptation to raise the nose in an attempt to improve the glide. Maintain the optimum speed all the way to the airfield, all the time making judgments with respect to calling it quits in order to make a safe outlanding. If the last few kilometers before the airfield are unlandable, then … "when in doubt - land out".

You may have heard other pilots talking about using ground effect to get home. Do not consider this. Unless flown to a very specific pre-determined flight profile you will actually achieve a range reduction. Make the decision early and land out rather than risk decapitation on the boundary fence.

On low energy final glides, you will have very little landing flexibility, so it would be wise to broadcast your situation and intentions very clearly so that those with more energy can be aware of your situation and make allowances for you to land.

Circuit

Whilst the straight-in approach is the preferred arrival, there will be times when due to surface wind conditions, excessive energy or runway congestion a circuit will be necessary. Prior to the contest, organizers will generally have provided preferred circuit procedures for each runway, so it would be smart to study these procedures and carry an aide-memoir in the cockpit.

To conduct a circuit you should aim to arrive at the airfield with the correct energy level to fit in with the circuit pattern. Too low on energy and you will be below other traffic and possibly have to turn inside of them. Too high on energy level and you may end up with preceding traffic in the blind spot under your nose. Here the navigation computer can sometimes be pretty useful for giving an early indication of likely airfield arrival height, but as usual as you approach the airfield it will be the visual estimation that is the key.

For planning purposes this may be of use: With say a 2.5km finish circle and landing on the reciprocal of your final leg expect a 4-500ft altitude loss between crossing the circle and rolling out on finals. In this case, crossing the finish circle at around 700ft at circuit speed and then flying a typical circuit, with allowances for other circuit traffic, will have you rolling out on finals at about 2-300ft. This is probably the minimum that you should be aiming for.

Climbs into the circuit. Long curving climbs into the circuit from a high speed finish, streaming water ballast, look glorious from outside and feel good from inside the cockpit. They have a time and a place and must be conducted sensibly and competently if risks are to be kept low. (Some local contest rules may preclude this type of finish.)

Taking the earlier example, if we were to cross the finish line at 200ft and wished to climb to 600ft (gain 400ft) then we would need to start the climb up from 200ft at not less than 120kts.

(This table might be useful.)

Approximate altitude gained when flown smoothly and positively, and levelling at 60 knots.

Climb from:	**Height gained still air (best case)**
80 knots	100 ft
100 knots	250 ft
120 knots	400 ft
140 knots	600 ft

(Glider requires excellent performance at the speed of initiating the climb if these heights are to be approached)

It is worth practicing this at height with your own glider, so you know what you can expect from a pull-up at various speeds. Be aware that experience has shown that some airfields experience strong sink close to the ground due local effects, and that a pull up in sinking air can leave you with alarmingly little height. Further, airspeed will appear to reduce more quickly so be prepared to lower the nose earlier than expected to maintain safe flying speed. Talk with local pilots about this, but be aware that this can happen at any airfield if a thermal is building nearby.

The time advantage of a high speed finish with subsequent climb compared with a more sedate slowing down approaching the finish, whilst measurable, will be small and measured in seconds. Further, the additional attention to flying the high speed finish and pull up can subtract from the spare attention for lookout and keeping a high level of situational awareness of nearby traffic and activity. If permitted by the local procedures, the wisdom of any sort of steep pull-up is questioned. Better to conduct a sedate climb, noting that not so much height will be gained, but this will be offset by more down range travel 'easing' yourself into the circuit pattern maintaining excellent lookout and situation awareness.

An alternative is to fly the entire circuit at 2-300ft while letting the speed gradually bleed off. Your flight path will be predictable, but be aware that you may be overtaking slower traffic above you and moving into a double blind situation so keep good lookout and awareness. This profile will generally allow an arrival on final at a suitable approach speed. Again – good high speed performance is necessary so that energy is sufficient to reach finals.

Consider these issues when contemplating the high speed finish and entering a circuit pattern.

General Circuit Principles. Each airfield will have its own particular circuit joining procedures during a contest, so it's impractical to describe the many combinations and permutations. Rather the following set of principles will generally apply:

- When the landing direction is opposite to the finish direction, after finishing, simply continue ahead and join downwind for the circuit direction as briefed. Be conscious that there may be straight-in finishers landing downwind and depending on wind strength they may have marginal directional control at the end of their ground run.
- When the landing direction is across the finish direction, often the circuit procedure will allow overflight of the runway before joining downwind. This usually works well and allows for a reasonably relaxed and orderly procession during a multiple aircraft arrival sequence. Pilots who find themselves low on energy can join on the nearside downwind or even on base. Since we don't want to have crossing flight paths on finals, pilots should land on the side of the runway which is the same as the circuit direction. IE right hand circuit - land right hand side of runway. Keep a very watchful eye out for pilots on the contra circuit. Obviously do not overshoot the base turn, and stay on your side of the runway.
- When the landing direction is same as finish direction, fly ahead after finishing, moving to the dead side of circuit, then join crosswind and downwind in the normal manner. Because many

aircraft will be landing straight-in and likely you will be one of only a small number flying a circuit pay particular attention to gaining visual on the low fast finishers. Importantly there is a potential conflict on finals where the straight-in finishers are generally lower than the circuit traffic. This means that the pilot conducting the circuit will be turning belly up to the straight-in finishes, with the potential for a double blind occurring on finals. A very good reason for staying on the allocated side of the runway.

As mentioned earlier, expect contest local rules to address combined straight-in and circuit finishers. Where possible the contest organisers will separate straight-in finishers from circuit finishers by assigning different runways or different sections of a landing area. Multiple runway use brings potential hazards of overlapping circuits which the organisers will aim to avoid in setting up preferred circuit procedures. Make sure that you are fully familiar with these procedures noting the areas of potential conflict and where to concentrate your visual lookout.

Landing

Basic Concept. During multiple aircraft landings the basic principle is to land long and where appropriate, at the end of ground roll, gently taxy clear of the flight strip, coming to a stop off the runway.

The idea is that following aircraft can land behind the first arrivals until the runway is full. By the time the runway is full, the earlier long landers should have been moved clear allowing subsequent aircraft to again land long, if necessary over aircraft that have yet to be been moved. Where the airfield layout allows aircraft should taxy clear. If landing on one of the side lanes, when practical taxy clear on your side. If on a central lane roll straight ahead, so as not to cross any of the side lanes which might have finishers in them. Every airfield will have its local peculiarities. The wider the runway the more the flexibility. A single lane runway will pose its particular challenges and pilots will need to be particularly vigilant and disciplined.

Finals – straight-in finishers. Straight-in finishers are expected to fly a direct path to the finals from the finish circle on a continuous descent, decelerating as needed. Any form of pull-up is discouraged as it can be disconcerting to other pilots in the near vicinity and the zoom will affect the offending pilot's ability to keep track of nearby aircraft and obliterate visibility over the nose. Use airbrakes to slow down, as described earlier, and maintain a steady descent. If a turn is required to line up on finals, stay alert for other finishing traffic, and aim to be established on the extended centerline on a long finals and certainly no later than the same distance that you have lined up when conducting a normal circuit. This allows for integration with any circuit traffic and reduces the risk of rolling out underneath someone flying a circuit.

Pre landing checks: As there is not the usual downwind mental trigger to do pre-landing checks it is easy to forget the basics – e.g. to lower the gear. Many an experienced pilot has landed wheels- up because they became distracted by high density traffic and failed to consider their checks. Noting that Flaps, Speed and Trim will likely be a 'works-in-progress' a quick revision of the checks, a kilometre or so out, would be prudent.

On a straight-in approach, particularly if carrying plenty of excess energy configuring the aircraft for landing can be a little harder than first envisaged. Lowering the gear is best done early, but take note of the max gear lowering speed. Be careful if you need to change hands to lower the gear. Make sure that you are able to fly left handed at high speed whilst lowering the gear with the right. For an unflapped glider the rest is straight forward. A flapped glider is "busier". Flaps will have limiting speeds at various settings and you will often be faced with having to lower the flaps progressively as you slow down with the airbrakes extended. Depending on the characteristics of the airbrakes they may not stay in the desired position if you release the handle in order to adjust the flap setting, so you might find it best to give priority to airbrake operation until speed is approaching approach speed, then release the brakes in a position where they will stay put and make the necessary flap selection for landing. Whilst possible, preferable not to land with flaps in a high speed setting because your nose position will be higher restricting forward view, touch down speed will be higher and ground run longer. As a minimum, pilots should aim to have the flaps in the slow speed (best L/D) cruise setting. For the newcomer, please have practiced straight-in approaches in the type that you will be flying before your first contest.

Multiple Runway Landings. Multiple runway landings are useful in separating arriving finishers. As mentioned earlier, this brings the potential for conflict during the arrival process. Once on the ground, the basic principle is that one must always stop before an intersection of active runways. Typically

however, one runway will be declared as the primary runway which allows its full use and any other runways are only available up to the intersection; i.e.if you are not on the primary runway then you must stop short of the intersection.

Pilots must avoid landing in the opposite direction to the duty runway direction - converging in opposite directions is particularly hazardous.

Finally – phew – your arrival is not over until your glider is in the tie down area! Stay alert, help others, do the right thing.

Conclusion

Hopefully these words will have provided food for thought. As said in the introduction this document is not exhaustive and not intended to be overly prescriptive – you are the captain of your aircraft. Every airfield, every finish will have its own circumstances.

Be prepared, pay attention to hydration, nutrition and urination, be predictable, stay alert to your energy levels, land out if you have to and always - Expect the Unexpected!

LOW ENERGY FINISHES

Bruce Taylor

The planning process for arriving back at the airfield should begin many kilometres from home. Too many times the required thought processes only start after the finish line is comfortably under the nose, and often even later than that! There are a number of decision points along the way that need attention, and if these are adhered to then the arrival at the field will result in a good finish, a well-executed circuit, safe landing and maybe even a good dose of fun!

To begin with, your task will progress until you find that you have flown onto a final glide path. This is ideally how it should happen, as struggling to get onto final glide early or driving on to low altitude looking for that last booming climb will often both end in lost time. At the point where you find that the numbers are about to add up, you should begin to pay some attention to the impending finish.

Through the day you will have gained a feel for what the air is like, and that may well influence the height that you decide to leave the last climb. If it has been a nice day with good runs and streeting, then you may decide to leave a bit lower than the numbers, and conversely if it has been one of those nasty days with lots of sink around, you will usually take a few hundred feet extra.

Get a feel for how the glide is going as early as you can. If it is going badly and there is no obvious change in the weather up ahead, perhaps you need to stop for some more height. Try not to leave this decision until too late; top up while you are still reasonably high, avoiding a low level grovel. Monitoring progress will allow speeding up or slowing down to use your height most efficiently, and will give an indication of what type of finish will be possible. Lots of spare energy will mean a high-speed finish with a pull up and circuit, and a deteriorating glide might mean a straight-in approach or even consideration of an outlanding.

Firstly consider the high-energy finish. For about the last 20 km you must watch and listen for all traffic. Get a picture in your mind of who the likely conflicts will be, gliders close to your height and distance, or lower and in front and higher behind. Remember that you will all be converging on the finish line and visualise the consequences if you hit one of them! You will have no height to get out. Eyes outside! If all continues to go well and at about 5 km you are still above glide and running comfortably over 100 knots, then a low altitude, high-energy finish will likely result. Think about the wind, landing direction and keep looking for traffic. From 5 km onwards you have no further need to look inside the cockpit, at all!

The height that you decide to go over the line will depend on experience, traffic, wind, obstacles and the rules. Very low and very fast is fun, and usually quite safe, SO LONG AS YOU HAVE ALL THE ABOVE POINTS ON YOUR SIDE. Traffic will dictate extra height or maybe moving to one side. Wind will make it uncomfortable and more dangerous to be right on the deck. There will always be some trees, power lines, fences or buildings near to your approach path, and some of these are difficult to see at speed and in particular lighting. Know the airfield before you go low. And the rules may impose severe penalties for being too low – that will also spoil your day.

Having crossed the line you must make all changes in direction and height as gentle and predictable as possible. There is no point in pulling up sharply to circuit height, then doing the rest at 50 knots. It is far safer to gradually bleed off the speed at just a few hundred feet and arrive on finals just as you get down to your approach speed. This takes practice, but will come with time. Watch, watch, watch for traffic, don't forget your checks in all the excitement and keep an eye on the landing area to ensure that it isn't becoming congested. An airfield is usually pretty big, and a bit of a walk to your car is less painful than hitting something.

Now, the low energy finish is the one that can bring you undone. Usually at some distance out it will become clear that you do not have the required energy for a high-speed finish, or alternatively the glide will all turn to worms in the last 10 km. The latter scenario requires strict attention and a degree of flexibility in your planning. If you never had enough energy then your planning is always to consider a straight-in landing, with the only other decision being to outland if the glide deteriorates. However, if all goes well till quite late, you may need to quickly change plans backwards from circuit to no circuit, and maybe even to outlanding.

There is a critical time about 5km from home when you must decide that indeed you do have enough height to get home safely, or you must land right here. After you pass that point, you will no longer have enough height to correctly choose and land in a paddock. Once again experience, wind and paddock choices will dictate how low you may choose to continue, but don't fall victim to the "get-home-itis" danger. A safe outlanding means you can try again tomorrow.

All the same comments about traffic and forward planning apply here. Once you descend into that height band below about 500 feet, great care is needed to maintain a safe speed, especially if you are stretching the glide to the maximum. As said earlier, from now on your best instrument is looking out the front. If there is any appreciable wind take extra care and add a few more knots. If the wind is on your tail the view out the front may be pretty daunting with a very flat angle and the prospect of a downwind landing. If you are low and slow then take this option, as trying to turn at low level could kill you. A downwind landing is a far safer bet, so long as you are prepared for early loss of aileron control. Stalling, spinning or digging a wingtip into the ground is very untidy… DON'T STRETCH THE LIMITS!

If you have the wind on your nose the whole process will be easier. You will be looking at a steeper angle to the field and an into-wind landing will usually be more straightforward. Same comment applies about turning close to the ground, and there is actually a case against steeper turns into wind at very low altitude. The wind gradient can mean that the lower wing can have significantly less airspeed, to the point of not being able to roll out of the turn. Keep turns moderate. Do your checks, as the stress of a long, marginal glide can so often lead to a spectacular belly-flop!

A young pilot I know always works with the motto: Airspeed, altitude and brains – you always need at least two. Sound advice!

COGNITIVE TUNNELLING

Christopher Thorpe

In Human Factors literature the term tunnel vision is generally related to the loss of peripheral vision due to the effects of 'g' forces on the cardiovascular system. Another form of 'tunnel vision', cognitive tunnelling, occurs when the observer is too focused on one object and not on the whole environment. It usually occurs when a person is under stress and describes a process of attentional, rather than visual, narrowing. In the presence of an attentionally demanding primary task, the mind's allocation of residual capacity to perceptual monitoring decreases as levels of arousal increase. Or to put it another way, the mind's capacity to deal with intuitive, fast-thinking tasks and judgements is often impaired by high workload, analytical, slow-thinking tasks and judgements. This in turn impairs time management, workload management and situational awareness.

In December 2012 there were two controlled flight into terrain (CFIT) accidents where cognitive tunnelling is considered a casual factor. In both cases the pilots were on final approach and collided with trees. The first was a fatal accident at Narromine NSW during the NSW State Gliding Championships, and the second occurred three weeks later at Tocumwal NSW where the pilot survived. The circumstances of each were slightly different but both shared similarities:-

- Both pilots were experienced;
- Both pilots were flying at low level at high speed;
- Both pilots were under stress (one the result of a long cross-country flight, and the other from getting low in circuit);
- Both pilots had their attention diverted by outside issues (one pilot was concerned about a vehicle on the runway, the other was focussing on a line of trees on the approach);
- Both pilots collided with trees in their peripheral vision.

Wickens and McCarley (2008) note that there are four primary forces that move the attention of a skilled person to selectively attend or sample sources of information:

- salience (target conspicuity factors);
- effort (the amount of cognitive and physical effort it requires to switch attention to and search for the relevant stimulus, and the amount of spare effort available due to other tasks being conducted);
- expectancy (extent that a particular stimulus is expected to occur or be present at a particular time and place);
- value (importance of the stimulus to the person's tasks at that time).

In a fast-changing, time-limited, complex sensory environment, the mind's ability to prioritise inputs and make appropriate responses may be reduced in a high-effort, stressful situation. Fixation and cognitive tunnelling are more likely in these circumstances; early contingency planning and prioritisation of options are therefore important.

Although collision hazards such as trees in close proximity would have high importance, the effects of low expectancy and low value can mean that an imminent collision problem may not be detected.

Pilots need to take particular care when flying close to the ground, where workloads are high, time and energy budgets are reduced and the margins for error are low.

SARWATCH, OUTLANDINGS, AND SAR

Stuart Ferguson

SAR and survival planning are like buying insurance; it is an essential part of our planning that we hope we never have to use.

Gliding, while generally being a non-team sport, relies heavily on structured activities and mutual cooperation so that those taking part achieve the most of the activity. These structures are, or should be, provided by the GFA, our home club, a host club, and competition organisers. One of the responsibilities a club, and competition organisers is to ensure that all aircraft/pilots are accounted for at the end of each day's flying. This responsibility, and the action they are required to take when someone is not accounted for is clearly laid out in the GFA Manual of Standard Procedures (MOSP) Part 2, subparagraph 8.1.18. The time stipulated in the MOSP that action for overdue aircraft and crew be handed over to the Search and Rescue authorities (AusSAR) is one hour after last light. While the MOSP does not stipulate any action be taken prior to that time, common-sense, and good judgement would dictate that local action would have occurred prior to contacting AusSAR.

SAR Watch.

As the pilot, and/or crew, you have a responsibility to yourself, the club, or competition organisers you are operating with to understand the local procedures in place for each gliding site you fly from. Details of all local procedures should be part of the initial briefing, and may be presented as a verbal briefing or as part of a package of briefing notes. SAR alerting procedures should be part of this briefing. If in doubt, ask.

Having established what the local procedures are, you have to work these procedures into your daily routine. You will be expected to advise the organisers where you plan to go each day. Those pilots who are fortunate to have a crew can delegate some of these duties. For those pilots who are working solo, it is just one more thing you must attend to in what is already a busy schedule.

Upon return we then have a responsibility to cancel our SARWatch. Once again follow local procedures.

Outlanding

While outlandings are part of gliding, most of us depart expecting to return to our departure point or another declared landing point. If we outland our priorities change. We need to communicate with event organisers and our crew to arrange the retrieve. In many cases this is done via radio, followed by a confirmation phone call from the occupied property we land near. It is worthwhile trying your mobile phone, however most outlandings will occur out of the coverage area.

Sometimes outlandings are not as straight forward as we would like them to be. We may land on a property where the occupants are away or the property is no longer inhabited. Occasionally an outlanding goes very bad and the pilot is incapacitated in some way. Communications are even more important in this case.

Having looked at established lines of communication, we should now consider some practical alternatives.

Assuming your VHF radio is still working or you are carrying a handheld radio, overflying Regular Public Transport (RPT) aircraft can provide a relay platform. This can be done using the local Air Traffic Control (ATC) frequency. These frequencies can be found on the Enroute Charts (ERC) that are published in two formats; one for below FL200 known as the ERC LOW chart and the other for above FL200 known as the ERC HIGH chart.

It is worth remembering that a pilot in command must have access during flight to appropriate documents and charts. For VFR flights these would be selected from the ERSA, ERC, WAC, VNC and VTC as appropriate for the route being flown (refer GFA Operational Regulations, subparagraph 4.5.1).

If you have no success contacting overflying aircraft, try the international distress frequency 121.5 MHz, which is monitored by most RPT crews in the cruise. Having made contact make arrangements to change to an alternative frequency to pass your information.

This information should include:-“Request relay via Air Traffic Control....”

- Who you are = Aircraft Callsign
- Where you are = (GPS position Latitude and Longitude)
- Situation = the usual items we pass in an outlanding report.
- Who you wish this information to be passed to = Phone Number etc. Any additional relevant information, such as short term intentions (keep it brief).

While you will most likely be talking to a local crew, it is possible that you will be talking to a crew who’s English is very poor so you may have to repeat yourself several times.

To avoid your outlanding becoming one of the classic tales of poor communication, keep it simple. This information will then be passed back through the Air Traffic Control system to the number you have requested. Hopefully you will be able to stay in touch with the relay aircraft and receive confirmation that your message has been passed.

Search and Rescue.

As previously discussed, if the organising club has had no contact with you, one hour after last light they are required to hand the fact you are missing/overdue over to AusSAR. This could result in a wide area search for you.

You can also assist if you are carrying a beacon, and it is recommended that you do. Activate your beacon approximately one-hour after last light. The “Rescue Co-ordination Centre” (RCC) having received notification that you are overdue will also be receiving the signal from your beacon. This will indicate that you are OK but need assistance. If you deploy your beacon correctly (read the manufacturers manual) the satellite system will identify your position within several kilometres and assistance will be on its way. By following these simple procedures you will speed up your recovery and avoid the need for an expensive search. It is also a good a practice to carry a portable strobe light or torch to assist crews find you in the dark.

If you have been injured, activate your beacon immediately. It is recommend that you carry your beacon on you so that, in the event of you having to bail out, the beacon is with you and not your aircraft.

Be mindful that a beacon is a distress signalling device and does not replace established or alternative means of communications mentioned earlier. The activation of a beacon sets the SAR machine into action. Used inappropriately it will bring discredit to the sport of gliding; used appropriately it may save your life.

Conclusion

Like insurance, with survival and SAR planning it is important you understand the fine print; it is too late after the event.

Tips - know the local procedures (carry a copy if you need to), know the local contact phone numbers, know the local frequencies and have a radio that can access them. Carry a distress beacon, surplus water, your usual outlanding kit, and a small survival kit.

It is hoped you will never have to use all of the information contained in this briefing. Fly further and faster with the confidence that you are well prepared.

NUTRITION, DEHYDRATION, HYPOXIA AND RECOVERY

John Buchanan

Flying gliders successfully and safely requires mental alertness and good decision making over a long period of time in a hot environment, probably after being in the sun preparing equipment for the flight. A competition, regatta or gliding camp requires good decision making and alertness over many days of tiring activities in the heat on the ground and in the air, whilst also sleeping and living away from home. Many pilots have attended the gliding venue from much kinder environments and are unaware that the stress effects of the heat and competing are accumulative. This fatigue and stress build up is very subtle, leading to irritability, indecision, bad decisions and unsafe actions.

In addition to the environment, other factors which affect the pilots' fatigue and stress accumulation, and cognitive thought processing abilities, are nutrition, dehydration, hypoxia and recovery. Fortunately, unlike the environment, all of these are controllable by the pilot.

Nutrition

The two most important factors with respect to nutrition are a balanced diet and appropriate blood sugar levels.

Much is written about balanced diets, typically concentrating on 70 to 80% fruit and vegetables and the balance in protein and other carbohydrates. Clearly this is in conflict with what a lot of Australians eat.

However, being mindful of the need for high levels of fruit and vegetables, and attempting to eat high levels, will help your energy levels through the vitamins and minerals they supply. You should also listen to your body. Take note of what you have eaten in the 24 hours prior to a period of low energy - or high energy. See if a pattern can be detected after a while. A lot of people are unaware that, for them, too much wheat, yeast or lactose can produce fatigue. Simple sugar foods, soft drinks, tea, coffee, and alcohol may provide short term energy bursts but are invariably followed by relapses. Try a week of high concentrations of fruit and vegetables or the longer lasting easier digestible vegetable juice and see if you feel more energised.

Of course you can go to a naturopath and get tested for food allergies or preferred foods for your body. Just don't get too hung up on the results though - just use it as a guide to your own experimentation.

At a contest try to maintain your normal diet in spite of the difficulties. In particular avoid an increased consumption of fats, sugars, starch and breads. Try to opt for a greater percentage of Asian foods if eating out a lot whilst away. These have higher veg to protein and fat contents.

Maintaining an appropriate range of blood sugar level is very important. Blood sugar is the fuel for the brain. Low levels produce slower thinking, reduced focus and concentration, with subsequent indecision, bad decisions, poor co-ordination, narrowing of vision and can lead to accidents.

After eating a balanced meal blood sugar levels will rise with digestion and then fall more slowly over the next two to three hours if the foods are balanced. However, if high sugar and carbohydrates are

consumed the levels will rise very quickly to an excessive level and fall very quickly resulting in a rapid decline in brain power and a feeling of lethargy.

Therefore, ensure you eat a proper lunch either before flight. A salmon, tuna or chicken salad would be ideal. If you have to take it with you ensure a lot of salad compared to the bread. It is better to make a pita bread wrap. I also take 2 bananas and 1 or 2 apples depending on the expected duration of the flight.

The salads or wraps should be a reasonable mix of food and allow prolonged control of blood sugar levels. The bananas are a slow complex sugar as well as vitamins etc., and also release into the blood over a relatively long period. The apples are a faster complex sugar - best kept for final glide or escaping from an energetic grovel. Minimise the nuts and dried fruit as they will contain a lot of sugar and fat. Breakfast bars are ok if you look to the low sugar and don't make a habit of it. Lollies are bad and to keep eating them and/or soft drinks will give you hits with progressively bigger downers resulting in fatigue and reduced mental performance particularly in the heat.

Dehydration

Lack of water produces fatigue, muscle stiffness, cramps and all the adverse brain power effects associated with low blood sugar levels. I know of two top international pilots who have "lost it" in flight and attributed it to dehydration. It is commonly believed that dehydration has been a factor in accidents in the past. I am sure that many pilots, including many of you, have suffered adversely, when flying due to dehydration. Do not underestimate the effects of our hot climate and the accelerated effects of the canopy and lower density altitudes.

The effects accumulate quite subtly and begin before take-off. Stay in the shade and keep covered as much as possible before flight. Wear long clothes. Avoid drinking tea, coffee and soft drinks as they repel the moisture uptake of the body. Drink an excess of water with the view to "super hydrating". Do this slowly over a period of time for maximum uptake. Yes you will pee more but not as much as you think (unless you're an elderly gent before the op!).

If you notice effects of dehydration or expect to fly for a very long time some sports drinks can help you hydrate or rehydrate by providing various salts and minerals. However, avoid the older types and those with high sugar content. Even then it is best to dilute them with 2 to three times their amount with water and drink them slower, using plain water in between.

I find that mixing a third pure, unsweetened apple juice or dark grape juice in water provides you with a more pleasant and sweet taste in flight and the carbohydrates contained will better replace the energy you are burning.

You should pee during a glider flight, in hot conditions after 2 hours or so. If you don't you are not drinking enough and you will be dehydrating. You may then encounter (although not notice - unless you are now more aware) tiredness, headachy, stiff and cramped. The pee should be clear - not like the diluted apple juice, If there is any yellowing or smell, drink more clear water.

Alcohol is not only a diuretic but aviation medical research shows that its' effects remain in the body for several days - with a resulting loss of mental abilities. However, we are presumably on "gliding holidays" so one glass or can per night is perhaps a compromise?

Hypoxia

Whilst oxygen is compulsory above 10,000 ft QNH, it would be better to use it above 8,000 ft if flying above this altitude for some time. This is because our type of flying is a lot more physical than other forms of aviation and is usually combined with heat, mental, environmental and competition stress. Accelerated fatigue, tiredness, reduced mental alertness and headaches are the symptoms of prolonged exposure to reduced oxygen use. All these effects are initiated through lower oxygenated blood levels to the brain and can be damaging to the brain!

Be wary of convincing yourself that you can handle 10-12,000 ft continuously because you are fit or used to it! To test yourself, borrow an Oxy system and take a sniff after exposure for a while at 8,000 ft. It is very likely that you will experience a clearing of the head and any energy level increase. I feel it is unfortunate that we do not use oxygen a lot more in our gliding in Australia and believe that we should have it at competitions for safety reasons and use above 8,000 ft QNH.

Recovery

Recovery is the process of rejuvenating the body and mind after the flight. This is necessary for continued optimum daily performance. A reasonable level of physical fitness will aid recovery. The first step after flight is to drink plenty of water with the intent of peeing regularly. Drink at least a litre specifically before having a soft drink, beer, tea or coffee. Then attend to your glider and domestics.

Follow this with 10 minutes of simple stretching exercises to get the blood circulating and the muscles working properly. Try to stretch as many muscles as possible - particularly the stiff and sore ones.

Relaxation is the next priority. A good walk, swim, shower and lie down - whatever. The meal should not be too heavy or pumped with highly emotional post mortems.

Before going to bed resolve to put the flight away and don't dwell on it as that will prevent you from getting a good nights' sleep.

Complete the recovery by conserving as much energy as possible the next morning before flight. Then go get 'em!

BAILOUT - WHEN YOU HAVE TO GO

Daryl Connell

The purpose of these notes is to suggest a Check List that pilots may consult to assist in their planning in case of need. Clearly this List is intended to be used from time to time to help in being prepared in the unlikely event of deciding to bailout. It is far too late once the need to jump exists.

By way of background there are two incidents that have significantly influenced the content of this List. The first was a mid-air collision that occurred many years ago involving two gliders. I saw the falling wreckage from the ground and later visited the impact site. One pilot remained with his out of control glider and crashed. Rescuers found him in the cockpit with parachute harness undone and seat harness fastened!

The second incident occurred when I was flying straight and level at about 3000 ft. Another glider rammed me from behind, totally disabling the glider and requiring me to bailout. This was successfully achieved with only minor injuries resulting.

I have a very clear recollection of the circumstances surrounding my bailout yet I know from other evidence that some things happened that I have no recollection. My point being that in such an emergency some actions are apparently instinctive or pre-learnt, and therefore there is an opportunity to improve our chances by planning.

Check List.

- Be familiar with your parachute, particularly the actuating handle. This is normally a D-ring.
- Where is the D-ring? How do you grab it and with which hand? In which direction should it be pulled? Left handed pilots take particular note. Practice.
- Sit in your cockpit as prepared for flight. Understand the canopy release mechanism. Can you reach it?
- What obstacles are there to impede you leaving? Check camera mounts, microphones, water tubes, cables etc. Permanently relocate as many as possible. The instrument cluster itself maybe a problem, and you will need to consider how you will get out. Remember your glider may be out of control and this probably will make it more difficult to bailout in any case.
- Before each flight; pre-flight the parachute, check ripcord safeties and D-ring stowage. Know how to fit the parachute correctly and do so.
- Whenever you land your glider climb out of the cockpit with your parachute on. This requires you to release your seat harness only, and take your chute with you. A good habit.
- Is your parachute in good condition? Regular packing and care could be a lifesaver.

Some additional tips that may be of interest.

Be aware that most of our parachutes are emergency chutes with a canopy diameter of about 26ft. This reduces the bulk in the cockpit but does mean the descent rate is a little high. They are designed to save life and some injury on impact is possible.

Should I try to make a radio call if I have to bailout? No, forget it unless your glider is sufficiently under control to give sufficient time. To get a reliable position broadcast if out of control will take too long. Rely on the emergency services. If you are flying remote to emergency services then you should be carrying an emergency position/location transmit device.

On landing treat your situation as if it was an outlanding.

Finally it should be noted that there are a small but worrying number of fatal accidents where a glider crashes for no identifiable reason. While not making assumptions, we do know it can take a fit/uninjured pilot many thousands of feet altitude to get out of a disabled glider into a deployed parachute. If a serious problem develops make your decision early.