Contest Airfield Arrival and Landing

DRAFT

Introduction

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 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 might also be a good idea. If you have been in the cool at higher altitudes

remember to drink regularly as you warm up in the descent, to avoid dehydration as the body recovers from cold diuresis*[1].

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 to 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.

[1] *We are all aware of the need to remain hydrated. Cold Diuresis occurs when the body cools down and we need to urinate. As we warm up in the descent the body reverses the process and we need to hydrate immediately to avoid dehydration. So drink regularly as you warm up in the descent.

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 waterballast.

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. Expect a requirement for a 10km radio call. Make your call as close to 10km as practical. Often due to radio traffic you will not be able to make the call at precisely 10km, so make your call when the airwaves are clear. Importantly, provide an accurate range when making the call, EG "Alpha Bravo Charlie, nine point two kilometers". This allows for nearby pilots to gain an accurate appreciation of your relative position. (Be ready to announce your height is queried by a nearby glider) This distance should be from the centre of the finish circle, so make sure that your nav system is providing this value.

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

A full airfield arrival call should not be used to allow maximum airtime for calls from multiple arrivals.

Waterballast. 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

judgement is generally quite instinctive and occurs further out with a higher energy final glide with a corresponding higher ring setting.

Finishing - from about 10km.

By the time you are about 10 km out, you should already be using visual judgement 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 maintaine flexiblity ,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 flyonto? 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, (we don't need sudden flight path changes that will startle nearby pilots!) before deploying the brakes. 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 $1/3^{rd}$ 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 judgements with respect to calling it quits in order to make a safe outlanding. If the last few kilometers before the airfield are unladable, then .. "when in doubt-land out".

You may have heard other pilots talking about using ground effect to get home. *This technique must not be relied upon and will not work unless over flat ground with the glider being held within about 1 meter of the ground. Very few airfield approaches will meet this criteria. (In fact if the terrain is suitable wouldn't it be better to land since you will have already crossed the finish circle!)*
However, If for some reason you find yourself in extremis you may be able to extend the very last part of your glide very slightly by nosing over from about 150 – 200 ft and then fly the glider very close to flat ground which is free from obstructions. Ground effect may carry you a little further, may a couple of hundred meters if all goes well. DON'T KID YOURSELF – IF YOU NEED GROUND EFFECT PRIOR TO THE AIRFIELDYOU ARE IN **A <u>VERY</u> DANGEROUS SITUATION**.

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.

<u>Climbs into the circuit.</u> 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 leveling at 60 kts.

Climb from:	Ht gained still air, best case:
80 kts	100 ft
100 kts	250 ft
120 kts	400 ft
140 kts	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 pullup 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. Consider these issues when contemplating the high speed finish with climb into the circuit.

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. Pilot's 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 deadside 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 allocate 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. Finally – 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. IE if you are not on the primary runway then you must stop short of the intersection.

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!!