

CABOOLTURE GLIDING CLUB

POST SOLO MENTORING PROGRAMME

Introduction

This program is aimed at helping you refine your knowledge and skills to achieve longer duration flights around Caboolture.

Finding and successfully working lift has little to do with good luck.

Traditionally one went solo, completed the post solo sequences and then was largely left to ones own devices to figure out the rest. This has led to frustration, poor member retention and hazardous experiences.

These notes contain the theory component of the programme and flights should be undertaken with mentors, and/or instructors, in your post solo stage to develop these skills.

It is recommended that, where possible, up to thirty percent of your first hundred flights should be done as mutual or instructional.

Remember, however, that no pilot can stay up when there is no lift, and to expect that this program will always guarantee long flights is unrealistic.

What mentoring is NOT about.

- Caboolture is not a cross country soaring site (unless you use a motor glider!)
- It is not our aim to teach you advanced cross county and competition flying. It is however our aim that if you do go down those paths that you are already highly skilled in making the most of the available lift.

Therefore you will not find details on advanced cross country theory in this program.

You should back this process up with other resources and, at the end of these notes are several references. If you are serious about advancing quickly, you need to read lots and, some would say (including myself), you should take advantage of computer simulation programs to practice your techniques.

Mentoring will accelerate your progression because;

- It will allow you to achieve longer flights when solo.
- Many of the advanced aircraft conversion criteria rely on flying experience not command time, so mutual flying does not slow this down.

Conversion criteria have been changed in line with this mentoring program such that up to half of the required solo hours for any conversion may be mutual flights with a designated mentor.

You will also have much more fun sharing your flying experience and have someone to discuss the flight with at the flight's completion.

Safety issues

It has been said that, as an early post solo pilot, you have a bag full of luck and a bag empty of experience. This coaching is aimed at helping you fill your bag of experience before your bag of luck is empty!

The early post solo stage is arguably the most dangerous stage of your flying career, as you do not see traps in your flying that could lead to dangerous situations. Consider the following traps.

Concentrating so hard on thermalling that you:

- Do not hear radio calls
- Do not see other aircraft
- Violate rules of the air (airspace and circuit restrictions)
- Make poor management decisions e.g Break off too late requiring a modified circuit or an outlanding.

Therefore it is essential that this training be done within the bigger picture of safe airmanship. It is essential that you review Basic Gliding Knowledge and also various safety notes on the club website, in particular those listed under "Read me now" on decision making (flight management), Circuit planning, and joining thermals.

Always keep a good lookout.

If an emergency occurs, keep breathing normally and do what your instructors told you to do!

Disclaimer. These notes are not intended to replace the instructional notes you have received in your training or advice received by your instructors.

The Aircraft

It is not uncommon for people to squander their time in the air due to improper handling of the aircraft. Many of these skills would have been demonstrated early on in your training but with all the subsequent information shared with you, you may have forgotten their importance. These simple concepts will substantially improve your flight durations.

1. The stable platform.

This concept is taught so early that we easily forget that a healthy glider that is properly trimmed will maintain a straight line or a constant turn at a constant speed unless an external force is applied. Minor balance and construction issues may cause an aircraft not to track dead straight (particularly if it is old) but the above essentially holds true.

Over controlling the aircraft has the following effects;

- It adds to pilot workload unnecessarily.
- Every time a control surface is moved it adds drag and leads to a loss of altitude.
- It robs us of feeling how the outside air currents are moving as they impinge on the glider.

Drill 1. Practice trimming accurately and then consciously flying with as little input as possible.

Instructors refer to over controlling as “stirring the Pot.” Severe over control leads to PIO, Pilot induced oscillations. Note the term is “Pilot induced”. This minimalist control is best revisited in smooth air at altitude then with confidence of the stable platform concept, continued throughout your flying.

1. Flying to attitude

As an early solo student it is easy to fly by the instruments. In a car this is necessary as there is no way to judge your speed accurately by looking out (as you go faster you unconsciously look further in front and the sensation of going faster disappears). In a car the speedometer is physically connected to the road and is real time and accurate.

It is the opposite in a glider. The airspeed indicator lags and is prone to inaccuracy. However, maintaining a constant attitude will ensure that you maintain a constant airspeed (unless you open the flaps or airbrakes). This is accurate to within 1-2 knots. The airspeed indicator should be used to calibrate your attitude then attitude (and slipstream loudness) and should not be the primary reference.

Drill 2. Cover your airspeed indicator and fly to attitude.

Unless flying with an instructor this must be uncovered prior to entering the circuit.

3. Constant speed turns

The radius of a circle prescribed by a glider is dependent on the bank angle and the airspeed. Suffice to say that we want to make turns that are as close to a perfect circle as possible otherwise we will drift around the sky and never stay centred on the core of any thermal. At best we will complain about the thermals being broken, and at worst we will keep losing thermals soon after we find them.

The most common reason for people not achieving constant turns is they are not looking in the right place. Your sequence of action should be to look in the direction of the turn and as far behind you as you can to “clear the turn”, then LOOK STRAIGHT AHEAD at the nose attitude while you commence the turn. Keep looking straight ahead till the turn is established with attitude and bank angle set (re-trim as necessary so it still requires minimum control input), and then resume your lookout.

If a paint brush was mounted on the nose it would leave a line parallel to the horizon all the way through the turn.

During the turn, constantly monitor attitude, angle of bank, and yaw string to ensure that the turn is accurate and balanced.

Drill 3. Maintaining a constant attitude and constant angle of bank throughout turns.

Have the mentor in the back seat advise you of how accurate you are, and what your head is doing during the turn to ensure you are looking in the right place at the right time.

Practice both left and right turns to prevent you having a preference one way or the other.

4. Optimal thermalling angle

While steeper turns allow smaller circles and therefore better use of the core, turns should not be any steeper than the angle at which you can maintain constant attitude and hence speed. The above drill should be started with shallow turns and only steepened when you can maintain the shallow turn accurately.

Remember that, when centred in a thermal, the inner wing will be in stronger lift than the outer and so you will usually need to maintain stick pressure in the direction of the turn to prevent the thermal “tossing you out”.

5. Optimal thermalling speed

While the airspeed for minimal sink is best for thermalling this speed is NOT just above the stall speed. Herewith the only piece of Maths in this program.

The stall speed and minimum sink speed are increased by increasing angles of bank. It actually increases by the square root of the g-force in the turn. Taking a Blanik at maximum weight the minimum sink speed is 42kts.

- At 30 degrees bank this means increasing the speed by 8% (45 kts)
- At 45 degrees bank this means increasing the speed by 20% (50 kts)
- At 60 degrees bank this means increasing the speed by 40% (59 kts)

Flying at these speeds for these bank angles not only gives you the best climb rate, it also avoids the other problems of going too slow i.e.

- Sloppy control response
- Poor control feedback about what the outside air is doing
- Safety margins are decreased and the likelihood of stalling or spinning is increased.

The optimal angle of bank for any given thermal depends on the strength and diameter of the thermal. As a general statement, most early solo pilots tend not to apply enough bank.

Flying steep turns allows you to stay closer to the stronger core, but this must be weighed against the increasing sink of the glider in steep turns and the ability of the pilot to maintain a content turn when steeply banked. Flying with a mentor will help you learn what bank angles you are coping with and what bank angles need further practice.

Drill 4. Steep turns

Once shallow turns are consistently accurate, commence steeper turns, anticipating the need for higher airspeed. In steep turns the rudder starts to play an increasing role in setting attitude. Considerable back elevator and therefore back trim adjustment is required, but again try and trim accurately to minimize the input required.

Have your mentor comment on the consistency of your turns and at what bank angle you start to struggle.

6. Speed between thermals

Just as important as the optimal speed in a thermal, is the optimal speed between thermals.

Putting the nose down as sink increases doesn't seem (or look) logical, but what we are trying to do is minimize the TIME we spend in heavy sink, therefore speeding up gets us to friendlier air sooner.

While the Blanik sink rate increases rapidly with speed over 55kts, travelling through significant sink at any slower speed is not saving you altitude. If the sink is really heavy, get out of there fast! .i.e. 60kts +. If the heavy sink persists change direction and change your flight plan.

In the IS28 and the Twin Astir it is reasonable to be cruising between thermals, even around Caboolture, at 60-80kts depending on conditions.

Drill 5

Explore the higher airspeeds between thermals to see how this all works out. Ask your mentor to keep an eye on speed between thermals.

7. Use of the variometer

Just as the airspeed indicator is overused by many pilots, so is the variometer dial.

The variometer is NOT used to find lift. That is done by your eyes outside the feel of the controls and the nerves in your backside. The variometer is used to tell you how strong the lift is and to assist in centring the core. If the audio function is available, then looking at the dial tells you little more than listening, so don't do it. If you can't resist the temptation do a mentor flight with the dial covered up. You will be pleasantly surprised how well the audio works!

Even without an audio vario, a brief glance every quarter turn is all that is needed. (As a young soarer I often caught myself glued to the vario. This is courting disaster of a mid air collision. Funny, when I stopped doing it, I tended to have longer flights)! More on centering later.

The Environment

We have talked about the aircraft and the pilot, so let's now consider the environment in which we fly.

Specifically, let's consider Caboolture as a gliding site, and leave the more generic theory to other sources.

Being coastal Caboolture is effected by the balance of land and sea air.

1. Wind patterns at Caboolture

South easterly

This is the predominant wind for Caboolture. The air is moist and thermals develop readily with clouds (and lift) appearing much earlier than at inland sites. In summer there is often good lift at 9a.m. This is unheard of inland!

As the day wears on, the rising air brings in a sea breeze, the clouds disappear to the west and thermals activity is severely retarded. This sea breeze allows for very smooth flying (which is good for drills).

Westerly

This wind makes Caboolture behave more like an inland site. Thermals develop later and stay longer. If the wind exceeds 15 kts, then wave lift may occur just west of the Bruce Highway and a secondary wave may be over the field. Later in the day, if a sea breeze develops it will meet the wind head on and a convergence line parallel to the coast may develop, giving good lift. This will be marked by either the line where the clouds stop or by a line of clouds lower than the rest of the sky.

North Westerly

This is similar to the westerly, and if wave develops it will tend to be towards the Glasshouse Mountains. Abundant lift often occurs northwest of the field late in the day.

Summer vs. winter

In summer the south easterly pattern predominates, thermals happen mid to late morning and the sea breeze comes in early afternoon.

In winter the north westerlies predominate and the flying day is later. Some of the best flying at Caboolture occurs in winter.

2. Cloud formations at Caboolture

Without going into general theory, cloud streets in the south easterly are often sourced from urban development of Bribie Island and the nearby mainland suburb of Pebble Beach. These are much more common than five years ago, and they tend to drift straight across the field. This is the only time I like property developers!

Clouds from the west and northwest tend to be very distinct, tight and flat bottomed. Those from the southeast are less sharply demarcated. Of note, just after rain the clouds can be quite deceiving. At this time the air is super saturated and the tiniest amount of lift creates a cloud. These post rain clouds have an indistinct and hazy appearance about them and at best will offer zero sink. These clouds can be quite dangerous in luring one too far away from the field only to find there is no lift to help the homeward journey.

It is common to feel the chaotic lift around the rubbish dump in the circuit. Rarely does this create a sustained thermal to ride, so don't be fooled. Remember absolutely no thermalling below 1500ft AGL within the Caboolture circuit area!

Introduction to thermalling

Each thermal buds off from its source and drifts downwind. Given the right atmospheric conditions, eventually a street of clouds forms from this source.

Between the cloud streets are sink streets, to be avoided!

Young clouds are better than old ones. The young ones are tighter, flat based and look like cauliflowers. Older clouds become ragged. When older clouds dissipate and die they are to be avoided because of associated sinking air.

Better still are spreading wisps that start developing into clouds.

Under a cloud there may be one or multiple cores of lift. This is where we want to be.

1. Before you launch

Watch clouds and see if you can identify the streets, the cycling time, and what pre-cloud wisps look like.

See if you can see signs of the core(s). These are;

- The darkest spot.
- On dryer days the development of a dome under the cloud.
- On moister days, small wisps below the clouds.
- Circling birds and scraps and rubbish.
- Circling Gliders!

See if the cloud drift is different from wind on the ground.

Drill 6. Interpretation from the ground

Between flights take the time to study the sky and see how many of the above features you can find. Explain to a mentor how you would conduct a flight from beginning to end under those conditions.

2. During Aero Tow

Note areas of good lift on the aero tow (turn the vario up). You may need to return to them to stay aloft.

3. Releasing

In much of your training you have traditionally released at a given height to have enough altitude for a given exercise e.g. 1500ft for circuits, 3,500 ft for spins.

Now that thermalling is your prime goal that is no longer true. You will now want to release when you either are in a good thermal or at sufficient height to give you a reasonable chance of success of finding one (determined by your confidence, the conditions, and your wallet).

As soon as you are above the altitude you are prepared to release at, you must be prepared to do so on only a few seconds notice. Therefore you need to be constantly considering where the field is throughout the tow.

A reasonable tug pilot will endeavour to find good lift for you if it is around.

Do not release because you have found a thermal or have reached a certain height if you are not happy with your angle back to the field! Remember you can always radio the tug to take you closer home. If you reach the airspace ceiling and you do not release, the tug will head back to the field.

4. Releasing into a thermal

Watch the tug for sudden jumps indicating it has just passed into a thermal. If your location and height are suitable, be ready to release and turn the moment you feel the surge then turn and centre as described below

- If in a thermal, slow to the correct thermalling speed.
- Fly at the angle of bank at which you can keep your speed controlled and your turn consistent.
- Don't forget to maintain a good lookout at all times.
- Do not become fixated on the variometer.
- Fly as much as possible looking outside for clues and use these and your bum to feel the air around you.
- Trim accurately. The lighter the touch on the controls, the more you will feel the air currents outside.

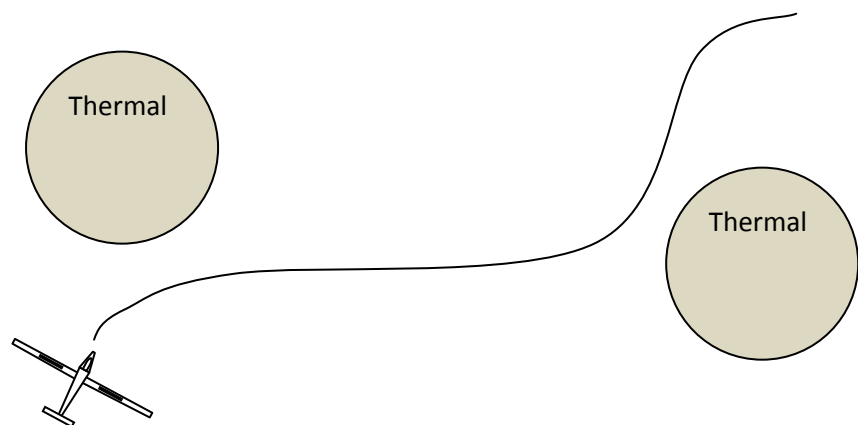
5. Releasing without a thermal

If you decide to release while not in a thermal then you must promptly start your search. Flying in aimless circles is a sure way of ending back down on the ground. Worse still is circling in sink hoping it will change to lift.

If there are clouds about pick your best option and head there promptly. While in sink this should be (for the Blanik) at 50kts plus, slowing as evidence of lift appears. If no useable lift is found look for clues as mentioned above.

If it is a blue day with no clouds, the thermals (if they exist) will still form streets and have sink streets between them. Search on the basis of downwind of likely ground triggers (imagine walking barefoot on the ground and what would be hottest) and across the direction of the wind to endeavour to intersect a thermal street and not persist in a sink street.

On blue days don't let the glider wander. Pick a direction and a destination and go there. If allowed to wander the glider will avoid nearby thermals due to being tipped away from rising air.



Once you are searching on a blue day;

- Do not stay in sinking air for more than twenty seconds without changing direction (say 45 degrees); You might be in a sink street.
- Keep you controls light and attention outside.
- Turn 45 degrees towards a lifting wing.
- If lift improves keep turning.
- If sink occurs turn back a sharp 180 degrees to return to where you felt the lift. If no lift found then resume initial track.

6. Centering Thermals

Look for clues for the core as you did on the ground.

Note which side of the cloud has the core. It will be the same for the next cloud.

First action on finding lift

You will know a thermal is close by if you encounter increased turbulence and increased sink. Continuing on and ideally you will then move into lift. A wide searching turn may help to find it.

- If there is a distinct wing lift, do a searching turn in that direction.
- If there is a surge without a wing lift turn, either way, but if the yaw string deflects, then turn in that direction.

If you wait until the vario confirms and peaks and then starts to fall (a common mistake of early pilots due to lack of confidence), you have already passed the thermal and missed it.

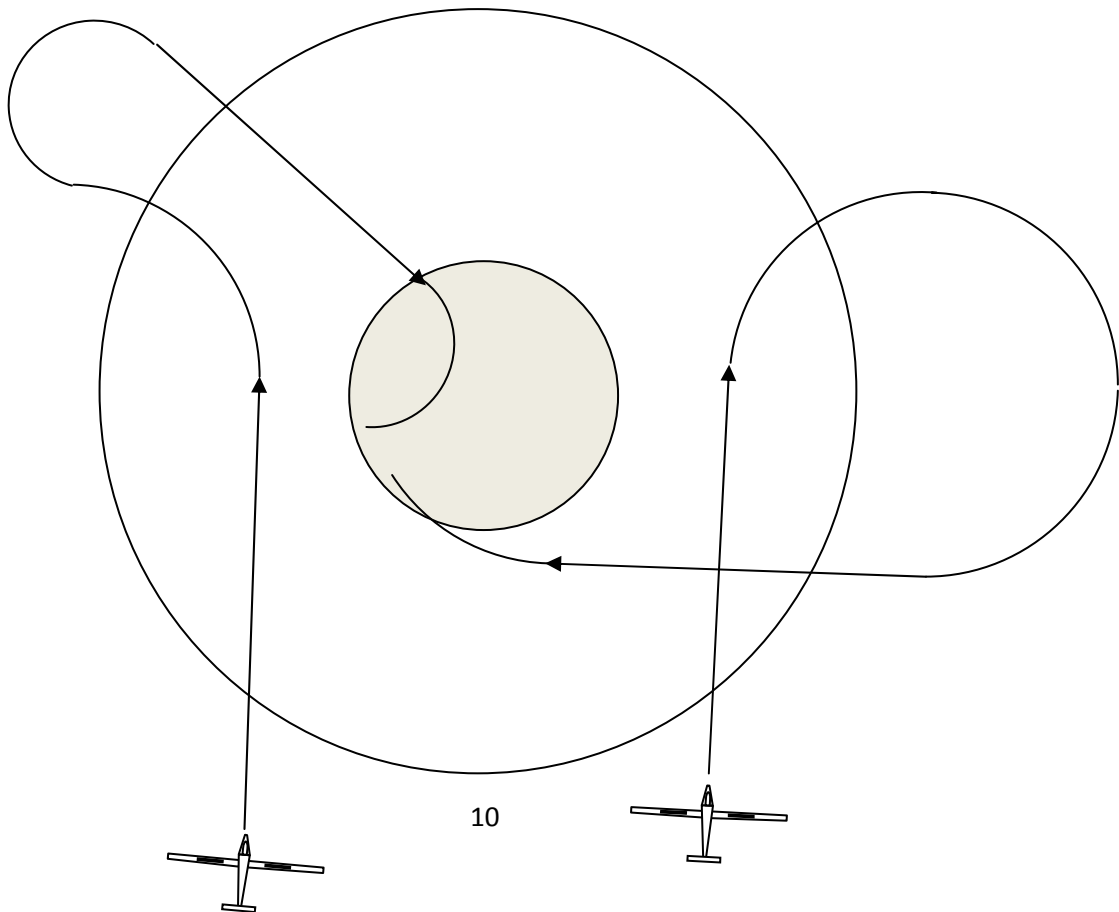
If your vario confirms that you have lift most of the way around the turn, then pass onto to cantering techniques.

If you find sink after 90 degrees (suggesting you turned the wrong way) you can either

1. Continue the turn for three quarters of a circle, straighten for 2- 5 seconds and then resume the turn. You will now be searching on the opposite side of your original track, or
2. Turn back a sharp 180 degrees to return to where you felt the lift and look on the other side or, if lift is not found, resume the original track and look elsewhere.

The first method probably loses more height (as you persist with the turn in sink) but is easier to do accurately for an inexperienced pilot.

Remember a vario cannot tell you which way to turn initially. You are more likely to pick the right direction by paying attention to what is happening outside, including the yaw string.



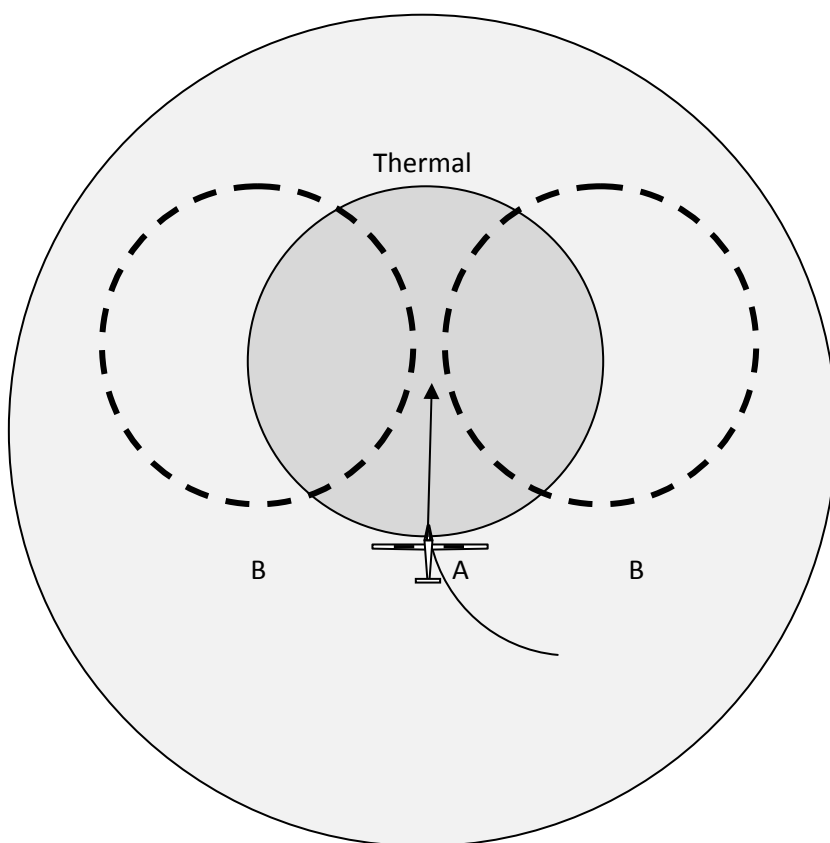
7. Centering Techniques

There are many techniques and further reading will explain them to you. Here are three.

- The first is better than nothing but difficult to use in small thermals.
- The second is the most popular and one that works regardless of the size of the thermal.
- The third is a variation of the second that is very useful if the vario does not have an audio feature.

Like any technique, they assume that you can keep a constant speed and angle of bank, not because thermals are all circular, but because flying circles stops you from wandering all over the place.

a. Straightening on the Surge Method



This is the most basic of centring techniques and is difficult to make work on small thermals as levelling for a few seconds and then turning in either direction will not centre the thermal

On feeling the surge at point A the wings are levelled for 1-3 seconds and then the turn resumed.

To make it work, a second levelling procedure **MUST** be made at point B (before the next surge) to have any chance of actually aligning the turn with the core.

Failure to do the second levelling or waiting for the surge to do it will leave the second turn unentered just like the first turn. Commonly people will talk of the thermal being broken or difficult to centre when in many cases it is the technique rather than the thermal that is at fault.

b. Worst indicated heading method

Note the point of greatest sink and look 20 degrees forward of your inboard wing for a landmark. As you continue your turn, level out for 2-3 seconds in the direction of the landmark before continuing the circle. Smaller thermals require less levelling time.

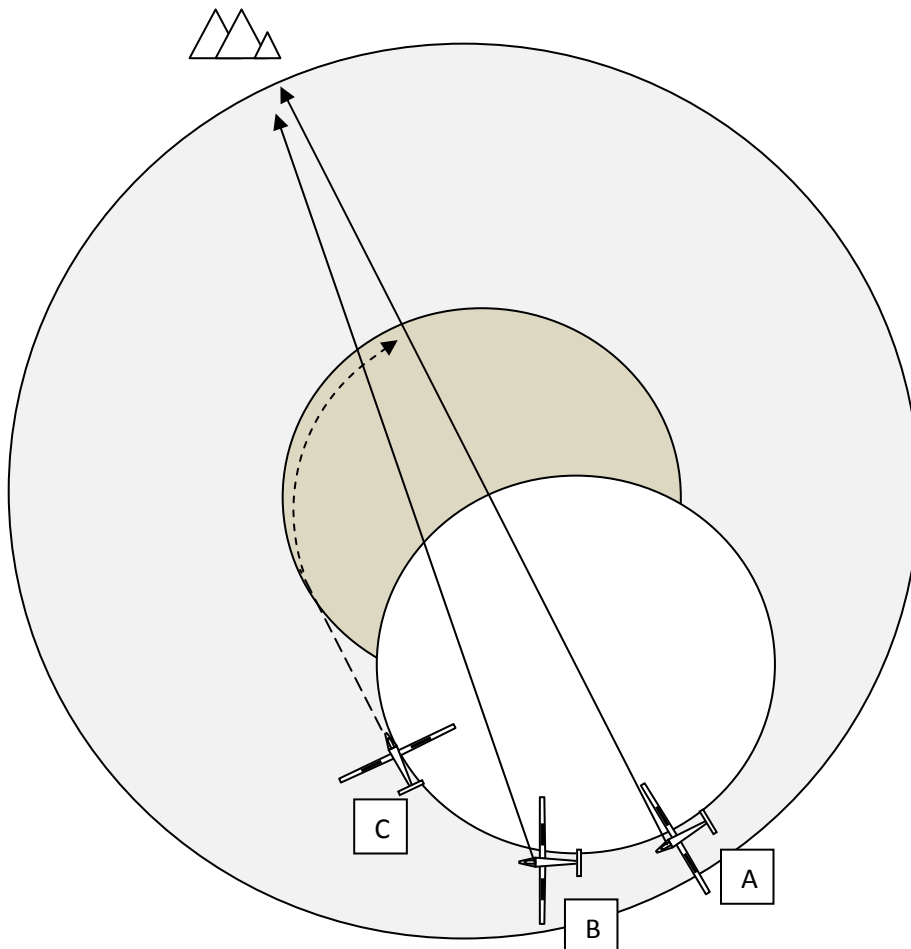
If you get it right you will often feel the surge as you re-enter the lift shortly after you commenced the levelling out manoeuvre.

e.g.

Point A True point of worst sink. Mountains are off Right wing tip

Point B Indicated point of worst sink (depending on vario lag). Mountains are 20 degrees in front of Right wing tip.

Point C levelling commencement point. Mountains are straight ahead.



Drill 7. Covered instrument thermalling

On a good thermalling day cover the variometer, airspeed indicator and altimeter, and rely on outside cues, stick feel and the audio signal.

c. “Best /Worst Sector Method”

This is a variation of the above and suited to the situation of not having an audio vario.

Divide the turn into 4 sectors. Glance at the vario in each sector. After one to two turns you should be able to tell in which direction to shift the circle.

8. You are climbing! What next?

With either technique you must keep making corrections on every turn. As a novice, be prepared to do a turn or even two without making **any** corrections till you are confident in which direction to make your corrections. With experience you will tend to understand thermals faster.

Drill 8. Exiting and re-entering thermals

Once well established in a thermal, fly away from it for ten seconds, do a U turn and identify the stages of thermal entry (increasing sink, turbulence wing lift and surge), re-centre and continue to climb.

9. Thinking ahead

On blue days, note a landmark when you join the lift and after several minutes look for that mark again. This will give you the wind direction, and hence the origin of the thermal and the direction of any thermal streets.

Look for better clouds and wisps upwind on your cloud street.

Look for birds thermalling.

Look for ground triggers.

Look where you felt the lift on the way up behind the tug.

Do not leave lift or even zero sink until you have a good plan as to where to search next.

Recheck where the field is and that it is reachable at least every 30 seconds.

Lookout – lookout - lookout!

Speed up in sink between thermals (Blaniks 55kts +)

Gaggle flying

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

#1 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!**

#2 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.

#3 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..

#4 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.

Conclusions

It is said of chess that the fast track to greatness is not to play lots of games but to study the techniques and play and study with the experts. The same applies to gliding.

These techniques are just a start to learning effective thermalling. Hopefully they will let you enjoy your gliding to the maximum.

References

Advanced Soaring Made Easy by Bernard Eckey

This is an excellent book written for Australian conditions. The thermalling principles are contained in the first forty pages.

Flying Faster and Farther compiled by Maurie Bradney

This is downloadable from the GFA web site for free! Pages 44-54 of part 1 discuss thermalling techniques

Gliding, A handbook or Soaring Flight by Derek Piggott

Although written for British conditions, a must for every serious glider pilot.

A word on computer simulators (personal view of Ken Wishaw)

Simulators are a good way to practice good or bad habits. Their use remains controversial. If you wish to go down this path, then consider "Condor" available through "go soaring." It contains aero and winch launching, thermals ridge lift and numerous different gliders. Although terrain is severely simplified it is reasonably realistic and lots of fun. All sorts of training and emergency scenarios can be practised in the safety of your own home.

Microsoft flight simulator 2004 "a Century of flight" only contains one glider which behaves similarly to a Blanik (requires higher speeds). There is no launch capability but with the terrain more photo realistic, for approaches and landing practice it is probably better than Condor.

