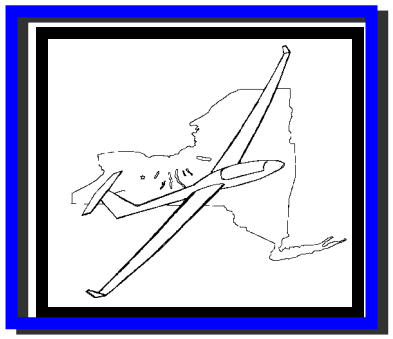


Introduction To Cross Country Soaring

Part I of II

Original Material Prepared From The Experience Of

Kai Gertsen

January 2002

Kai Gertsen has logged more than enough miles in a glider to fly around the World…four times. Kai Gertsen has prepared a booklet on Cross-country soaring. Your editors feel that the info in that booklet would be of interest to every pilot and will present it here with current additions and revisions.

INTRODUCTION
to
CROSS-COUNTRY SOARING (Part I)

This publication does not offer any new, brilliant strategies, nor does it reveal any deep guarded secrets. All the material presented here has previously been presented in other publications and used by glider pilots for many years. This is merely an effort to present the very basics in one booklet for the aspiring cross-country pilot.

…..Kai Gertsen

TYPE OF GLIDER

While the latest ultra-performance glider with and L/D approaching infinity would be great, an intermediate type with a glide angle of 30:1 will do nicely. On the other hand, on the average eastern day, it is simply not possible to successfully practice any of the following X-C techniques in anything with a 1-26 performance.

MAP PREPARATION

In a sailplane, we do not have the time or space to unfold and fold sectional charts. We need a single, one-sided map, which covers the area within which we intend to operate.

Unfortunately, the sectional charts have been carefully arranged such that most glider ports are located near the border of the charts so that typically two or more sectionals need to be joined together to create a one piece single sided map.

Before covering your map with clear vinyl it is important to draw concentric circles around home base. The purpose of these circles is to enable you, at any time, to estimate your distance from home and the altitude required to get there. If you are flying a sailplane with a glide angle of 30:1 then circles in increments of 5 miles make sense as an L/D of 26.4:1 will get you 5 miles per 1000 ft. loss of altitude. This gives you a little margin of safety, which is always a good idea. Also, 200 ft per mile is a nice handy, round number to work with. Some allowances of course, have to be made for the effect of wind, which on most soaring days amounts to about 15 mph. A good rule of thumb is to anticipate covering approximately 3.5 miles per thousand feet or losing 1400 ft. in 5 miles if going upwind. Downwind should net about 6 miles for every 1000 ft.

DEFINITION of CROSS-COUNTRY SOARING
The fine art of getting ill while going nowhere very slowly
at great expense and inconvenience…but great fun!!!

DON'T PART WITH YOUR ILLUSIONS. WHEN THEY ARE GONE,
YOU MAY STILL EXIST BUT YOU HAVE CEASED TO LIVE.
…..Mark Twain

NAVIGATION-SIMPLIFIED

With reference to the map and a couple of prominent ground features, point the glider on the heading you need on the first leg. Don't forget to make some allowance for cross wind. Note the compass reading and you know the compass heading for the first leg. Repeat this process after rounding each turn point.

OFF-AIRPORT LANDINGS

At some sites it may be possible to lay out a route which permits airport hopping. For this method to be practicable the airport spacing should not be greater than 20 miles. The idea is that you don't go beyond reach of one airport until you are within reach of the next.

This is an excellent way to get initiated and if possible, the first few cross-countries should be done this way. However, serious cross-country soaring can not be done without the possibility of a field landing and no cross-country, airport hopping or otherwise, should be attempted without being fully prepared to perform an off airport landing. Off-airport landing is a subject in itself and is covered in another chapter.

TECHNIQUE

There are really only three things you need to know, which are:

1. **WHERE TO GO**
2. **HOW FAST**
3. **WHEN TO THERMAL**

WHERE TO GO

DETERMINE THE RELATION OF LIFT TO CLOUDS

Exploring the conditions before pushing off is a good idea. A half hour can be well spent in establishing where the lift is with respect to the clouds. It is not always upwind, but whatever the relationship is it will tend to hold true for the rest of the day and this bit of knowledge should minimize the amount of searching and fumbling associated with getting established in each thermal.

RESIST TEMPTATION TO TURN BACK

In the event you encounter a prolonged stretch of sink immediately after heading out, you may be tempted to make a 180 degree and go back home. This is generally a mistake as you will then be flying through the same area of sink and are likely to find yourself with marginal altitude to reach the airport.

IF ENCOUNTERING A LONG STRETCH OF SINK, TURN 90 DEGREES

Chances are that you are on a street, unfortunately the wrong kind. Your best bet in this situation is to make a 90 degree turn. Stay on that heading until the sink subsides, then get back on course.

FOLLOW PATHS OF LIFT

Supposing your effort resulted in a zigzag course of 15 degrees but only reduced the sink rate by half? No need to feel bad, it was well worthwhile. Think of it this way, your 30:1 glide ratio got to be 60:1 and the extra distance flown, over say a 20 mile run would be a mere .75 miles.

FOLLOW PATH OF SHORT CYCLING WISPS

Short cycling wisps can be worthwhile, especially if there are no other cu's around, even though they are likely to vanish before you get there. The wisps indicate an area of convection and are likely to cycle again. Keep in mind that thermals tend to trigger from the same sources throughout any given day.

STAY UP-WIND OF COURSE LINE

If at all possible do not get down-wind of the course line. Purposely heading down-wind should only be done to remain air borne. This of course becomes less significant on days when the wind is light, but on a day when it is blowing at 20 kts. getting back on course after a slow climb originating down-wind can be exasperating. However, don't be obsessed with getting back on the original course line. If you have drifted significantly off-course the prudent thing to do is to draw a new course line from your position to the goal and abandon the original. Remember, your compass heading will now be different.

FOLLOW CLOUD STREETS

Cloud streets tend to line up with the wind. It usually pays off to follow the streets even if they are as much as 30 degrees off track, but don't get too far off-course and cross over to the next street at 90 degrees so as to spend the least amount of time in the sinking air between the streets. The rate of sink between well-developed streets is likely to be much greater than what we normally encountered between cu's.

STREETS ON BLUE DAYS

If the wind is 15 knots or more the thermals are likely to form in streets aligned with the wind direction, notwithstanding the absence of clouds.

UTILIZING CLOUD STREETS 90 DEGREES OFF-COURSE

Once in a while a cloud street as much as 90 degrees to the intended track can be helpful. Suppose you are about to cross a sizable hole on a day with a strong cross wind. If there is a good, solid looking street going upwind at the edge of the hole, if it is good enough to enable straight cruising at cloud base, it can be worthwhile to follow it upwind for a few miles. You can then set off across the blue with a bit of a tail wind.

FOLLOW TERRAIN FEATURES ON BLUE DAYS

Don't be discouraged by the absence of clouds. Paul Bikle once remarked that the advantage of blue days is that you don't waste a lot of time chasing after dead cu's. Most thermals drift along the terrain unable to break free of the surface tension of the boundary layer until they are triggered by terrain features, such as rivers, the border line of wooded areas, the up-wind shore line of lakes, the end of ridges, etc., bubbles can also be released by a tractor driving across a field. It is even possible for you to trigger your own thermal by flying through a bubble which hasn't reached the buoyancy to break free on its own. Then of course, there are the more obvious sources such as ridges facing the sun, slopes facing into the wind and gullies in ridges, dark patches, towns and ripe wheat fields. Conesus is a good example of the effect of a lake with a northwest wind the thermals are triggered by the dome of cold air over the lake and a line of cu's can often be seen along the length of the lake.

WATCH CONDITIONS AHEAD WHILE CIRCLING

You should know where to go before reaching the top of your climb. While circling it is a good idea to select a couple of cu's in the direction you are going and monitor their development every 360 degrees. This is sort of time-lapse photography and you will get a good idea of their development.

JUDGING DISTANCE TO CLOUDS

Judging the distance to the next cloud can best be done by looking at the shadow on the ground. Also, when close to cloud base, the best indication as to how the cu's line up and direction of cloud streets is to look at the shadows.

EVALUATING CLOUDS

When the sun is low, as in mid-October, the clouds will appear to be better defined when looking toward the sun than they do when looking away from the sun.

LINE UP WITH STREETS BEFORE YOU REACH THEM

If there is a cloud street ahead, you can increase the likelihood of flying in better air if you line up with the street long before you actually reach the clouds.

THINK AHEAD

You should always know where you want to be 2, 5 and 10 minutes ahead. Never get behind the glider. Before you leave a thermal you should not only have one cu selected but one or two back-ups in case the first doesn't work, and if all goes to pot, where to find a suitable field.

RIDGES AS LAST MINUTE SAVES

A ridge can often be used to prevent a premature landing. If there are ridges in your area, always plan ahead so that you can reach a workable ridge if all else fails, preferably one with a suitable field at the base. A thermal will ruffle the treetops in a rotary motion as it drifts across a ridge. If you are ridge soaring, waiting for a thermal to come by, this kind of vortex in the treetops is a helpful sign. When hunting on a ridge, hawks tend to hover directly into the wind, making an excellent weather vane, a good indicator of the angle of the wind to the ridge.

PLACES TO AVOID

Lakes, even small lakes, if they are elongated and the wind direction is along the lake, can create a significant area of stable air down-wind. Another situation, which can be troublesome, is to get caught down-wind of down-sloping terrain. This also will stabilize the air mass inhibiting convection. Expect weaker conditions over wet terrain.

KEEP TRACK OF WINDSPEED AND DIRECTION

A change in wind direction will influence the relationship of lift to the clouds. Also, should you get to the point where you need to evaluate fields, you ought to know the direction you will want to land in

HOW FAST? –OBJECTIVE

As you leave each thermal, the objective is to get to the TOP of the next one as fast as possible.

MacCREADY RING

Back in the early fifties Paul MacCready determined that there is an optimum speed to fly between thermals and that that speed is based on three things; the performance of the glider, the rate of sinking air between thermals and the strength of the next thermal. To display this optimum speed he devised a speed-to-fly ring consisting of a rotary ring fitted around the variometer, calibrated for the specific glider. You set the ring to the expected rate of climb of the next thermal and the variometer needle will point to the optimum interthermal speed. This circular slide rule has now been replaced by computers but we still have to enter the thermal strength.

MacCREADY SETTING

Conventionally the MacReady setting is based on the last climb. This is all well and good if you are flying in reasonably uniform conditions, where you can expect the next thermal to resemble the one you just left. However, there are many days in the eastern part of the country where this is not the case. Keep in mind that the thermal you just left is history. It is really the strength of the next thermal that matters, and using your estimate as to what that might be can often provide a more sensible MacReady value than blindly using the rate of the previous climb. A simplified criteria for establishing the MacCready setting is to set it at the rate of climb you are willing to stop for.

AVERAGE RATE OF CLIMB

Don't be misled by the variometer. The average rate of climb is the altitude gained divided by the total time associated with a thermal, including the time spent centering, which turns out to be about half of what the averager indicates during the better part of the thermal.

CORRECT INTERTHERMAL SPEED

The good news is that adhering to the optimum speed between thermals is really not all that critical. If we stray as much as plus or minus 10 mph from the correct speed it will not significantly impact the average speed achieved. Chances are that you will do better to err on the slow side rather going too fast. Most often the air we fly through has a greater impact on the optimum airspeed than the estimated rate of climb in the next thermal. Be sure to slow down in reduced sink and speed up when the rate of sink increases. However, when slowing down, even when going through lift, don't get below the speed for best L.D., the loss of altitude if entering sink at minimum airspeed will be excessive. *The main thing is to be sensitive to the air you are flying through and adjust the airspeed accordingly.*

BE PREPARED TO CHANGE GEAR

You constantly need to be alert for changing conditions, If for instance, the clouds ahead seem to be down-cycling, you may want to slow down. A couple of cu's in a row with no lift may also be an indication of deteriorating conditions, slow down, and of course, if you are about to cross a sizable hole it will be prudent to get down to the speed for best L.D. Conversely, you may have had to shift to survival mode crossing a soft stretch, but you must be prepared to start pushing again as soon as conditions improve.

WHEN TO THERMAL—MINIMIZE CIRCLING

Keep in mind that whenever you are circling you are going nowhere. Consequently, you want to be sure that whatever circling you do is worthwhile. Every time we stop for a thermal there will be time spent centering. For this reason it pays to take as few thermals as possible.

DECIDE ON A MINIMUM RATE OF CLIMB

During the half hour you spend locally evaluating conditions, prior to starting, also decide on the minimum rate of climb you will be willing to stop for.

THE ACCEPTABLE RATE OF CLIMB VARIES WITH ALTITUDE

The closer you are to cloud base, the more selective you should be. Lets say that shortly after pushing off at cloud base after a 5 kt. rate of climb you encounter another thermal of the same caliber after only losing 500 ft. You may consider "S" turning through it, but anything else would be a waste of time. A thousand feet further down it may be advantageous to stop for another 5 kt. climb but you may be too high for a 3 kt. thermal, and so forth. Eventually you may get as low as you want to get, in which case you will be willing to stop for anything. Another situation to guard against is the tendency to hang on to a mediocre thermal, from a low save, after reaching an altitude at which you would have passed up a thermal of this strength had you encountered it while cruising

OPERATING BAND

Conventional practice is to consider the operating band to be the upper two thirds of the convection layer. If the maximum altitude is 6000 ft., the operating band should be 2000 to 6000 ft. Spacing of thermals is proportional to the height of the convection layer (there are few things in gliding which are certain, but this is one of them). This is the reason cross-country flights are possible even when cloud base is low, as the thermals will be closely spaced. Conversely, expect a long way between thermals when cloud base is high. So if you find yourself at 2000 ft. on a day when it goes to 8000 ft. you may be in trouble.

BIRDS AND OTHER SAILPLANES

A soaring bird circling is a good indication of a worthwhile thermal. A circling sailplane may not be. Avoid needless detours. Before joining another sailplane, be certain that it is indeed climbing. On the other hand, if it is climbing don't waste any time, join up as quickly as possible.

OTHER GLIDER AS A THERMAL PROBE

Sharing a thermal with another glider is like having a remote thermal probe to indicate where the best air is. It works better than any variometer. By closely watching the vertical displacement of the other glider around the circle you will get a perfect picture of the lift distribution. But for this to work you must be at the same altitude. It is important to be comfortable in the company of other gliders. If this is a problem for you, get help from an instructor.

WHEN TO LEAVE A THERMAL

It is time to push on when the rate of climb drops to two thirds of the mean. There are of course times when it makes sense to climb to the top, as when faced with a hole or when approaching deteriorating conditions.

HOW TO LEAVE A THERMAL

Having decided it is time to leave, make one more 180 degree, then tighten the turn so as to get on course, going straight thru the thermal and picking up speed in the process. It is always best if you can have your cruising speed established before entering the sink surrounding the thermal. Unfortunately, this technique must not be used if you are sharing the thermal with someone else. If there is a lot of dead air ahead there is another trick you can use to get a bit more advantage before casting off, but it requires a strong thermal which doesn't weaken at cloud base. What you do is make an extra turn or two after your climb is restricted, converting the lift to extra speed before setting course. Again, don't try this with someone else around.

WHAT TO DO DEPENDS ON WHAT LIES AHEAD

Situation awareness is crucial at all times. Remember, what you do at any given time depends on what the conditions look like on course. As stated previously always be (think) ahead of the glider.

IF YOU GET LOW

In the interest of safety, as you reach the 1500 ft. level the most important thing you can do is to turn the radio off. Being low on a cross-country flight will probably provide the most demanding situation you will ever encounter in your flying career. Aside from trying to stay up, you must also go through the process of selecting a suitable field, just in case, with the myriad of tasks that entails. You will definitely not be in need of other things to occupy your mind. The radio will not help you stay up. Nor will it help you land. It will only distract your attention from the task at hand, at a time when you can ill afford it. There will be plenty of time to contact your crew later.

PRACTICE FOR CROSS-COUNTRY WHILE FLYING LOCAL

First, let's define local flying. Local flying is by no means restricted to the perimeter of the airport. It simply means that we are within glide ratio of the airport with some allowance for the pattern and other eventualities. Even with a moderate glide ratio of 30:1 this gives us a considerable area to practice in. The objective of practicing is to have as few untried skills to cope with as possible when the time comes.

Local flying is generally detrimental to cross-country. It is all very well and wonderful to float around at cloud base over the airport enjoying the view, but you don't learn much. Worse, because there is little incentive to optimize performance, bad habits, which are not always easy to break, tend to creep in. To be beneficial each flight should have an objective.

SET ALTIMETER TO SEA LEVEL

Set the altimeter to S.L. on all flights. Chances are that when you go cross-country, there will be other gliders around. So when someone announces being in your proximity at a certain altitude it's nice to be using the same language.

THERMALLING AND CRUISING

If you have done a lot of local flying chances are that you thermal and cruise at the same speed. Also, you probably do not bank steep enough to maximize your climbs. Because of the low stalling speed of a trainer with a light wing loading, it will climb reasonably well with moderately banked turns, but a higher performance glider needs to be banked rather steeply to climb efficiently. Also, get accustomed to increasing the speed between thermals. Even if you don't bother with MacCready settings you can improve your performance by simply making a guesstimate. If in a modern glider, you won't be too far wrong with an interthermal speed in the range of 65 kts, on a day with 200 ft/min thermals and about 80 kts if the rate of climb averages 400ft/min. The K-21 does not do well much above 65 kts..

ALWAYS CARRY A MAP

Point the map in the direction of flight. Practice map reading, noting relative terrain features and how they relate to the map.

ALWAYS CARRY A CAMERA

Naturally it should be mounted in accordance with FAI guidelines. Taking turn point pictures is not as easy as you might think. Fortunately, this is something that can be practiced right at the home airport and well worth the effort. There are few things more exasperating than making an FAI qualifying flight only to have it rejected due to unacceptable turn point pictures. However, this means T.P. verification is rapidly becoming obsolete.

OPTIMIZE EVERY THERMAL

Never be satisfied.

LOCATING AND CENTERING THERMALS

To effectively practice locating and centering thermals limit your climbs say to 2500 ft. then spoiler down to about 1500 ft. and look for another thermal.

PRACTICE NOT CIRCLING

Take the first thermal to the top. Then see how long you can stay up without circling. This exercise makes you more keenly aware of the conditions and the importance of planning ahead. This is something you can practice very nicely when flying passengers, in case you are involved with this activity at your club. Passengers generally do not like going around in circles and if you keep them up for more than 25 minutes they either get sick or bored or both.

LEAVE THE THERMALS EFFICIENTLY

Practice leaving the thermals as you would on a cross-country flight, but don't cut through the center if you are sharing the thermal with someone else. Get in a habit of leaving the thermals as soon as the rate of climb drops down to two thirds.

ALWAYS CARRY A BAROGRAPH

A barograph trace will show if you exit the thermals in an expedient fashion. The trace at the top of each climb should be in the form of a sharp peak. Rounded tops are a sure signs that you linger too long. It is also important to get accustomed to operating the barograph and preparing the barogram.

GPS

If you plan to use a GPS you should get well acquainted with it while flying local. Learning to operate the GPS on your first cross-country is definitely not a good idea.

CONCENTRATE ON EFFICIENT FLYING

Be selective, use only the strongest thermals. It is easy to drift into complacency when flying locally. Don't get in the habit of being content simply to stay up.

KEEP TRACK OF CONDITIONS

Keep track of conditions while you are climbing so that you know where to go next, before you reach the top of your thermal, just as you would on a cross-country flight.

FINAL GLIDES

One of the most difficult things to judge is the distance a sailplane can cover from any given altitude. The only way to develop this judgment is to make a lot of final glides. Fortunately, there is really no reason why we can't finish every local flight with a final glide. When it is time to come down, get yourself some distance away e.g. 10 miles out at 4000 ft. this should get you home with 2000 ft. in hand, which is a sensible plan for the first few attempts. As you gain confidence you can plan to arrive with 1500 ft. but this is the minimum until you are approved for cross-country.

MINI TRIANGLES

Practicing triangles with turn points between 6 and 10 miles from the airport is an excellent way to monitor your progress. Establish a start and a finish line and be sure to take turn point pictures or use GPS T.P. verification.

GLIDER FLYING IS THE NEAREST YOU CAN
GET TO HEAVEN WITH YOUR CLOTHES ON.
……HANS CHRISTENSEN

RACING VERSUS CROSS-SOUNTRY

You may say, "All this business of optimum cruising, being selective, etc., is all very well but I am not interested in racing, I just want to go cross-country."

As mentioned earlier, on the average soaring day in the eastern part of the country we are typically blessed with a 15 mph wind. In the old days when most of our flights were down-wind dashes we could afford to stay with every scrap of lift and not worry so much about efficient flying. Even if we only managed 25 mph with a 15 mph tail wind we would nevertheless cover a respectable 160 miles in a four hour flight. However, now that closed circuit flights have become fashionable we do need to at least practice some of the techniques used in racing, to some extent. The same performance which netted 160 miles with a 15 mph tail wind would only get you 64 miles on an into the win, out & return.

OPTIMIZING YOUR RATE OF CLIMB

PREREQUISITE

Instrumentation

Efficient thermalling is virtually impossible without a total energy compensated variometer as any variation in airspeed will give false readings as to lift distribution. As we must be vigilant at all times for other traffic and at the same time monitor the variometer constantly, an audio variometer is also essential.

Skill Level

The prerequisite for being able to center thermals with a reasonable level of efficiency is the ability to make well banked, coordinated, steady speed turns in either direction.

In addition to increasing the rate of sink, any slipping and skidding also changes the noise level, which is a major input we use in controlling the airspeed.

Skill Level (con't)

It is absolutely essential to maintain a constant airspeed, as any variation in speed will skew the circle, making it impossible to keep track of our path.

Being proficient and comfortable at turning in either direction is important, as when entering a thermal it generally pays to turn in the direction of the rising wing, as this ought to be the side the thermal is on. Accordingly, you will be greatly handicapped if you have a weak side, you should therefore practice your weak side at every opportunity until you feel equally comfortable turning either way.

DIRECTION OF TURN

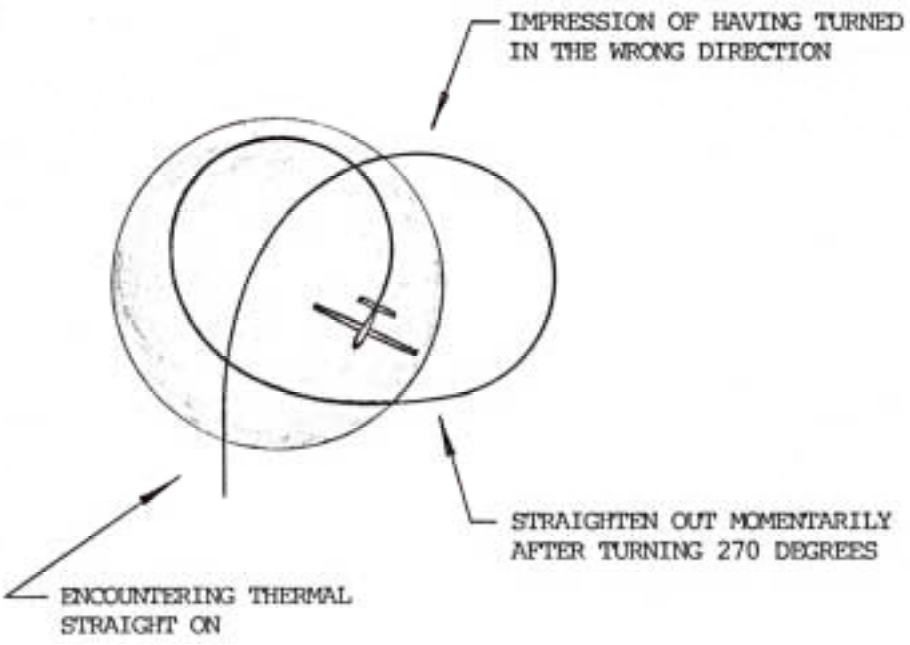
The first indication that lift is near is an increase in the rate of sink. If you are heading in the right direction you are likely to encounter some turbulence as the rate of sink diminishes – now get ready and pay close attention to which wing wants to come up as that will be the direction in which you will want to turn. Nonetheless, in spite of having turned toward the rising wing you will, in all likelihood, get the impression that you have turned in the wrong direction. By the way, the chances are this will happen nine out of ten times. But don't worry, this happens not only to you, this happens to everybody, and there is a logical reason for this. In years past, when we would draw our flight path on a piece of paper, we would depict a turn entered from a straight path by a concentric circle tangential to a straight line. This, of course, is impossible. The path from the point where the turn is initiated to the point where the bank is established is not circular but elliptical, thus, even though we turned in the right direction we may come out the side, creating the impression we went the wrong way. This is the reason it most often is necessary to straighten out completely after 270 degrees for a second or two and then tighten the turn as the rate of climb increases. With a little bit of luck, this should place you closer to the center.

One mistake, which is often made, is to change direction of turn. In the rare instances when this maneuver is successful it is generally attributable to pure luck, in accidentally stumbling into another core, as a means of centering it is useless.

WHEN LOW

If at 1200 ft. or less, rule number one is: don't leave what you have for something better. You may even be loosing slightly at first, but nine times out of ten, if you stay with it, the rate of climb will gradually improve as you work your way toward the center.

WHEN LOW (con't)



AIRSPEED

It is said that you should speed up in sink and slow up in lift, which is all well and good but that does not apply in thermals. I have had the thrill, on a number of occasions of occupying the rear seat with a novice in the front who attempted to apply this technique. The demonstration resembled a roller coaster ride and, of course obliterated any sense of lift distribution.

The airspeed should be constant, and the optimum speed will depend on the type of glider and angle of bank. Some gliders do best if flown near the stalling speed, yet others climb better if flown a little faster. It is imperative that you not be afraid of stalling the glider. If you have a fear of stalling, you most certainly will tend to fly too fast, and many pilots do.

As we all know, the stalling speed increases with the rate of bank, so more speed is required as we tighten the turn. When low, don't forget to add some extra speed in the interest of safety.

ANGLE OF BANK

The most common mistake is not banking steep enough. Except when flying a glider with a really light wing loading, such as a 1-26 or a 2-33 it is simply not possible to stay within the size of thermals we typically have to cope with in the north-eastern part of this country. If your angle of bank is not at least 35 degrees you are going to fall out of the thermal somewhere along the way.

ANGLE OF BANK (con't)

Keep in mind that 35 degrees of bank will seem like 45. Thermals, of course, vary in size and structure. If the thermal is fairly big 35 degrees of bank might be optimum, if it's smaller or there is a strong gradient in the distribution of lift, i.e. the lift is considerably stronger in the core, the rate of climb will improve as you tighten the turn. The ideal angle of bank will be somewhere between 35 and 55 degrees. Beyond 55 degrees the sink rate gets to be excessive.

Tight turns are especially needed when attempting a low save, not only because thermals are smaller in diameter close to the ground, but also from the standpoint of safety. Stall recovery from a steeply banked turn is crisp and instantaneous, with very little if any loss of altitude, this is not the case if stalling from a gently banked turn. Flat, slow turns close to the ground have brought many a pilot to a bad end.

WHEN TO TURN

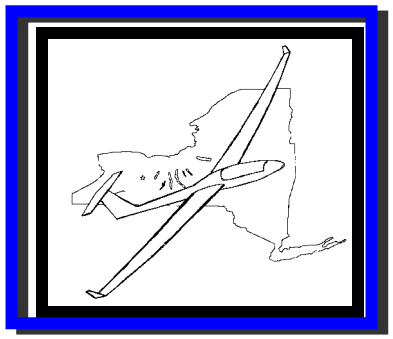
The question is often asked, should you turn right away when encountering a thermal, or wait a few seconds. It depends, if you are low and looking for a save the best bet is to turn right away, any hesitation and there is a good chance you may miss it all together. On the other hand, at higher altitudes there are a number of reasons why you should hold off for a few seconds; you probably have some idea of the kind of lift you can expect based on your experience for that day or by the shape of the cloud, hold off until the rate of climb approaches your expectation; if it's a huge cloud, some exploring is generally required to seek out the strongest cell. If on a cross-country flight you wouldn't want to turn until you reach the minimum rate of climb you are looking for. However, when you do turn, do so aggressively and establish an angle of bank of no less than 35 degrees right away. In all likelihood it will be necessary to straighten out momentarily after completing 270 degrees of the circle, as we discussed earlier.

OPTIMIZING THE CLIMB

The first objective is to form a mental picture as to the lift distribution, and then continue to shift your circle, in small increments in the direction of the strongest lift.

If the variometer actually shows sink on part of the circle you need to take more drastic corrective action and straighten out completely to move the circle away from the sink, toward the good side. Don't make the mistake of tightening the turn when you are in the sink in an effort to expedite the process of getting back into the lift, if you hold the turn on a bit too long it may have the effect of centering in the sink, simply maintain the same angle of bank till it's time to straighten out. In this situation it's a common mistake not to move over far enough so that you wind up going through the same sink twice. (see Part II)

End Part I



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Kai Gertsen has logged more than enough miles in a glider to fly around the World…four times. Kai Gertsen has prepared a booklet on Cross-country soaring.
Your editors feel that the info in that booklet would be of interest to every pilot and will present it here with current additions and revisions.

INTRODUCTION
to
CROSS-COUNTRY SOARING (Part II)

OPTIMIZING THE CLIMB (con't)

(continued from Part I)…… I think every glider pilot should have a plaque right across the instrument panel, as a reminder, "I will never fly through the same sink twice."

Once we are within the confines of a thermal, there are two techniques for optimizing the rate of climb, which at first, seem to be contradictory. One theory says to widen out the turn when the lift is increasing and the other says that you should tighten the turn when the lift is the strongest, both theories are correct. The key words here are "increasing" and "strongest". When the lift is increasing, flatten out the turn to move your circle in that direction. When the rate of climb reaches it's peak, tighten the turn immediately, make the glider stand on it's wing, because this is where you want to be. The trick here is to know when you have reached the strongest lift.

When you feel a surge, that is the strongest bit, it's not likely to get any better beyond that, so dig the wing in right there. Keep in mind that you only want to be circling tight as long as the rate of climb is at maximum, as soon as it drops off a little widen the turn out slightly, this should either bring you back to center or bring you in contact with another core, then tighten the turn again on the next surge

Thermals unfortunately, are not the nice well defined, smooth columns of rising air that we like to depict them to be, but consist of a turbulent mass of bubbles and individual cores, this is the reason centering is a never ending process, you are not likely to experience a fixed rate of climb all the way around for very long. One key to maximizing the rate of climb is to never be satisfied. Centering is an endless process that requires total concentration.

When maneuvering within a thermal, control movements have to be timely but smooth and not excessive. Any control movement causes drag, which in turn increases the rate of sink. Be careful not to over control. Look at it this way, if you are sharing a thermal with another pilot he should not be able to see any control movements.

SUMMARY

- **If you have the opportunity, release in a thermal.**
- **Other than when releasing in a thermal always turn toward the rising wing.**
- **When encountering a thermal low, do not hesitate to turn immediately.**
- **If you have enough altitude, don't turn until the climb rate approaches your expectations.**
- **When you decide to turn, bank steeply right away, 35 degrees minimum, if you get the impression of having turned in the wrong direction, straighten out momentarily after 270 degrees.**
- **Do not change direction of turn.**
- **Shift aggressively if there is sink on one side. Never go thru the same sink twice.**
- **If there is some lift all around, shift in small increments.**
- **Do not over-control. Control movements must be timely but no more than needed.**
- **When lift is increasing, reduce the bank to move the circle in that direction.**
- **Tighten the turn on the surge, (when the lift is strongest) and decrease the angle of bank slightly when the lift drops off. Then tighten again on the next surge.**
- **Concentrate and never be satisfied.**
- **If low, steeper turns are needed, and safer.**
- **If you are low, do not leave what you have for something better.**

I WOULD RATHER BE IN MY GLIDER AND THINK ABOUT GOD, THAN BE IN CHURCH AND THINK ABOUT MY GLIDER

…..ARNE J. BOYE-MOELLER

WHAT YOU DON'T KNOW CAN'T HURT YOU, UNLESS YOU'RE STILL ALIVE

…..ALEX AYRES

OFF-AIRPORT LANDINGS

I am reasonably qualified to address this subject, having made, at this point in time, 165 off-airport landings and having probably picked ten times that number of fields. Consequently, most of the following material is based on personal experience including that in the "must never do" category. Naturally, it is impossible for anyone to have been exposed to all possible scenarios, even in a lifetime of cross-country flying, so some of the material is derived from other pilot's encounters

KAI GERTSEN

WARNING

There will be a test after this study. It will take place at your first off-field landing and failing is not an option.

WHY YOU SHOULD BE PREPARED

Although you may not deliberately set off cross-country, an off-airport landing is always a possibility when flying an airplane. When flying locally, unless you always fly directly over the airport, there is always the potential for misjudging wind velocity of encountering excessive sink and thus finding yourself too low and too far away to get back to the airport. Selecting a field and landing safely while there is still adequate altitude to do so, is much safer than attempting to stretch a glide to the airport with marginal altitude. Also, there is the possibility of a rain or snow shower engulfing the airport, reducing visibility to impossible levels. Again, selecting a field in the clear rather than risking a landing in hazardous conditions at the airport is a much better option. Be especially vigilant of snow showers, they can be treacherous, reducing visibility to zero in less than a minute.

Some years ago we were selling our K-6. A fellow showed up and said he was interested, could he fly it? We didn't see why not and gave him a tow. Just then a snow squall moved in and he disappeared and did not return. This was somewhat disconcerting, this fellow whom we had never seen before, didn't even know his name, had vanished with our glider. An hour or so later we got a phone call. He had taken the proper course of action and landed in the clear 9 miles away.

CONTEMPLATING CROSS-COUNTRY???

There are many pilots who deprive themselves of the exhilaration and rewards of cross-country soaring because of their anxiety regarding off-airport landings and that is needless and regrettable. Cross-country flying is really what soaring is all about. Of course, it is possible to venture out away from home with virtually no risk of landing at someplace other than at an airport by using the method of "airport hopping". Nevertheless, serious cross-country flying cannot be done without the prospect of the occasional visit to a farmer. Unquestionably, landing in a farmer's field does entail a higher level of risk than landing at an airport, but with proper preparation it can be done with an acceptable level of risk.

Luck plays a surprisingly small role in the safety aspect of off-field landings. Ninety-nine percent is know-how, preparation and skill.

PREPARATION

Proficiency can only be acquired through practice and mental preparation. Some skills needed for successful off-airport landings can be practiced without straying beyond gliding distance from the home airport. But unfortunately there will be no opportunity to practice a lot of the situations with which we may be faced. The best we can do is to collect all the information available on the subject and contemplate various situations which may be encountered when facing an out-landing such as; type of surface, slope, obstructions, etc., and envisioning the correct action, thereby getting ourselves mentally prepared.

SOME PREREQUISITES

As you will come to realize as you progress through this material there are a few personal traits which are rather essential such as, being disciplined and yet, at the same time having the ability to be flexible. What's more, no amount of preparation will do much good without the application of "situation awareness".

THINKING AHEAD

Your mind must always be ahead of the sailplane, e.g. "If the present course is maintained and the present conditions (sink rate, ground speed, etc.) persist, where will you be one, two, and ten minutes from now?" Always remember, you fly a glider with your head, not your hands. Never let the glider take you somewhere your brain didn't get to five minutes earlier.

SERIOUS HAZARDS

Now that I have told you how safely this can be done, I'll highlight the hazards. (*I thought I would cover this while I have your attention)*

The most dangerous hazards to off-airport landings are:

- **WIRES**
- **FENCES**
- **SLOPES**

Learn to avoid the first two, and to cope with the third, and the chance of ever causing serious damage to the glider and yourself is minimal.

WIRES

Wires-the invisible foe--If there are wires on the approach, chances are you will not see them soon enough to react. When we look at wires from the ground they are quite visible. So, what are we talking about "the invisible foe?" The problem is that when we are in the process of landing we are not viewing them with the sky in the background but against trees, earth, crops, etc., which tends to camouflage wires very nicely. To assure we never make an unpleasant discovery, we must pretend there *are* wires where they are likely to be.

I have, on several occasions, skirted imaginary wires and, to my astonishment after landing, found them to be real.

There are likely to be wires:

- **Between two poles**
- **Between a pole and a group of trees (it is not uncommon to find a telephone pole hidden by a tree or trees**
- **Between a road and a house**
- **Over any road**
- **Going into any building**
- **Pretend there is a wire there, then fly the pattern accordingly. It is not advisable to fly under the wire or wires as there could be a wire half way up the utility poles**
- **If you must make your final approach over high tension power lines be sure to allow for the thin ground wire above the power cables. Beware, the heavy-duty power cables tend to catch your attention.**

FENCES

We are not so much concerned with wooden fences or fences with wooden posts, not that we want to run into them but that they are quite obvious and should be readily avoidable. The fences we are especially concerned with are the single strand electric fences with thin steel posts. They can literally be invisible and deadly. Not that I want to over-dramatize the subject, but some unfortunates have been decapitated. (In Belgium all gliders must have a steel cage inside the canopy, by law). Just how difficult it is to see depends a lot on the lighting and the background.

To avoid ever encountering this hazard:

- **Never land or roll across two different crops.**
- **A slightly different textured surface in one section of a field may indicate the presence of a fence, never cross such a boundary.**

If you are approaching a fence on the roll-out and you realize that you are not going to be able to stop in time the best course of action will be to ground loop the glider. Anything is better than to run into a wire fence, but remember to push the stick forward at the same time you put one wing down, to lift the tail off the ground. This will prevent the fuselage from breaking.

SLOPES

Whenever possible pick a field in a valley. In the Northeast the terrain on the high ground tends to be rather hilly. Fields in the valleys are more flat and level, they also tend to be bigger. Furthermore, you will have more altitude available in which to find a thermal!

Here are some tips on how to detect and deal slopes:

- **When evaluating a field never fly directly over it, as this makes it impossible to detect any slope. The field should be viewed from an angle of about 30 degrees from horizontal. Flying directly above a field which you are contemplating is a waste of time.**
- **To get some idea of the general slope of the terrain, a creek can be expected to be at the lowest local elevation.**
- **Any slope detectable from the air will be steeper than you think.**
- **Any detectable slope will be too steep for a downhill landing.**
- **If there is any slope at all, you must land up-hill regardless of wind direction.**

This can be a tricky operation and as with so many other skills we talk about, we don't have much opportunity to practice. Yet, it is imperative that we get it right. During an up-hill landing it is crucial to pick up extra speed on final so as to be able to fly up-hill parallel to the ground, prior to flaring. You must avoid flaring into the hill, people have sustained serious injury from doing this. The final should be started at the same place in the pattern as you normally do and at the same height, then get the nose down to build up extra speed. What makes this maneuver even more challenging is that a

SLOPES (con't)

strong illusion comes into play. When looking at an up-hill slope in final you will get a distinct impression that the glider is more nose-down than it is. Be sure to monitor the airspeed indicator. Go easy on the spoilers, chances are you may not need them at all. The speed will dissipate in a hurry once you start going up-hill.

Landing across a slope is not advisable. However, you could be faced with a situation where there is no other choice. If you must land on a cross-slope, keep in mind that the glider simply will not fly straight with one wing down. Landing from a conventional, straight approach will most certainly result in a vigorous ground loop. The only hope is to make the final in a turn to match the slope, a tricky business. The touchdown must be on the upward portion of the slope so as to avoid rolling down hill.

WIND DIRECTION

- **Check wind direction periodically during any flight.** ***If you already know in which direction you will want to land that will be one less thing you need to sort out if or when you get to the level where you need to look for fields, For example, my thought process during a flight usually goes something like this: "If I need to land any time soon, I'll need to have the sun over my left shoulder."***
- **Drift when thermalling is a good indication of wind strength.**
- **Smoke is the best indicator, but there are not as many smoke stacks as there used to be.**
- **On a pond or lake surface, a wind shadow (calm area) will be next to the upwind shore,**
- **Drift of cloud shadows across the terrain. Keep in mind that there can be a difference between surface and altitude wind direction.**
- **When ridge soaring, the wind in a narrow valley between two ridges will be parallel with the valley.**
- **When hawks hunt on a ridge they tend to hover directly into the wind making excellent weather vanes.**
- **Waves in high crops, grass or trees**

FIELD SELECTION

- **Do not rely on small private airports, unless you have checked out in advance or the runway is obviously wide enough (the width of the mowed runway is often only wide enough for a tricycle landing gear and too narrow for a 50 ft. wingspan. A mowed hay field is generally a better choice).**
- **Use visual judgment- not the altimeter.**
- **Be conscious of the terrain at all times.**
- **Look for a group of fields when down to 2000 ft. AGL. Never rely on a single field in the midst of hostile terrain.**

FIELD SELECTION (con't)

- **Retrieve convenience should never be considered when selecting a field. Always select the best and biggest field within reach regardless of convenience of roads, gates, restaurants, bars etc. There are enough terrain features to deal cope with as it is.**
- **If the farmer can get his equipment in to cultivate it, you can get the sailplane out.**
- **Weighing a potential unsuccessful landing versus a cumbersome retrieve is a poor gamble. Even a ten hour retrieve is insignificant compared with damage to the sailplane.**
- **If you spot a high-tension wire pylon, look for others. You want to be sure you know where they are.**
- **At 1500 ft. turn the radio off. (*The radio will not help you to land or stay up and those are the only two things that matter. Even listening to the radio is distracting. Getting low away from home is the most stressful situation you are likely to encounter in your soaring career and the tasks at hand will require your undivided attention. People have crashed because of being preoccupied with the radio).***
- **Once a field has been selected stick to it. This is not the time for indecision. On closer scrutiny you may discover some obstacles or troublesome features you did not notice earlier but your best course of action is to make the best of it. Do whatever needs to be done to cope with it, trying to find an alternate field at this stage would be inviting disaster. From 1000 ft. you have only about a minute until it is time to start the pattern.**
- **Once a field has been selected, you can consider it your base of operation and look for lift, but be sure you can reach the I.P. with proper altitude.**
- **On your first few off-field landings do not attempt to prolong the flight below 800 ft. Once you reach that level consider the flight over and concentrate on the field and making a safe landing.**

LOW SAVES

Many flights have come to a bad end because the pilot attempted to climb away from an impossibly low altitude. Consequently, an in-depth discussion on the subject is prudent.

At contest, we are often enthralled by spellbinding accounts of heroic saves from 97 feet. However, it should be mentioned that some glider pilots have been known, on rare occasions, to stray ever so slightly from the factual truth when relating their aeronautical adventures. Also, you need to know that there is, in fact, an amazing illusion, which mysteriously comes into play in these situations, which is, this 400 feet actually looks like 97 feet.

LOW SAVES (con't)

In discussions on the subject of off-airport landings we often neglect to mention that the optimum course of action, when faced with a field landing is, of course, to not land. So, if a climb–out is feasible and it is within your capabilities to do so safely, it should be attempted. Naturally, there will come a time when all efforts to continue the flight must be abandoned so as not to compromise a safe landing, and that's the big question, when must we commit to land?

Pundits are often asked, "How low is it safe to thermal?" But this question hardly ever brings forth a definite response. Most often the question is evaded entirely. The reason this question fails to bring forth a nice, firm, quantitative answer which you can neatly tuck away and have handy when needed, is that there isn't one. The altitude at which the decision should be made to discontinue the flight depends on several factors such as experience, currency, and familiarity with the sailplane and weather conditions.

EXTRA AIRSPEED AND WELL-BANKED TURNS

Low-level thermalling should always be performed using well-banked turns with an additional 5 to 10 kts of airspeed. One of the most frequent causes of stall and spin accidents is circling close to the ground in gently banked turns, near the stalling speed. In a sailplane, it is far easier to stall and spin from a gentle turn than from a well banked one. In turns of more than about 40 degrees of bank, because of the higher stalling speed, the control response remains firm and crisp until the last moment before the stall and recovery can be made instantaneously without any loss of altitude by simply relaxing the backward pressure on the stick. In straight flight or a shallow banked turn, the stalling speed is lower and control response gets sluggish when approaching the stall. Should a stall occur, recovery couldn't be made without a significant loss of altitude.

EXPERIENCE

One prerequisite which has to be met before attempting to thermal at low altitudes is that you must be capable of flying the sailplane with only occasional glances at the instrument panel as 99% of your attention has to be directed outside. *An audio variometer is essential.*

You may have acquired the level of proficiency outlined above, but if you get down to 800 ft. on any of your first few cross countries, by all means abandon the flight and concentrate on the pattern. Those first off-airport landings will tax your capabilities without further challenges. Do not attempt to thermal below 800 ft. until you have a handful of field landings under your belt and begin to feel a little more comfortable in these situations. That is, sheer terror has been replaced by just a normal state of panic.

CURRENCY

You made good progress last year and reached new levels of performance. Now it is Spring and you are all primed to continue where you left off, but it has been six months since you last flew. Not being current is somewhat like being slightly intoxicated. You won't notice the effect till you get in a tight situation, as for example, scratching around low down out over the boonies. So watch out, do not get too aggressive right off. Get a few hours in before getting too adventurous,

FAMILIARITY WITH THE SAILPLANE

Regardless of the level of experience you may have, if you are flying a type of glider which is unfamiliar to you it is a good idea to fly more conservatively, until you get thoroughly acquainted with the glider

SPINNING PROFICIENCY

Proficiency in spin recognition, prevention and recovery should be a prerequisite for cross-country flying, in any case. It is also important to have practiced in the glider to be flown, as spinning characteristics will vary from one glider to another. When practicing, be sure the center of gravity is where it will be during your cross-country flights. If you have never spun a glider, be sure to get some spin training in a two-seater with a qualified instructor prior practicing on your own.

WEATHER CONDITIONS

There are a few days in the eastern part of the country when we are faced with high winds, standing waves and rotor turbulence. These conditions are primarily confined to the mountains of the Northeast and along the Appalachian ridges In those days it is not uncommon to experience a climb rate of 1000 ft. per minute or more, only to be going down at the same rate on the other half of the circle. On those days, don't even think about circling below 800 ft. You may never experience such extremes, but you need to increase your margin of safety on windy and turbulent days.

HOW LOW IS TOO LOW?

Let's assume you meet all the prerequisites. You have the experience outlined above, you are current and thoroughly familiar with the glider. You are on another cross-country flight. Things didn't go as expected, you are in the pattern to an apparent inevitable landing in an alfalfa field and you feel a surge. Should you a circle? The criteria I have used for many years is simply this, "If you can afford to lose 200 ft., try it. If you cant afford to lose 200 ft., forget it, and proceed with the pattern." Why 200 ft., you may ask? Well, on the average soaring day it is reasonable to expect areas of sink in the magnitude of 600 ft. per minute. It is also reasonable to expect that you will turn in the wrong direction, which could place you very nicely in 600 ft. per minute down. The rate of turn will probably be about 20 sec. per 360 degrees. Consequently, you may be 200 ft. lower by the time you

HOW LOW IS TOO LOW? (con't)

complete the circle. If you expected this and planned for it, you won't get into trouble. With a little bit of luck, you may find yourself going up half way around, so that you haven't lost or gained any at the completion of the circle. Incidentally, this is about the best you can hope for, as the thermals tend to be small close to the ground, so it is highly unlikely you will be climbing all the way around during the first few circles. If you can keep the variometer on zero, stay with it. It usually improves as you keep centering. However, if you continue to merely hold your own, you must be prepared to abandon the effort before you drift too far out of position in the pattern. In case you eventually are forced to give it up, your effort will not have been completely futile as it got you some extra time to further scrutinize the field and plan the approach.

Aside from your altitude, another criteria which is equally important is your position with respect to your chosen field, e.g. you may be high enough but will you be in the right place in the pattern if you lose 200 ft.?

THE CLIMB-OUT

If you do start to climb, you need to make a real effort to keep concentrating. There is a natural to heave a sigh of relief as we reach the1000 ft. level, promptly losing our concentration and the thermal. A cease of climb at a 1000 ft. or so, is not always caused by inattention. It is possible that the thermal didn't go any higher. Sometimes a thermal draws in excessive amounts of cold air and loses its buoyancy. At times like this, keep in mind that on any specific day, the thermals tend to sprout from the same spots on the ground. Consequently, if you lose the lift before you get high enough to continue on course your best bet is to go back to the spot where you found it. Chances are there will be another bubble coming along which may have enough temperature differential to continue all the way up to the inversion. At times I have had to return to the same source several times before *Remember, as always, carry a little extra speed at pattern altitude.*

CROP AND SURFACE

- **A freshly mowed hay field (without haystacks) should be your first choice.**
- **Low crops may be OK—land parallel with the furrows between the plants. If you cannot see any ground between the plants or you can see wind waving the crop, it is too high.**
- **Cultivated fields (raked) or freshly seeded will be soft.**
- **Plowed fields with deep furrows should be one of your last choices-in other words, when desperate.**

I consider a landing in a plowed field a crash landing. The question whether to extend the gear or not is debatable. One claim is that an extended gear offers more protection for the pilot. On the other hand an extended gear will bring you to a stop very fast exposing the glider to high "G" loads, one thing for certain the gear doors won't stay on.

CROP AND SURFACE (con't)

- **High crops should also be avoided.**
- **If you must land in a high crop, pretend the top of the crop to be ground level and flare accordingly.**
- **Fields with animals grazing are likely not to be cultivated and may be too rough and/or rocky for a successful landing.**
- **Horses are unpredictable and may get excited. Cows are curious, difficult to keep away from the sailplane and like to eat it. If you must leave the glider surrounded by cows, leave the radio on with the squelch turned down and the volume up, they don't like the noise. If there is a single cow in a field it's probably a bull**

FIELD SIZE

As discussed earlier, small private airports are long enough but many are too narrow. As a rough idea, if there are no obstructions on the approach, 500 ft. may be adequate. However, if there are 70 ft. high trees, you will need about 1000 ft. and if your speed control is less than perfect you may need more. But adequate size depends on a number of factors such as:

- **SLOPE**
- **WIND DIRECTION and STRENGTH**
- **OBSTRUCTIONS**
- **TYPE of SURFACE**
- **TYPE of SAILPLANE**
- **LEVEL of EXPERIENCE.**

Another glider in a field may not necessarily mean that it is good for you.

It was at a national contest and a lot of us were coming back to earth in the same area. A fellow competitor had landed ahead of me and invited me to join him but I declined. The field had been more than adequate for his ASW-20 but there was no chance of my squeezing in there with my heavy Schuman Libelle with its ineffective dive brakes.

VISUAL ILLUSIONS

A narrow field will appear to be longer than it is. A wide field will appear to be shorter than it is. If you have been low for a while, the fields will appear to be bigger. If there is a lot of wind and turbulence you jus t maintain plenty of speed throughout the pattern, right down to the hold-off. Consequently, you will need little longer field than you normally would.

PATTERN AND APPROACH

- **If possible, avoid making the approach over tall obstructions.**
- **If landing on a hill when the wind is 15 kts. or more, expect plenty of turbulence.**
- **If approaching a hill from the down-wind side, expect strong sink at the brow, and keep the base leg close in and the final short.**
- **Always use a standard pattern—this is important.**

This is not the time for the type of pattern we often witness, where the base leg is replaced by a 180 degree turn from the down-wind and the final leg is virtually obliterated as that final turn is completed at a mere 50 ft. It's a good idea to get in the habit of making proper, well defined patterns with a proper base leg and high enough to enable you to start the final leg at no less than 200 ft.. The pattern can be either right-hand or left-hand, whatever is optimum, pending wind direction and terrain. If there is a cross-wind component, make the base leg into the wind or, if there are tall obstructions on one side, fly the down-wind leg on the other.

- **Good speed control is imperative. Same as always, be sure you have extra speed in the pattern, plus additional speed as dictated by the wind and turbulence.**

Do not confuse a low energy landing with a pattern flown at minimum airspeed. Also remember that well banked turns are safer than gently banked turns.

There has been a lot of impetus on low energy landings. While it is true that modern gliders are slippery and we need to be extra careful concerning speed control it is not advisable to fly the pattern at minimum speed. You nay be at the proper position and altitude in the pattern but if your airspeed is marginal the situation can deteriorate in a hurry should you encounter some sink. With a little extra speed you are better prepared to cope with the unexpected.

The accidents which are caused by excessive speed are attributable to loss of speed control. To my knowledge no one has ever crashed due to approaching at an extra 5 or 10 kts. Select a speed based on the conditions e.g. wind, turbulence and wind gradient. Select a speed that will make you feel comfortable and in full control, then stick to it.

Be careful not to start the downwind leg too high. It should not be above 700 ft.

Some people get the idea that starting a little higher is better but it isn't, if the correct altitude is 700 ft. Then 1000 ft, is simply wrong. The down-wind leg is where you need to scrutinize the field for rocks, holes etc. and select the touch-down spot, and you'll be surprised how much detail you are going to miss from a few hundred feet further away. Starting too high will also get you out of position for the

PATTERN AND APPROACH (con't)

rest of the pattern. Maintain proper distance during the down-wind lag so as to better evaluate the field and to leave plenty of room toe that well-defined base leg.

- **The final leg should be long enough to allow for unhurried minor corrections. Don't rush the pattern. Your first land-outs are likely to be stressful experiences and you may feel an urge to get it over with. The glider will come down in due time.**
- **If you should find yourself hopelessly too high as you are about to turn onto final, implementation of "the reverse pattern technique" will save the day.**

While it is true that accidents due to overshoots are rare, they nevertheless do happen from time to time, which is a shame as they could easily be avoided.

Imagine yourself, as you are about to turn onto final, desperately too high such that even full brakes and side-slip will not prevent a crash into the boundary at the far end. Highly unlikely, you say. It may not be as unlikely as you think. Supposing, on one of your first cross-countries you are committed to a rather smallish field, you are surrounded by unfamiliar terrain and perhaps you haven't practiced landing without reference to the altimeter as often as you should have. Also, there is a tendency to fly the pattern a little higher than normal during your first off-field landings. And there you are! What do you do? The worst action you can take is to make a 360 degree turn, as it is difficult to predict the loss of altitude and there is real danger of becoming disoriented, especially in strange surroundings, which can lead to dire consequences. With the "reverse pattern technique" you can salvage the situation without stress or strain. You simply continue the base leg to the other side of the pattern, meanwhile edging slightly further back so as to make room for a 180 which will lead you onto a perfectly normal base leg from the other side. During this entire maneuver you can apply spoilers as required while constantly keeping the landing site in full view.

If you are not familiar with this technique, talk to an instructor. You may never need it, on the other hand, it may come in real handy some day, like having an ace up your sleeve.

- **If the field is small and the surface is suitable, a landing diagonally across the field will add considerable landing area. In a field 300 ft. wide and 450 ft. long, a diagonal path will add approximately 100 ft. Be sure to "clock" the pattern around to match the direction of the approach.**

PATTERN AND APPROACH (con't)

- **Although a standard pattern is important we must also be flexible. E.g. if, while on the down-wind leg you notice the field has an undulating surface with waves perhaps 50-100 ft. apart and say 20 ft. high, align diagonally across the field. The prudent thing to do, regardless of wind direction, will be to clock the pattern around such that you will be landing in line with and on top of one of the crests.**
- **If the sailplane is equipped with a retractable wheel, don't forget to lower it. This should be done at the same place in the pattern as you normally do e.g. when entering the down wind leg.**

DOWN-WIND LANDINGS

- **If the wind is minimal it may be advantageous to land down-wind.**
- **As stated previously, if landing on a slope you must land uphill no matter what the wind direction is, whether the wind is minimal or otherwise.**
- **It may be better to land down-wind with no obstructions on the approach than into the wind over tall obstructions.**
- **It may be a better choice to land down-wind in a quality field than into the wind in a marginal one.**
- **If you are landing close to sunset do not land into the sun because you will not see much of anything if you do. Fortunately by that time there is seldom mush wind.**
- **After selecting a specific touch-down and roll-out area, do not change your mind.**
- **Good speed control is imperative.**

Excessive speed on final will add considerable distance required for landing and roll-out. The objective is to touch down precisely on the spot you selected while on the down-wind leg, at minimum speed. As the amount of energy is proportional to the velocity squared- if 50 mph is the correct speed, then 60 mph is 44% too much.

- **Always use complete flare-out on every landing. If landing in high crop, be sure to flare completely above the top of the crop as if the top were the ground, as mentioned previously.**
- **Immediately after touch-down, apply brake to shorten roll-out. The longer distance you roll, the greater are the possibilities of encountering rocks and holes. So don't be clever and roll up to the gate for convenience. It may not be as convenient as you think. Supposing, within a few feet of the ground, as you are about to flare you realize that you forgot to lower the gear. Leave it alone!**

DOWN-WIND LANDINGS (con't)

Attempting to extend the gear at that point in time can easily lead to pilot induced oscillations and a hard landing. It is next to impossible to cycle the gear with one hand and remain totally steady with the other and any slight twitching will result in P.I.O.s. If this occurs before you manage to get the gear down and locked, you will be susceptible to injury. On the other hand, a smooth and gentle landing with the gear up is likely to cause very little damage, if any.

PREREQUESITE

So when will you be ready to tackle off-airport landings? Of course, you need to be signed off for X-C by an instructor. Aside from that you should be comfortable with the glider you are flying. There really are no set minimum hours. In any case, it is the number of flights that counts. If you recently have moved up to a new type the same criteria applies—Don't go cross-country until the task of flying the glider is intuitive.

AFTER LANDING

If you have landed on a private strip be sure you move the glider out of the way immediately so as not to block the runway.

During a Region III contest a competitor had landed at Avoca and left his glider in the middle of the runway. The owner came back from a trip, was not able to land on his own airport and had to go somewhere else to land. We are very fortunate in having places such as Avoca to resort to when the need arises. We must be courteous an considerate to the owners or these oases may not be available to us in the future. Also, if you are in a contest and have landed in a farmer's field, you may get company so move the glider off to one side.

- **Keep in mind that you are trespassing.**
- **If landing in a field with crop next to a busy road, try to keep spectators out of the field as they can cause considerably more damage to the crop than your landing.**
- **Always contact the owner of the field if possible.**
- **If there may be a question of crop damage, take pictures of the landing path to defend any potential insurance claim.**
- **Be sure to ask the owner of the field for the best way of getting the sailplane out and to get his permission before driving the car and trailer on into the field.**
- **Prior to making the phone call. Write down the directions to be sure they are complete and clear. Also, it is crucial to include the telephone number of the people you are with-enabling the crew to contact you in case they have any problems.**
- **At first the farmer may very well view you as a rich city playboy who has landed his expensive toy on his humble plot of land with complete disregard for other peoples property. Here are some suggestions as to how you may conduct yourself to win him over:**

AFTER LANDING (con't)

- **Be polite and courteous.**
- **Be sure to show appreciation for all his help including the use of his phone and don't forget to pay for the call.**
- **Impress upon him how fortunate you were that his field was there, enabling you to avoid a crash, and how happy you are not to have caused any damage.**
- **Emphasize how, in these rare emergencies, we always strive to avoid landing in any kind of crop**
- **Show interest in his farm. Ask questions and talk less about yourself.**
- **Take pictures of him, his family and kids next to the glider.**
- **Don't forget to get his address so you can mail him copies of the pictures and perhaps a soaring calendar at Christmas to show your gratitude.**
- **Remember-you are an ambassador for the soaring movement. The manner in which you conduct your self will be a reflection on all glider pilots.**
- **A discourteous pilot will make a lasting impression on the locals, and future visiting glider pilots will be treated accordingly. You may have had a bad day but don't take it out on the farmer.**

FINALLY

Some practical hints for the more serious cross-country pilot for whom off-airport landings are a somewhat frequent experience: Keep a small knapsack stowed in the glider- it comes in handy for carrying all miscellaneous items such as turn point cameras etc. Many pilots have returned to the ship after making the phone call to find such items missing. Carry a wet sponge in a plastic bag for wiping the bugs off the ship while waiting for the crew. This leaves much less to do after they get there.

PRACTICE

Off-airport landings require many skills. Skills are acquired through practice. Our problem is how do we achieve proficiency without crashing now and again in the beginning. Fortunately some of the skills essential to successful off-airport landings can be practiced without actually going cross-country. The following maneuvers should be practiced by anyone aspiring to fly cross-country.

GET TO KNOW THE PERFORMANCE OF YOUR SAILPLANE

Most pilots tend to underestimate the area within reach from any given altitude. As previously stated, a well-planned off-airport landing is better than trying to stretch the glide home with marginal altitude. On the other hand, it does not make sense to needlessly land out if there is enough altitude to reach the airport in safety. However, it is impossible to make the correct decision unless you know the performance of the glider. Remember, the optimum airspeed is seldom the speed for the best glide ratio. To cover the maximum distance the airspeed needs to be increased if facing a head-wind and a slower airspeed will get you further if going downwind. Also don't forget to speed up when going through sink and slow-up in

GET TO KNOW THE PERFORMANCE OF YOUR SAILPLANE (con't)

decreased sink or lift. Knowing the performance of the sailplane you are flying when going cross-country is of course essential to enable you to cross unlandable patches of terrain and to be sure that your selected potential landing sites are within reach.

Getting to know the performance of your glider is not as easy as you think, it takes a lot of final glides to make a believer of you but fortunately this is something we can practice on just about every flight. At the beginning it's a good idea to plan on getting back with 2000 ft. So when it's nearly time to come down, on a day when you can get to 4000 ft. AG, get yourself 12 miles away and see what altitude you arrive home at, chances are you will do a little better than 6 miles per 1000 ft.

ALWAYS PRACTICE PRECISION PATTERNS

There is never any reason to start a pattern with excess altitude. An attitude of indifference in this regard will not get you in trouble at home. But when going into a farmer's field, a down-wind leg initiated too soon and too high can lead to trouble.

PATTERNS WITHOUT REFERENCE TO THE ALTIMETER

As frequently as possible enter and fly your patterns without reference to the altimeter. When it's time to come down, while still at 2000 ft. or higher, tape a piece of cardboard over the altimeter. This is a well-worth-while exercise as when the time comes for the real thing, the altimeter will be useless.

LESSEN YOUR DEPENDENCE ON THE AIRSPEED INDICATOR

When the time comes to make an approach into a strange field there will be many other things requiring your attention.

PRECISION LANDINGS

Do not be satisfied with anything less than precision landings on every flight. Strive for perfection in speed control and spot landing.

COMPLETE FLARE

Complete flare with minimum touch down speed must be practiced on every landing. If flying an SGS 2-33, do not get into the habit of pushing the stick forward to stop. In a normal landing there is no urgency to bring the glider to a stop, no great harm is done by rolling another 50 ft. or so. Habits are hard to break and can resurface without warning. This habit could sneak up on you during a stressful field landing in a high performance glider, with dire consequences.

LAND AT SOME OTHER LOCATION ON THE AIRPORT

Whenever the traffic allows, land at some other location on the airport. Doing a few of these before setting off into the unknown is well worth it. It gives you the opportunity to experience a pattern over different ground features than you are accustomed to.

EVALUATE FIELDS WHILE DRIVING

Don't let the drive to the airport go to waste. Although the vantage point is not quite right, it is still worthwhile to contemplate potential scenarios. e.g. which field would be better, what would be the best approach etc. By practicing as many of the skills as possible and simulating as many of the various conditions which may be encountered when landing "out", we can significantly reduce the stress and work load when faced with the real thing

EMERGENCY PROCEDURES

LANDING IN LAKES

If there are no fields in sight, lakes are preferable. Land parallel with the shore. Providing the canopy is either side or front hinged, unlatch it before landing, this prevents the canopy from jamming shut due to compression loads on the fuselage. Flaps should be set to the neutral position and the spoilers should be closed at touch-down. Flaps and spoilers were not designed for water loads.

Contrary to what may be intuitively obvious , it is important to lower the landing gear. It has been proven that there is less tendency for the glider to tuck under if the gear is down.

If a water landing is done correctly, the glider may well be flyable the next day. In some parts of Sweden water landings are done on a more or less regular basis as lakes are the only option other than trees.

LANDING IN WOODS

If a landing in the woods is unavoidable, never pick a clearing with stumps. Select a large tree with a full crown. Set a normal pattern. Be sure to approach the tree into wind, then stall, nose high into the crown.

COLLISION AVOIDANCE

If, with the sailplane on the ground and rolling, it becomes obvious that it cannot be stopped in time to avoid colliding with a fence, ditch or other obstacles. An intentional ground loop may be a better alternative. But delay it as long as possible. Also, moving the stick forward at the same time when applying ailerons may lift the tail sufficiently to avoid breaking the fuselage.

Obviously we cannot practice any of these emergencies, but we can be mentally prepared. By envisioning any and all eventualities and pre-planning the optimum way of dealing with them. We can significantly increase our chances of keeping our skins intact. The prime objective is to maintain control of the sailplane, no matter what the circumstances.

I HAVE KNOWN A GREAT MANY TROUBLES, BUT MOST OF THEM NEVER HAPPPENED.

….Mark Twain

A SUPERIOR PILOT IS ONE WHO STAYS OUT OF TROUBLE BY USING HIS SUPERIOR JUDJEMENT TO AVOID SITUATIONS WHICH MIGHT REQUIRE THE USE OF HIS SUPERIOR SKILL

….Arne J. Boye-Moeller