THERMALLING

Efficient thermalling is a prerequisite for successful cross-country flying. In contest flying, it is absolutely imperative. On an average day, a couple of minutes more in each thermal can add 15 or 20 minutes to a 150 mile flight. That much time can be lost in the initial centering process alone if your performance is not up to par. Also, when thermals are feeble the right thermalling technique can make the difference between going up or going down.

Prior to solo flight, most training is concentrated on take-offs, patterns and airmanship, as it should be. Occasionally, when a thermal is encountered the student is instructed to circle, then to straighten out here and there. This is done mostly for the purpose of prolonging the flight. Some will receive some limited instruction in the basic principles of thermalling, but learning to center quickly and maximize the rate of climb needs special attention, and cannot be mastered before airmanship is fully developed.

Consequently, some pilots are a little short on thermalling technique, so it seems appropriate to cover this subject at the onset.

Some people believe going around in circles is all there is to thermalling. This is far from the case.

INSTRUMENTATION

A total energy compensated variometer is a necessity. Without it, any variation in airspeed will give false readings of 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 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 airspeed.

It is absolutely essential to maintain a constant airspeed, as any variation in speed will skew the circle.

There is good reason to be proficient and comfortable at turning in either direction. When entering a thermal it generally pays to turn in the direction of the rising wing. When entering a thermal which is already occupied you have no choice, you must conform with the direction of turn already established. Accordingly, you will be greatly handicapped if you have a weak side. You may have a weak side and not be aware of it. If you use a data logger, check the flight statistics regarding direction of thermalling. If you are consistently make more than 50% of the turns in one direction, you have a problem. The solution is to practice your weak side at every opportunity until you feel equally comfortable turning in either direction.

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 of occupying the rear seat with a novice in the front who attempted to apply this technique while thermalling. 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 climb better when flown near the stalling speed, yet, in other types, performance improves 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.

If the thermal is broken up, or consists of a number of small cells it may be advantageous to fly a little faster to maintain crisp, fast control respond to increase maneuverability.

ANGLE OF BANK

The most common mistake is not banking steep enough. Except when flying a glider with a very light wing loading, it is simply not possible to stay within the size of the thermals we typically have to cope with in the North Eastern part of the country, without using well banked circles. Most often, if your angle of bank is not at least 35 degrees you are going to fall out of the thermal somewhere along the way. Keep in mind that 35 degrees of bank will seem like 45 degrees.

Thermals vary in size and structure from day to day, and the optimum rate of bank will vary accordingly. On a few occasions, if the thermal is fairly big, 35 degrees of bank might be optimum. If there is a strong gradient in the lift distribution, i.e. the lift is considerably stronger near the core, a steeper angle of bank works considerably better. Close to the ground, thermals are smaller and more broken up than they are at altitude. So if low, circle tight at first, then as you gain altitude it may be advantageous to reduce the bank a little.

The ideal angle of bank will be somewhere between 35 and 60 degrees. A bank angle of 60 degrees generates a force of 2Gs, the stalling speed increases by 1.4 and the rate of sink increases correspondingly. Nevertheless, a couple of 60° turns in a strong surge can be well worthwhile.

CENTERING AND OPTIMIZING THE CLIMB

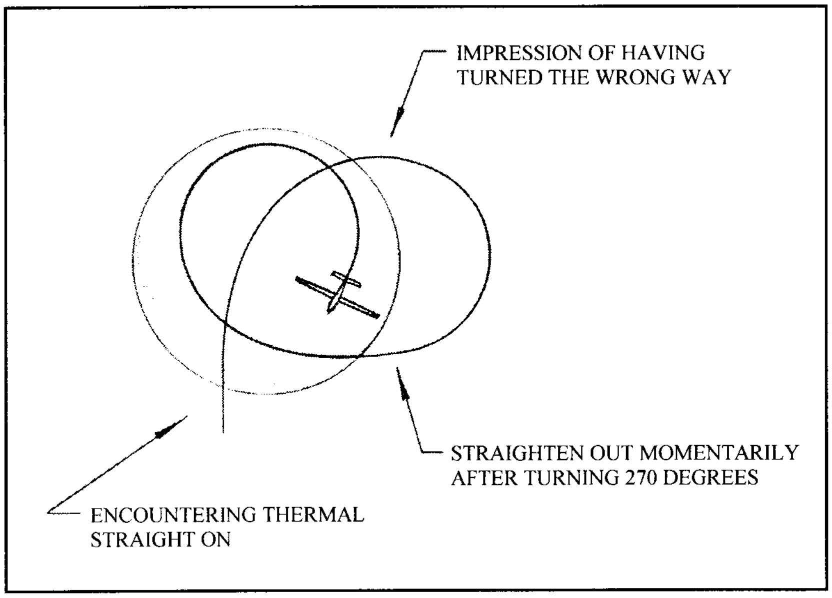
The objective is to center as quickly as possible and maintain the optimum rate of climb until it's time to leave.

When looking for a thermal, 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. This does not guarantee success, but it works more than 50% of the time.

In spite of having turned toward the rising wing you will, in all likelihood, get the impression of having turned in the wrong direction. By the way, the chances of this happening is nine times out of ten. Don't get paranoid, this happens not only to you, this happens to everybody, and there is a logical explanation for this. In years past, when demonstrating thermalling techniques on a piece of paper, we indicated our flight path by drawing a 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 circle 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. When back in the lift, immediately tighten the turn again. With a little bit of luck this should place you closer to the center. The objective is to form a mental picture of the lift distribution as soon as possible.

If the variometer shows some rate of climb all the way around, continue to shift your circle in small increments by reducing the angle of bank when lift is increasing, and then increase the angle of bank when the lift has peaked – timing is all important.

If the variometer actually shows sink on part of the circle you need to take a more drastic corrective action and straighten out completely to move the circle away from the sink. In this situation it's a common mistake not to straighten out completely, and not move over far enough, dreadfully going through the same sink twice. 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."



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.

Take time out occasionally for a glance skyward. There is a lot of information to be gained by observing the development of the cu' you are circling under. It is especially beneficial to keep track of what's going on up above when beneath a small, thin, and short lived cu'. If the lift begins to taper off, intermittent checks will tell you if the cloud is dissipating, which is a good indication that it's not your centering that's gone wrong, but that it's time to move on. At other times you may notice another wisp forming next to the one you are under. This likely indicates another cell and since it is just reaching the condensation level chances are it is at it's peak of development – better move over. Incidentally, there usually two cells to a thermal. It also pays off to keep track of the more mature specimens. Bigger clouds are sometimes fed by numerous cells. The darker areas is where the cloud development is the deepest, and that is where the strongest lift is to be found. Be careful not to fall victim to 'the grass is always greener' syndrome. "Is that dark patch over there really any better than the one I am under? Or would the one I am under look the same from over there?" – but that's what makes it interesting.

One mistake is to change direction of turn. In the rare instances when this maneuver is successful it is generally attributable to pure luck by accidentally stumbling into another core. As a means of centering, this strategy is totally useless.

If you lose the thermal entirely, you might consider making one shallow banked 360° circle, then tighten the turn if and when you re-enter. At times, it is tempting to prolong the search, but unless you are desperate it pays to move on after one circle.

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.

Though you may have perfectly good instrumentation, don't ignore the sensations you get from your hindquarters. The first indication of entering lift will be an increase in, "G" loads, nose down pitch, noise level and airspeed. This feed-back always precedes the respond on the variometer.

Thermals 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 which are evident by surges of stronger lift. In addition to constantly shifting the circles toward the better side you can further improve on the rate of climb by tightening the turn in these surges. A good strong surge is evident by an exceptionally pronounced boost from the seat pan. When you feel a surge, dig the wing in right there and hold a tight turn as long as the lift is solid. A strong core will have the tendency to push you out of it, when that happens tighten the turn even further, if possible. The instant the lift tapers off a little reduce the angle of bank ever so slightly, perhaps 10 degrees, but no more. This will cause a small shift, either bringing you back to center or bring you in contact with another core. Then tighten the turn again on the next surge. This may seem contradictory to the method outlined for centering, but think of this process as adjustments, rather than centering. Only maintain a steep angle of bank as long as the rate of climb is maximized. When hawks are thermalling they constantly make sharp turns here and there to take advantage of such surges.

Efficient thermalling is a combination of constantly shifting the circles toward the better part of the thermal and tightening the turn in the surges.

One key to maximizing the rate of climb is to never be satisfied. Achieving the ultimate rate of climb require total concentration. I believe it was Justin Wills who said: "If you can make a radio transmission without some loss in the rate of climb, your rate of climb wasn't maximized to begin with". Centering is a never ending process, you are not likely to experience a fixed rate of climb all the way around for very long. Whenever the rate of climb is slightly different on part of the circle you need to take action, it won't improve on it's own.

In the interest of safety, when sharing a thermal with other gliders, do not make any erratic moves, the other pilots should be able to anticipate your intensions. For example, changing direction of turn just as another glider approaches, intending to join your thermal, could possibly put you at risk of a mid-air. When in a sizable gaggle you will not be able to implement all of the tactics proposed in this section. If you did, you most certainly would be most unpopular. When joining a congested thermal, you don't have much choice but to jump on the carousel, pick a slot and follow the crowd. You simply will have to settle for a slower rate of climb. But that's the price you pay for the security of staying with a gaggle.

WHEN LOW

For safety reasons, low level thermalling should always be performed using well banked, coordinated turns with an additional 5 to 10 kts of airspeed.

Many stall and spin accidents are caused by 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 level flight or shallow banked turns, the stalling speed is lower and control response get sluggish when approaching the stall. Should a stall occur, greater control input is required, and recovery cannot be made without a significant loss of altitude. In turns of more than 35 degrees of bank, due to 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.

The good news is that using well banked turns and a little extra speed is no disadvantage as at lower levels, thermals tend to be small and broken. Steep turns and more speed for increased maneuverability, are necessary in order to climb well.

OTHER METHODS

After all is said and done, thermalling is more of an art than a science. I can only recommend what works for me, but many top pilots advocate techniques which, in some cases are not only different, but entirely contradictory to my approach. Yet, these various methods obviously works for them. Indeed, it is difficult to find two books on the subject of soaring which are in agreement with one another on the subject of thermalling.

Here is a sampling of recommendations from other publications, written by some of the best: Instead of straightening after 270 degrees, change direction of turn; wait 5 seconds before turning; tighten the turn in sink; straighten out in a surge, then change direction of turn. These various techniques obviously works for them, but they don't work for everyone. From this, you may think anything works, but that's not the case. On a few occasions I have watched in amazement, from the rear seat, as a student (having read the wrong book) consistently shifted the circles out of every thermal.

There are, and have been a few world champions who does not even believe in tight turns, they merrily go around in 25 degree banked turns, out-climbing every one else – seems like pure magic to me.

Ultimately, you will settle on a style which works for you, possibly consisting of a combination of different methods. Occasionally getting out-climbed is an indication that a change in your method may be in order.

Centering by using lift gradients.

There is another method of centering which utilizes gradients of lift to seek out the position of the core by the amount of tilt these lift gradients imposes on the glider. This method is based on the cross section of thermals being roughly circular and consisting of lift gradients centered around a core, with the strongest lift at the core and gradually diminishing toward the perimeter. Here is how this works:

1. If the lift is minimal and the tilt is pronounced, you are near the perimeter with the core at about 90 degrees. Make a medium turn toward the rising wing.
2. If the lift and tilt is moderate, you are somewhere between the core and the perimeter. Turn more aggressively toward the rising wing.
3. If the lift is strong and there is no tendency for either wing to come up, your course is straight for the center. Weave slightly to one side and then turn sharply in the other direction.

Due to the size of thermals and the airspeed which we approach them at, to use this method you must rely on your physical sensations, as your reactions would be far too slow if using the variometer.

Yet, there is a world record holder who doesn't even believe in turning toward the rising wing, claiming that tilt is totally random.

ELEMENTS OF THERMALLING

- **Timing is all important.**
- **Always turn toward the rising wing.**
- **When encountering a thermal low do not hesitate, turn immediately.**
- **If you have enough altitude don't turn until the climb rate approaches your expectations.**
- **When you do 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.**
- **Establish a mental picture regarding lift distribution.**
- **Do not change direction of turn.**
- **Shift aggressively if there is sink on one side. Never go through the same sink twice.**
- **If there is some lift all around, shift in small increments.**
- **When lift is increasing, reduce the bank to move the circle in that direction, in small increments.**
- **Do not over control. Control movements must be timely but no more than needed.**
- **Take advantage of surges. Tighten the turn on the surge, and decrease the angle of bank slightly when the lift drops off. Then tighten the turn again on the next surge.**
- **If you lose the thermal, make one wide 360°, then tighten the turn when you re-enter. Limit the seach to one 360°.**
- **Steeper turns are needed and safer when at lower levels.**
- **If you are low, do not leave what you have for something better.**
- **When sharing a thermal with other gliders, do not make any erratic moves, and keep track of everybody.**
- **Concentrate and never be satisfied.**

> *Racing pilots hate all thermals, and spends as little time in them as possible.*

Once you have mastered the art of thermalling there are really only four things you need to know to successfully go cross-country, which are:

1. HOW TO FIND THERMALS
2. WHERE TO GO
3. HOW FAST
4. WHEN TO THERMAL

HOW TO FIND THERMALS

As with anything else in the art of soaring, when it comes to finding thermals nothing is for certain. But unquestionably, if you know and seek out the likely places and conditions where thermals are likely to be found, your rate of success will be significantly better than if you simply rely on running into thermals by chance. Undoubtedly, there will be times when you do happen to completely unexpectedly stumble into a perfectly good thermal when you least expect it.

FINDING THE FIRST THERMAL

A ground launch takes you to a fixed release point every time and unless there happens to be a thermal right there, you will need to go look for one. An aero tow takes you to a thermal. That is the prime advantage of an aero tow over a ground launch (winch or auto tow,) not necessarily the additional altitude.

The advantage of releasing in a thermal is obvious, especially in a low performance glider. In a low performance trainer you will have more time searching for a thermal while on tow than after release. Many pilots have become programmed to tow to 2000ft on every flight, and would never think of doing anything different. They will get dragged through perfectly good thermals but insist on 'getting their moneys worth' and stay on tow till they reach 2000ft. By this time they are generally in sink, and will frequently be on the ground in record time. Even in a high performance sailplane, it is advantageous to get off in a thermal at a thousand feet rather than hanging on. Releasing before you reach the conventional tow height also gives you more practice at thermalling.

So how do we go about releasing in a thermal? The first step is to get in the right mind set. Change your objective, instead of towing to a fixed predetermined altitude, tow to a thermal. The timing is crucial so it is important to be mentally prepared. Decide beforehand the minimum altitude at which you are prepared to release at. This could be a thousand feet, or whatever you feel comfortable with.

Once you have reached your prescribed minimum altitude and the tow plane enters a thermal, evident by a sharp increase in climb rate. Watch the tow plane closely, if it hasn't flown through the thermal by the time you reach the edge of it, release right then and there.

The timing is critical, this is the reason it's important to have predetermined the altitude you are willing to release at, there is no time to think about it, a couple of seconds hesitation can make the difference between success and failure. Immediately upon release make a well banked 360° circle to the right and then proceed to center the lift.

It is crucial to maintain a steady tow position, so when the tow plane rises above the horizon it really is the tow plane going up and not the glider going down.

Keep tab on the rate of climb during the tow. Entering 'normal air' after having gone through a prolonged stretch of sink, the tow plane's rate of climb will increase. If you had not been keeping track of the climb rate, this could lead you to believe a thermal is at hand.

It is normal to be somewhat reluctant at first to release at a lower altitude than you are accustomed to, but keep working on it. Once you get the hang of it, you will need fewer relights, get more satisfaction and more thermalling practice.

DETERMINE THE RELATIONSHIP 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, or on the sunny side, but whatever the relationship is, it will tend to hold true for the rest of the day. This bit of knowledge should minimize the amount of searching and fumbling associated with getting established in each thermal.

The leaning of thermals due to wind is more pronounced at lower levels, then it becomes more vertical as the thermal approaches cloud base.

SPACING OF THERMALS

Spacing of thermals is proportional to the height of the convection layer. There are few things in gliding which are for certain, but this is one of them. When the convection layer is shallow the thermals will be closely spaced. This is the reason cross-country flights are possible on days with low bases. Conversely, expect a long way between thermals when cloud base is high. Therefore, if you find yourself at 2000 ft. on a day when the thermals go to 8000 ft., you may be in trouble.

STRENGTH OF THERMALS

There is a 'rule of thumb' relationship between the depth of the convection layer and the strength of thermals. For example, if cloud base is 4,000ft you can expect to find a couple of 4kt thermals, the rest will be roughly two thirds of that. If the base is at 6,000ft a few thermals will be 6kts, the rest 4kts. When the lift goes to 8,000ft....and so on.

EVALUATING CLOUDS

A sharp, well defined base and a cauliflower, crisp outlined top is what you should be looking for. If it's a large cu is likely to be fed by several cells, the darkest part of the base is an indication of the deepest vertical development, and that is where you are likely to find the strongest lift. A sure sign of strong lift is a domed shape base. A ragged base with a broken, crumbling top is a sure sign of decay.

As I am sure you already have discovered, on a day with cu's all clouds do not have a thermal. On a good day, about one cloud in three works well. When the air is dry a greater percentage of cu's will be active. On a day with high humidity, only about one in four or five will have a thermal feeding it. Amazingly, there are also days when there does not seem to be any connection what so ever between thermals and clouds.

Do not confuse long vertical tendrils of vapor with a ragged cloud base, these tendrils are signs of exceptionally strong lift. These tendrils are mostly found when flying along the border of two air masses with different moisture contents.

When the sun is low, as at noon 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.

When low, evaluating the terrain for likely trigger spots as you do on blue days will be more helpful than cloud reading. It's difficult to judge the degree by which a column of rising air is leaning. Also, a cloud may be all as good as it looks, but the lower portion of the thermal has expired, and your search will be futile. This is especially the case on windy days when the thermals get sheared off from their source or trigger point and rises as isolated bubbles.

Just as there are clouds with no thermal attached, there are thermals which have not yet formed a cloud. If, while heading for an attractive cu, you stumble upon a good thermal out in the blue, by all means take it.

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.

Reading the terrain not only applies to blue days. If you get low you will do better reading the terrain than the clouds. It is difficult to predict how much a thermal is leaning. Also, the thermal feeding the cu' you are aiming for may have left the ground long time ago.

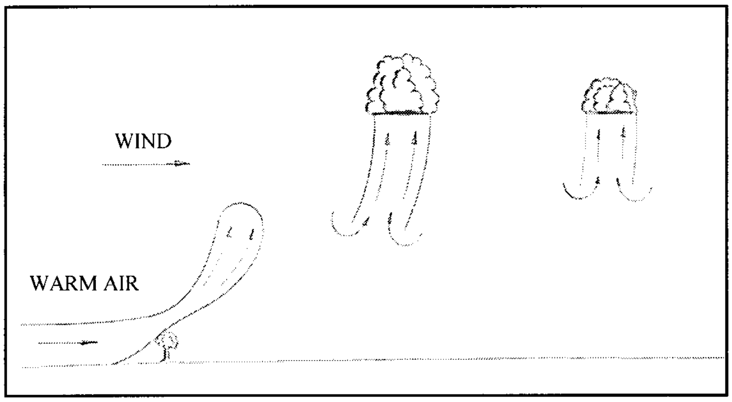
You can expect thermals at the higher levels of upward sloping terrain facing the wind. As the air from the lower levels moves up the slope to higher elevations with cooler surrounding air, it becomes unstable. Such areas tend to be fertile ground for thermals.

At times, the thermals stop just short of reaching the condensation level, but gets close enough to form haze domes. These haze domes are excellent markers, always look for those on blue days.

A long ridge with the terrain sloping up on both sides to a crest can be used to great advantage, even in light winds, or when the wind is parallel with the ridge. On most days there will be thermals along such a spine, often spaced close enough to permit straight cruising.

WINDY DAYS

On windy days, a warm air bubble over a heat source gets displaced by the wind before it has a chance to gain enough buoyancy to break away. It will drift with the wind, gathering more warm air as it moves over the terrain until it reaches a triggering feature which can be just about any discontinuity in the terrain such as a line of trees.



On such days look for features in the terrain that might trigger thermals, such as, rivers, border of woods, end of ridges. The cold air over small lakes can often trigger thermals. The dome of cold air above the water makes an excellent trigger for thermals as they drift with the wind across the terrain. This is especially the case in early summer when the temperature differential is significant. On the diagram on page 20, envision the wind being at ninety degrees to the lake and you have a classic example. This is the reason we often find ourselves thermalling over small lakes. Of course, the thermal is not generated by the lake, but is triggered by the shore and leaning out over the lake.

ON DAYS WITH MODERATE WINDS

When the wind is not too strong the domes of warm air are able to remain in place to attain buoyancy and rise up directly from the heat source. The thermals will be either columns of rising air or a series of closely spaced bubbles. This is when you will want to go for the hot spots like, ridges facing the sun, dark patches, gravel pits, towns and ripe wheat fields. Wherever you wouldn't want to be walking around on a hot day.

A bubble over a field which haven't quiet reached the buoyancy needed to break free on its own can be released by a tractor driving across the field. It is even possible for you to trigger your own thermal by flying through such a bubble. Well over 50% of the time when launching by car or winch, there will be a thermal right at the top of the launch. This is not likely to be coincidental. No doubt the thermal is triggered by the cable/rope, and glider cutting through a bubble, thus releasing it from the boundary layer.

In the beginning of this publication I mentioned that some of the techniques expounded on here, have been used for many years. Here is an extract from *The National Geographic Magazine, ca. 1936:*

> A modern sailplane flight in competition is never over until the ship is actually on the ground, and stubborn pilots, fighting to the last for a breath of breeze that wood keep them in the air, discovered something.
>
> They found that if a man dived his ship at high speed, 70mph or so, above a promising source of a thermal current such as a corn field, banked sharply when only 1-200ft from the ground, and spiral upward in tight climbing turns, a surprising thing sometimes happened. A sudden thermal current caught the ship and carried it up, up, up, to the neighbourhood of the clouds again. The swirling sweep of the 50ft wingspread, traveling at 70mph and suddenly twisting upward in a corkscrew fashion, had apparently dislodged a thermal bubble which had been on the verge of rising.
>
> When the first report of this came from a pilot in Germany, most American soarers were sceptical. But they tried it and found it often worked. Meteorologists say it is entirely credible.

(I suspect this article was embellished somewhat, but the basic concept is there.)

BIRDS AND OTHER SAILPLANES

A soaring bird circling, or a swarm of swallows chasing insects caught in a thermal is a good indication of a worthwhile thermal. A circling sailplane may not be. There are some pilots who never met a thermal they didn't like, and will go around in just about anything. Avoid needless detours, before joining another sailplane, be certain that it is indeed climbing at a worthwhile rate, and if it is, don't hesitate, move over right away.

If you encounter another cell before you reach another glider in a thermal it pays to make a turn in case the one you stumbled into is better. That is the best chance you have to gain on the other glider above you.

You can generally be assured to find lift when entering a thermal above another glider. Entering below another glider is another matter. There are times when the other glider is in a bubble and you happen to be bellow it, your rate of sink continues as the other glider climbs away. That sort of thing can get on your nerves.

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.

SMELLING THERMALS

There has been some claims made that thermals can be located by smell. While it is true that smells do get carried aloft by thermals it has been my experience that by the time my nose picks up the scent the variometer is already telling me what I need to know. Your nose won't lead you to a thermal.

Be careful, the aromas drifting skyward do not all derive from freshly baked bread or sizzling bacon. Some fertilizers are potent. Once I encountered a thermal coming off a fertilized field. It didn't take long before my eyes started burning, it got so bad it was almost impossible to keep them open. It took quit some time before my condition improved. I was thankful a landing was not imminent or I would have been in serious trouble.

APPROACH THERMAL SOURCES IN LINE WITH THE WIND

The possibility of intercepting a thermal if approaching a potential source at ninety degrees to the wind is not very good as it is difficult to estimate how much a thermal is leaning, especially on days when the wind is rather brisk. The chances of connecting are much better if you approach the thermal in line with the wind. The same technique applies when attempting to connect with a cloud, when some distance below it.

EARLY EVENING SOURCES

These days we seldom use the entire soaring day. In competitions we race around for a couple or three of the best hours of the day. When flying for pleasure, most like to be home for cocktail hour. Nonetheless, in the unlikely event you should get caught out as the sun gets low, here are a couple of prospects to keep in mind.

Wooded sections, having soaked up heat throughout the day will be releasing it as the surrounding terrain cools down. These evening thermals seems only to be workable at some reasonable altitude – stay high when the end of day approaches.

In hilly country, as evening comes on, and the wind is light or non existing, the air on the high ground cools and slides down the hills into the valleys (Katabatic Wind), forcing the air in the valleys to rise. This kind of lift is as smooth as wave lift.

> *Flying a glider is the nearest*
> *You can get to heaven.*
> *(with your clothes on)*
> Hans Christensen