HANG GLIDING FINISHING SCHOOL

by Dennis Pagen

PART XIV: MORE LEARNING TO THERMAL

Last month was our thermal inauguration. We discussed the basics for starting a career of getting high. This month, without any further ado, we look at some more wrinkles and nuances in the thermal experience.

LOCATION, LOCATION, LOCATION

Let's cut to the chase: When pursuing thermals, some early philosopher said: "Thermals are where you find them." That guy wasn't over-massaging the philosopher stone; he was expressing the true nature of things. Thermals are somewhat elusive and unpredictable, so the first quality that makes for a better thermal pilot is to be ready to hit a thermal at any time and place, and be able to quickly wrap up in it when you do hit it. Be prepared and always on the hunt like a ravenous shark.

Philosophy aside, there are ways to maximize your chances of encountering a thermal. As we mentioned last month, there are "house thermals" that exist at certain places. These places are where a good heating source occurs, along with perhaps a terrain feature that channels the thermal. For example, where I fly there are several quarries along the ridge, and these quarries tend to pump out the most thermals and the longest-lasting thermals. It behooves all pilots to find out the location of local house thermals. Do that by the simple method of asking experienced pilots in the area. If they don't tell you, they must have some combination of egomaniacal-insecurity-cryptomania syndrome, or maybe they just don't know. Sometimes there isn't a reliable go-to thermal area, but inquiring minds always inquire. And often improve their lot.

Other well-known thermal generation areas are those that heat up well in the sun. You've probably heard about this already. There are some nuances such as dry ground is better than moist ground; rocks take longer to heat up than dirt surfaces; tall dry crops create more heated air than low crops, etc. (For much more on the subject of finding thermals and thermal sources, look in Chapter 5 of *Performance Flying*.)

A second factor when exploring for thermals is to look where features of the terrain will help the thermal trigger off. For example, a hill, a tree line, the edge of a lake, etc. may give the warm surface air a little boost to help it start buoying upward. The most common place we find a thermal is along the top of a mountain or ridge. The thermals normally track up the ridge and release from the top edge. These matters are also discussed in the above-mentioned book.

Next, we have to mention clouds. Cumulus clouds indicate where a thermal is (or has been) feeding. If you are high enough to place yourself somewhere below this cloud, your chances of finding a thermal are quite high. When you are ridge soaring, the most thermal-productive strategy is to go along the ridge and hang out where cumi clouds are drifting above, even if that area is in shadow.

Finally, we must mention birds and other gliders. These flying co-pilots are the best sign of a thermal, bar none. If you see them turning, go to them to up your chances of a thermal encounter to almost 100%. And yes, you guessed it, these matters are also discussed in the book.

As a summary, you find thermals above heated areas, above trigger areas, above high points or ridge lines, under cumulus clouds and right close to birds or other gliders. Find them and enjoy the ride.

All that being said, we must go back to our original statement: Thermals are where you find them—and when. Sometimes you get surprised. We went flying recently in a 100% overcast. We expected only a bit of floating in ridge lift, but to our surprise thermals were abundant and we climbed up to 300 feet per minute. On a couple of

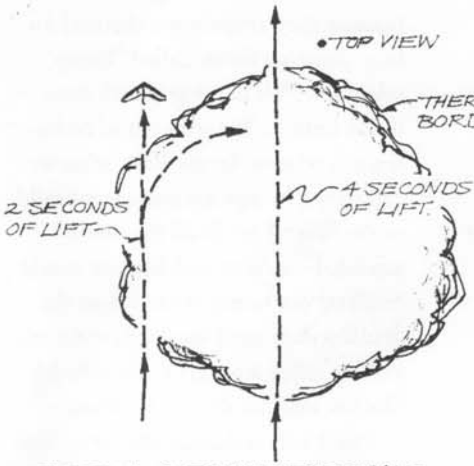

FIGURE 1.- CATCHING THERMALS.

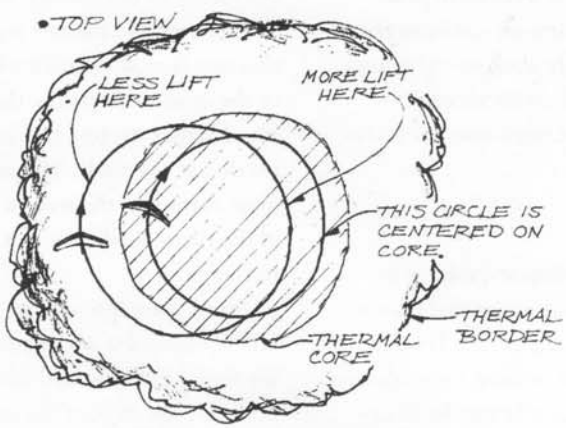

FIGURE 2.- CENTERING IN CORE.

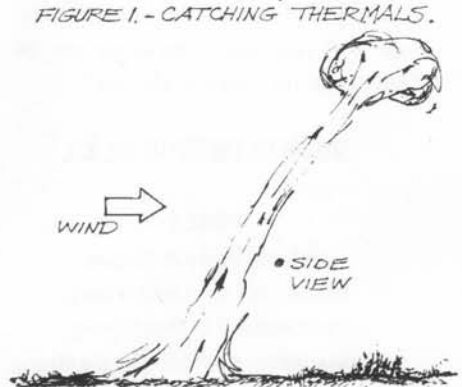

FIGURE 3.- THERMAL TILTING IN WIND.

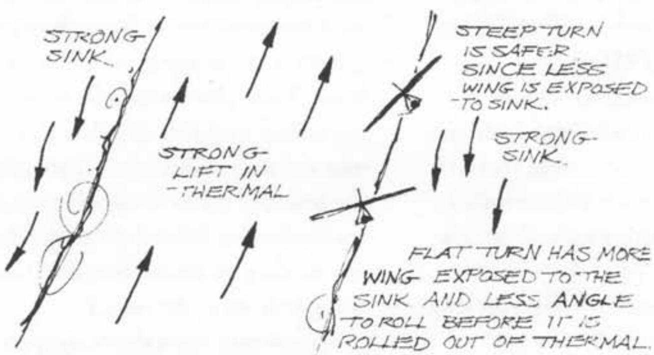

FIGURE 4.- SAFETY IN STRONG THERMALS.

occasions I was still climbing at 2300 feet over, but pulled out of the thermal because it was turning into cloud suck. Getting sucked up into a benign cumulus is one thing, but getting sucked up into a stratus layer spread as far as the eye can see is way up there on the no-fun list. (We deal with cloud suck next month.)

GETTING ESTABLISHED

You may have heard the rule to count three seconds—one potato, two Mississippi, three hippopotamus—when you encounter lift before beginning your turn. Let's briefly look at the numbers. Assuming your glider has a 20mph normal stall speed, a 20-degree banked 360 will take a bit over 16 seconds to complete with a diameter of 157 feet. A 30-degree banked 360 will take 10.7 seconds to complete with a diameter of 107.6 feet. Flying with a bit of speed over stall—say 22 mph—means you will cover about 97 feet flying straight ahead, so the three-second wait will mean the lift area is just big enough for you to circle in at a 30 degree bank and remain in its lift. But most beginners do not use a 30-degree bank, so an even wider lift area will be needed—perhaps four seconds of straight-ahead lift. For a beginning thermal pilot this counting method works to help you get the feel for timing and thermal size.

Most experienced pilots do not count, and if they did would not necessarily wait for three seconds to begin turning, especially in areas or times of day when the thermals are smaller. Probably two seconds is the norm. The reason for this is that more experienced pilots use steeper bank angles and we don't necessarily hit the thermal dead center. If the thermal is off to our side a bit we may only have a little piece of it and waiting too long makes us miss it. Figure 1 helps picture this matter.

If you encounter a thermal off to the side, usually your wing will lift on the same side as the thermal. So we always turn toward the lifted wing. That is a basic rule of thermaling effectively and efficiently.

Perhaps you have heard of the thermal "core." The core is the center of the thermal, which typically has the strongest lift. Even if we enter into the meat of a thermal, if we haven't center-punched it the stronger core will tend to lift one wing, so again we turn towards the lifted side (can you see how important it is to be as comfortable circling right as left?). The idea is to end up circling the core with the center of our circle coinciding with the core's center. Figure 2 shows how to detect when you are centered.

So in sum, your beginning game plan should be to learn the timing for initiating a turn in a thermal; practice smooth continuous circles in the thermal; gradually work on tightening your circles. Begin with about 20-degree banks and work towards 30- to 45-degree banks.

STEEPER

Why should we want to progress to tighter 360s? There are several reasons for us to tighten our circles. First, except for big, fat evening thermals, the best cores are typically smaller than a 20-degree 157-foot-diameter circle inscribes. If you want to climb best in them you need to tighten up.

Secondly, as a thermal climbs it expands, but also mixes and sheds area on its borders. Consequently, thermals often eventually erode to have only a small diameter lifting area. If you are circling too wide you will eventually feel the lift weaken and disappear long before it actually totally dies out.

Thirdly, if a thermal encounters an inversion on its way up, it will often be slowed, broken up and sometimes moved to the side with only the very inner core retaining its cohesiveness. If you are circling wide, you'll probably lose it, while you may be able to hang on and ride it up through the inversion with a tighter circle. Often a thermal will reorganize above the inversion. Especially in the East, thermals often encounter weak inversion layers—sometimes several—as they climb.

Finally, in wind thermals have a tendency to drift and be tilted, as shown in figure 3. In addition, in some areas with light wind thermals may be snaky and shift drift directions several times on the way up. If you are thermaling with a flat bank angle it takes up to 10 seconds longer to perform a 360, which gives the thermal more time to move while you are heading upwind. It is much easier to follow a thermal when you are tighter. In some cases thermals drift so fast or are so close to the terrain that you should vary your speed constantly in the thermal to follow it, and for control. The safe technique in this case is to slow down when heading in the upwind direction, then pull on speed before starting the downwind portion of the circle. This action gives more control in the downwind portion of the thermal where it can be more turbulent.

Some years ago we were flying a NNW facing site with good thermals. We would grab one and take it up to drift over the back of the mountain, but within about 500 feet of the top we found ourselves drifting the other direction, out towards the valley in front. Those pilots who were turning tighter were able to follow this unusual thermal behavior. (I attribute the strange drift to the presence of an enclosed valley behind the ridge which was sending off thermals to feed those rising in front of the ridge.)

As you gain more thermal experience you will find that thermals in wind and stronger mid-day thermals often are variable as they push upward. Good pilots are aware that they may have to make a circle adjustment quite often. You can start this awareness by paying attention to the feel of the thermal and your vario sound. If you encounter a part of the circle that is producing better lift or a surge, try to center on that area. We usually do this by tightening our circle as soon as we encounter the surge (it takes time for the glider to respond, so the timing is about right) and then flattening out to the chosen bank angle about when you have changed 180 degrees in heading. Practice this technique until you know the timing and can follow the cores like a trained dancer.

EAST AND WEST

As you rack up hours of thermal experience you will find that what felt like earth-shattering bumps at first are now welcome little nudges—welcome because they announce a thermal. In fact, there is a factor called "bump tolerance." We develop it with time in the bumps. The strength of turbulence is relative. In the East, what we call strong bumps are considered mild in the West. I recall all the meets I attended out West and how we would build up our bump tolerance on the first few days until slack side wires and getting rolled strongly to the side felt like just another day at the office.

Pilots would discuss this factor and it compelled me to write a parody song about 15 years ago, sung to the tune of "Sitting on the Dock of the Bay":

SITTING ON THE TOP OF THE HILL

VERSE 1

I left my home in Kansas,
headed out west with a song,
I had enough of that towing;
I'm going where the thermals are strong.

CHORUS

Now I'm just Sitting on the Top of the Hill,
watching the pilots soaring their fill,
Sitting on the Top of the Hill—
'cause I'm scared.

VERSE 2

Two thousand miles I drove,
just to reach this site I know,
Now the wind is coming in,
but I'm feeling afraid again.

CHORUS THEN BRIDGE

Looks like nothings gonna change,
I've been here for over a week,
I can't find the gumption to launch,
so I guess I'll remain a geek!

VERSE 3

Sitting in the morning sun,
I'll be sitting 'til the evening comes,
Watching the pilots get high, with my
glider on the car and still tied.

LAST CHORUS

Now I'm just Sitting on the Top of the Hill,
watching the pilots soaring their fill,
Sitting on the Top of the Hill—
just tossing stones.

We're only being a little facetious here. In truth, desert area thermals can be powerful and overpowering. There are two defenses for the hapless pilot. First, we should maintain more speed (for control) both between thermals and inside the thermals. Typically, we fly between thermals faster than best glide because we will usually be in sink. We also add some VG pull for efficiency and want more speed for control with added VG (see Part VII of this series). In strong western-type conditions, we must fly even faster to maintain control (and also because where there are stronger thermals the sink is normally stronger as well).

Inside the thermals it can be turbulent even when near the core. Extra speed improves control and also helps prevent a strong upsurge from stalling our glider. A steeper bank angle helps maintain speed because the glider must be pushed out more to slow down at higher bank angles. Also, there is a greater safety margin in a steeper bank angle because the turbulence at the edge of a thermal cannot roll you out as easily, as shown in figure 4. So here we have another reason to thermal with a steeper bank angle to add to the previous section.

Very strong thermals can have sharp edges—there is strong up flow in the thermal and strong down flow just along the thermal border. If we head out of the thermal without good control speed we may go "over the falls." What this vivid description refers to is suddenly having our nose dropped while our tail is lifted. In an extreme case we can be rotated nose down so fast and hard that we tumble. Fortunately today's glider designs help prevent such dire pitch excursions, but we still need to take all precautions to avoid exiting a thermal too slowly. You will soon acquire a feel for the strength of turbulence in a thermal and will be able to judge how much extra speed you need for control.

There is much to learn—we have only scratched the surface—but that's what keeps thermal flying fresh and interesting. The books *Secrets of Champions* and *Performance Flying* will add a lot to your thermal knowledge and skill. While there are a few added precautions we must take in thermals, they are nearly always benign, fun and fulfilling. If you do your learning gradually, mainly by starting out in gentle conditions, you will quickly learn their behavior and come to love them. Thermals are your ticket to the upper reaches of the sky. They provide you a perspective like no other. The first time you climb in a thermal you will start keeping track of the height gain, until you have climbed so many times it all runs into a blur, but still there are red-letter days. Sometimes you top out so high that you can see all around the world to the back of your head. And you will know why we spend so much time perfecting our climbability and trolling for warm currents.