

mass of air in which centrifugal force must be producing a partial vacuum in the center, could likewise have its greatest lift at the center. But for whatever cause, changing the direction of circling often does produce a change in flight characteristics.

From all this it would seem that finding a loose thermal in the upper air is a matter of being at the right altitude and distance downwind from a thermal producing area at the right time to catch one of the rising air masses. Depending on temperature, lapse rate, wind velocity, and so on, these "bubbles" become detached at a roughly uniform rate so that on any one day it is possible for the really expert to more or less predict the period of the cycle and take off at the proper time to catch some lift. While the unlucky and inexpert could cover the exact same region at a different time and find nothing.

Cloud thermals are related to cumuli in process of formation. A cumulus must have its birth in some heated region of the earth's surface but once it is well under way it becomes self-sustaining (since its heat of condensation keeps it permanently hotter than the surrounding air) and can continue to grow even though its umbilical cord is broken. A cumulus is thus a separate being all on its own and must be considered on this basis and not in relation to surface conditions and wind.

You could, therefore, expect the circulation of a cumulus to be upward under the cloud and on the sunny side, and downward around the cloud elsewhere. And, as a matter of fact, when you get under a good, fast-growing cumulus you do see that there is a sort of inverted bowl in the center where the greatest lift is taking place.

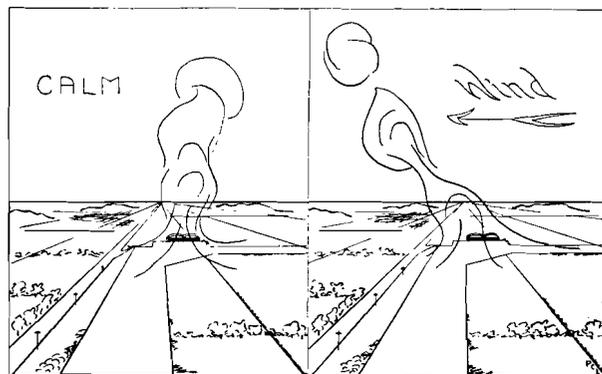
But clouds are confusing to the beginner when seen from close up. They don't have the sharp, clean edges that they have when viewed from the ground, and sudden bits of down-draft are upsetting.

So, if you are looking for an easy, pleasant flight and don't care about getting up on the roof there is nothing better than a hot, calm day with lift all over the place. Then you are even willing to concede the sailplaners their "bubbles," their "inverted tear-drops" complete with an enclosing skin of the Lord knows what, holding their shape although the center continually rises faster than the periphery, and where spin can proceed without centrifugal force.

And now to get on to serious matter, what do you do when you find a thermal? What you do is this. You are coasting along, quartering the territory with one eye on the variometer and the other on your airport when there comes a slight jolting motion and the little green ball pops up.

If you aren't too excited you try to remember which wing lifted. If the right wing went up that naturally means that the faster rising air is to your right. You could duck your right wing and start circling but if the thermal is small you may be out of it before you get settled down and never find it again.

So what you do is keep on in the same direction until the green ball has reached its peak and starts coming down. Then you make a tight 270 to the left, which



An artist's conception of dry thermal structure on calm and windy days: at left, the thermal goes up over a heated area in chimney fashion; at right, a chimney disrupted by the wind sends up a skinless, invisible hot-air balloon.

should bring you back into the lift area already banked to keep on circling.

You circle in a fairly steep bank and as close to stalling as convenient. The Kite, for instance, stalls at 28 mph and is circled at 32 mph. Its rate of sink at this speed is not its minimum, but the slower the speed the tighter the circle and it pays to keep inside the thermal.

While circling you watch the variometer closely. Let us say that you are making right turns. Perhaps when going north the ball is higher in the tube than when you go south. This means that the center of lift is to your left. You therefore edge your circles slowly over to the left until you get uniform lift all the way around.

The theory is simple. But making tight, smooth turns on a gusty day requires considerable attention, especially in flying so close to the stall, and you will find that you have not many eyes for the pretty scenery. Nor will you want them.

Whatever jokes you may have made before, you will find that a little green ball half way up a little glass tube is just as pretty a sight as anyone could hope to see and one that you feel you could never tire of.

Round and round you go and higher and higher and higher, with an occasional glance at the little old Cubs far below puffing around the pattern. The Florida Airways goes by on its way to Orlando or Jacksonville or Ocala, concerned with such trivial matters as north, south, east and west.

But where you are, the only direction is up.

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