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A NEW APPROACH TO THERMAL FLYING

Continental flyers take their thermals rather more seriously than we do, and this report by a German enthusiast on his search for thermal conditions on "non-thermal" days will be of special interest to R/C glider modellers.

GROWING interest in radio controlled gliding (and on the continent in compass steering models) prompts this new approach to thermal flying.

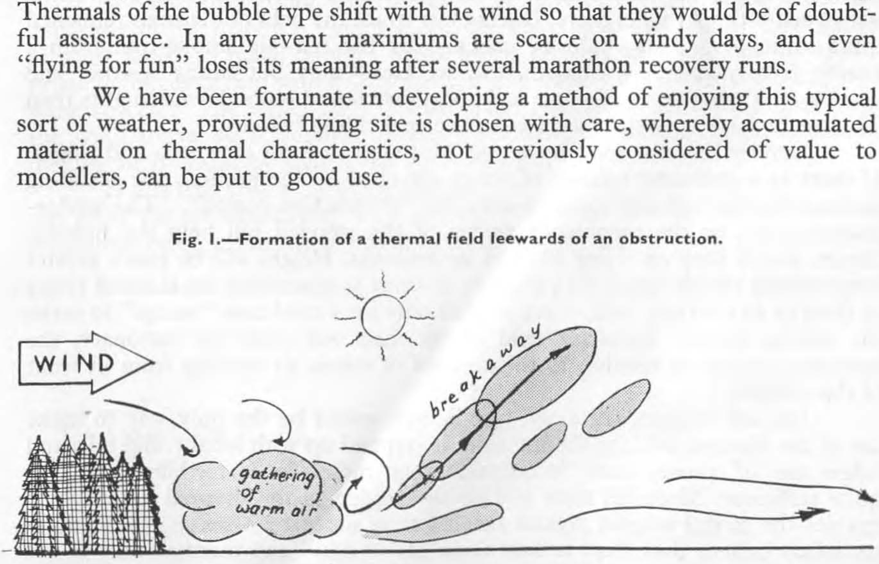
Certainly normal circling flight is the only way to fly a model when there's little horizontal air movement. Under such conditions thermals are rather small in diameter, requiring tight circling models to make use of lift. A steering device for straight flight would be of no special value under such conditions.

But how often do we find such ideal weather conditions for thermal flying? Meteorologists state that fine weather periods with little wind in summer—that intrigued modellers into designing our modern thermal soarers—have rather been an exception than the rule. They tell us that the normal pattern would be a cool summer with rather breezy air at times. The writer has been observing weather conditions for a long period and his findings are: 70 to 80 per cent of flying occasions were "blessed" with so strong a breeze that a model by only flying straight ahead remained stationary over the launching field, or was even blown backwards a little.

Flying a straight course under such conditions is not very satisfying. Thermals of the bubble type shift with the wind so that they would be of doubtful assistance. In any event maximums are scarce on windy days, and even "flying for fun" loses its meaning after several marathon recovery runs.

We have been fortunate in developing a method of enjoying this typical sort of weather, provided flying site is chosen with care, whereby accumulated material on thermal characteristics, not previously considered of value to modellers, can be put to good use.

Fig. 1.—Formation of a thermal field leewards of an obstruction.



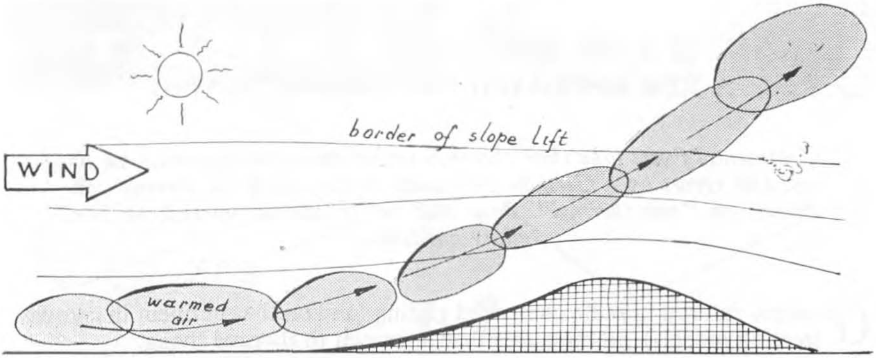


Fig. 2.—Departure of thermals on a wedge (or in front of a wood).

Thermal Fields like Slope-lift

The harder the wind blows, the more jagged and sporadic are the thermals close to the ground (patchy thermals). This has encouraged the writer to make for the leeward of hills and woods, where there is less wind. In those wind-protected quarters there is an appreciably higher rate of thermal formation, due to better penetration of sun rays, and, leeward vortices make thermals depart all right (see Fig. 1). With a strong wind in evidence, there is a quite frequent thermal "departure", as compared with normal. However, we must add, that leeward thermals with strong wind are usually weaker but more frequent than in still air. So they can cause a lift field similar to slope soaring conditions.

Thermal research flying in a heather district near Munich leeward of a small wood, proved these assertions. One can make quite appreciable durations with a self-steered model there. During our trials, the field of thermals remained quite stationary. This could be checked by the tell-tale smoke-trail from a nearby factory chimney. Nonetheless, we had windy but sunny weather and no clouds. Trying this region on cooler days we found more downdraughts than lift, just in the very region we'd been thermal riding before.

Similar thermal conditions may be found in front of woods and ridges. If there is a sufficient volume of warm air close to the ground, the resulting thermal bubble will slip leeward onto the "obstruction region". The wedge-shaped ridge, or the turbulence wedge of the wooded hill help the bubbles depart, which keep on rising like hot air balloons. Height will be much greater than normal lift on ridges (see Fig. 2). If there is sometimes no thermal rising in front of an obstacle, well, there is need only for a moderate "wedge" to make the bubble depart. Resulting field of thermals will often be stationary, the intensity varying in relation to the amount of warm air coming from in front of the obstacle.

On low wedges, certainly, tow-launch would be the only way to make use of the thermal field, as the intensity is stepped up with height. Big hills and ridges are, of course, more "economic" than molehills. Here, hand-launch is quite sufficient. Slope-lift then will be the bridge to the thermal field, which enables the model to gain greater heights than normally observed. Sometimes modellers believe that there is only slope-lift on a hill and thermals only in the flat country. Actually there is nowhere more thermal-lift than on a hill.

Now, where there are no "wedges" or obstructions causing thermals to depart the same phenomenon may occur at the brink of differently planted areas. For instance, if there is a swampy area next to a sandy patch of heather, provided, of course, that both areas are sufficiently large. As soon as warmed air is blown over a "cold" region, a breakaway will most likely occur at the borderline. This will result in an almost "thermal-front" like field of lift (see Fig. 3). Flights of this pattern have been made by the author, over a 5-6 acre rain-wet lentil field lying behind an already ploughed dry field. Height gained was about 60 ft. Of course, wind direction should be at right angles to borderline. If wind blows parallel to borderline, then the lift seems to be closer to the edge than before and rather stop the "warmer" ground than the damp and cooler area. However, there is little research data as yet to support this trial.

Artificial, Arbitrary Breakaway of Thermal-bubbles?

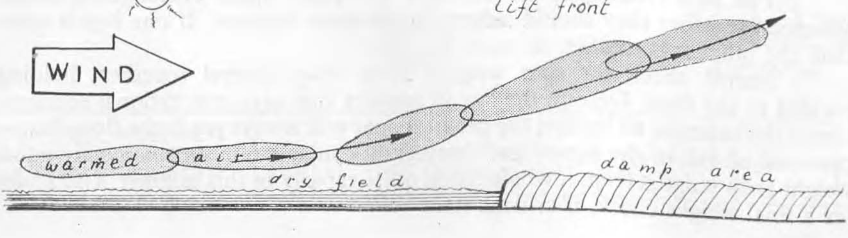
In connection with the departure of thermals on obstructions on windy, sunny days there are past trials of interest to students of breakaway thermal-bubbles with still air weather.

We would refer to a contribution by the American scientist Huffacker written in 1897 (!). He made silk paper strips rise, by simply flapping a fan, with which he caused the breakaway of the thermal. This worked particularly well on hot days in the Indian summer. He goes on to say that sometimes by just one stroke he could trigger a chimney-like stream of up-rising air which sent his silk strips floating upwards for quite a height. What he meant to prove by this was that a vulture flying through a not yet released thermal bubble could trigger it just by violent flapping of his wings, so being able to soar on afterwards without moving his wings or expending energy. This phenomenon, Huffacker says, is a MUST for vultures who can't always be sure to find rising ready at beck and call and around a district where they could be sure of finding a carcass to feed on.

We also may recall, that in the early days of thermal flight, when the departure of thermals was explored, people considered creating a "disturbance of some kind" to make bubbles break away. Driving cars through the appropriate region or diving with a sailplane into the bubble are told to have met with some success. The writer feels one need not resort to such tricks. Just make the wind throw such bubbles against some obstruction or wedge, in lieu of moving such obstacles against the stationary air.

If it is true that a car going through the base of a "ripe" thermal bubble, can make for the breakaway, why shouldn't a wedge of some height in windy conditions be in a position to effect the same triggering?

Fig. 3.—Formation of a stationary thermal front at the juncture of two different types of ground.



Do Birds Know Stationary Thermal-fields?

Yes, they do. While we were doing our research flights in that heather near Munich, we could study the flight antics of a stork who made a straight course thermal flight over the borderline of a wood losing no height at all over quite a time. Buzzards may be seen sometimes making head-on long duration soaring flights against the wind which may be strong at that, using stationary fields of thermals as described above.

In this connection we can quote from Pierre Idrac's classic book on *Experimental Research on the Soaring Flight of Birds* who says: "If the breeze is gaining force, one can very often see the birds giving up circling flight making head-on straight flights or in a broken line or even remaining stationary all the time". Similar flight patterns have been recorded by Huffacker who studied the large continental soaring birds.

This is enough theory on a very interesting field of studies. We can only suggest practical trials on sunny, windy days and tabulation of findings. Of course, besides self-steered and R/C models normal gliders would indicate stationary thermal-fields, but not so typically as they leave lift-zones due to wind-drift.

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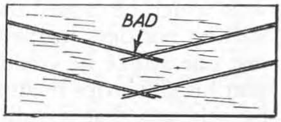
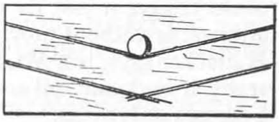
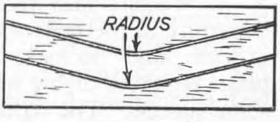
PLY DIHEDRAL KEEPERS







Thin plywood is generally quite adequate for spar joiners and dihedral keepers. One-quarter of the spar thickness at dihedral joints and twice this thickness at centre wing joints (one keeper of one-half the spar thickness or, preferably, two keepers, one each side of the spar, each one-quarter of the spar thickness).

Ply joiners should be cut *carefully*. If sawn, there is a danger of "notching" the centre of the brace and consequently weakening it. This applies particularly to the top cut. It is better to drill a $\frac{1}{4}$ in. diameter hole in the ply first and cut to this hole rather than attempt two straight saw cuts meeting at the centre. If the keepers are cut with a fretsaw or jigsaw, take the cut through a radius at the centre rather than abruptly changing direction.

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A SIMPLE SPAR CHECK

To check balsa spar strip, try holding it by one end and whipping it up and down gently. You can usually tell by the "feel" if the strip is good and true. A hidden defect or a piece of short grain will usually make the spar break under this test.

The safe technique can be used to "pair" spars or longeron stock. Whipped together they should behave in the same manner. If one bends more than the other it is weaker, or more flexible.

Simple check for spar weights is to drop several together, holding parallel to the floor. Despite the law of physics that says gravitational acceleration is the same for all bodies, the heaviest spar will always reach the floor first—provided all fall in the same "flat" way. You can sort out approximately equal weight strip lengths from a whole batch quite rapidly in this manner. Use scales for a final weight check, if critical.