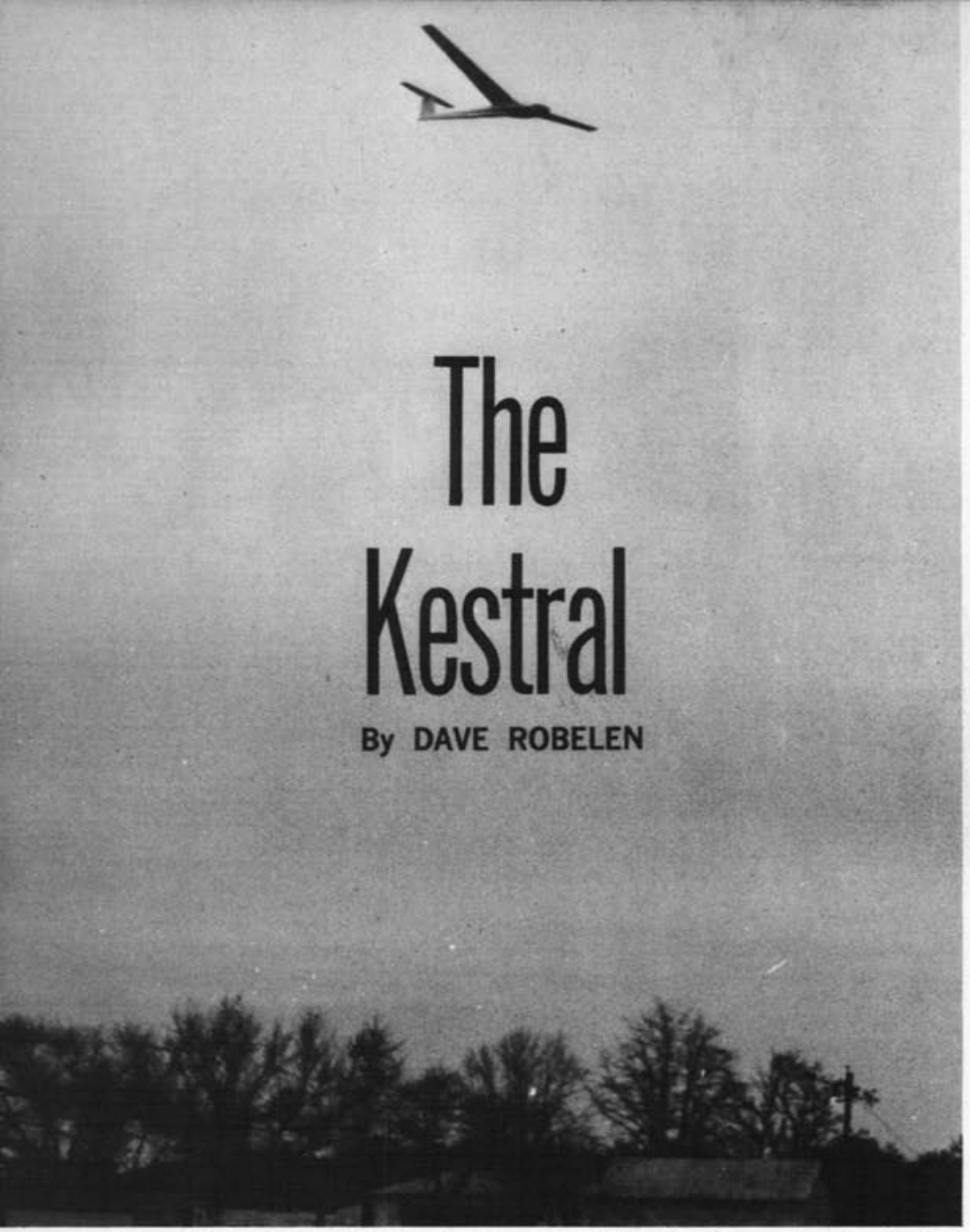
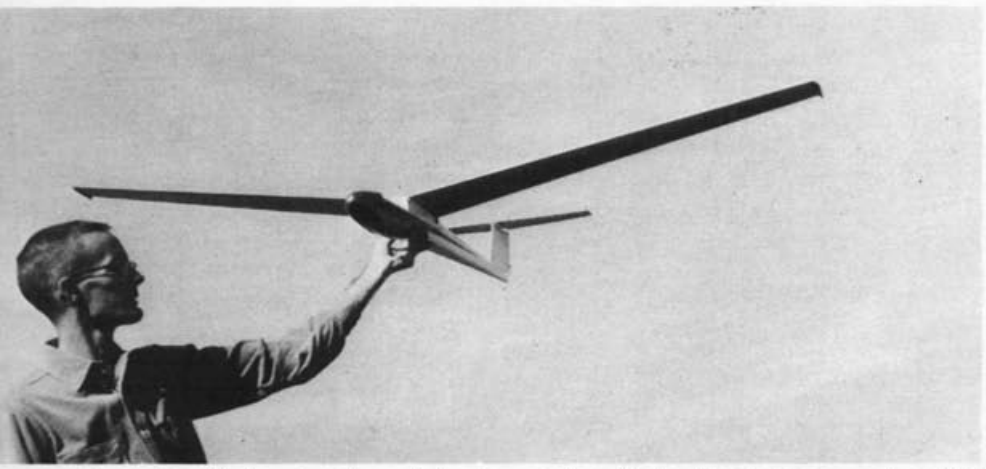


The Kestral

By DAVE ROBELEN

The relaxed but refreshing challenge of radio controlled thermal seeking should not go untried.

This soaring glider is simple to build yet clean and neat. It's almost impossible to pass by without serious consideration. Designed for single channel, but mini-propo will fit.



The author displays the clean, simple lines of the all-balsa Kestral. Note snag-free T-tail.

▶ The Kestrel is a model sailplane born of compromise. I have read many times about the thrills of soaring, but had never witnessed any R/C glider thermal soaring firsthand. The area in which I live, typical of many East Coast flying sites, has a fairly strong breeze most of the time. When the mid-day thermals are present, the breeze is normally above 10 m.p.h., sometimes as high as 20. The first requirement, therefore, was a fast but flat glide with some ability to slow down when the winds would drop off. The Kestrel meets this requirement with a flat-bottomed, low-drag airfoil combined with a fairly light wing loading. Other requirements were as follows: scale-like appearance, strong, simple construction, high strength for some occasional slope soaring, ability to fly well with the many excellent rudder-only systems currently available, and an ability to be launched via the high-start system.

After surveying the above requirements, I decided to design my own plane to meet them. The fact that I met with some success is the reason for this article. I wished to share the fun.

If complex structures are the reason some of you may have avoided gliders, please look at Kestrel closely. It can be built in no more than a week of lazy evenings, and for the novice, the Kestrel has fewer difficult alignment chores than most models. Just imagine, no engine or mounts, landing gears, or even fuel tanks and plumbing, and the wings and tail are very simple to construct without warps or misalignments.

The novice will also find Kestrel very easy to fly and quite resistant to damage. As for the expert, the challenge is always there with a thermal riding glider. No two days are exactly alike and there is never the monotony of stunt flying. It probably will give your adrenalin glands quite a rest too. In fact, sometimes I find it difficult to enjoy a power model after watching Kestrel riding a thermal hundreds of feet high.

The Kestrel won't break your piggy-bank for equipment either. A single channel outfit is completely adequate. There are many on the market now and I don't want to promote any one line, but the radio system sold for the Testors Skyhawk has many good features. The original Kestrel is equipped with an Adams actuator, a Citizenship RSH superhet, an Ace add on switcher, and three 500 mah pencell size nickle-cadmium cells. Whatever type of equipment you choose, I highly recommend a superhet receiver unless you only fly in the boondocks, otherwise those long glider flights might annoy your fellow modeler. I also must recommend using a pulse system instead of escapements. A flyaway with the Kestrel could well be

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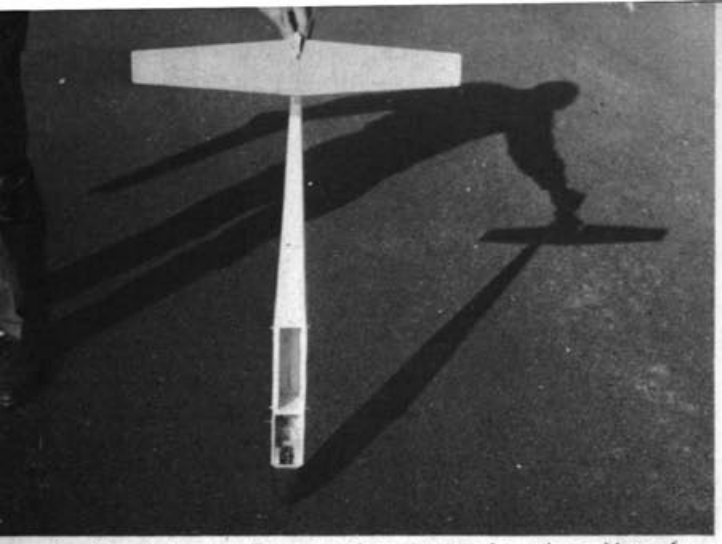


Yes, it's all there! Author uses Adams actuator for pulse rudder only. Adding elevator control by Galloping Ghost or small propo not difficult.

Do you have to drive miles to get to a field where engines are tolerated? Here is the answer. Dave shows easily built, high A/R sheet wing.

THE KESTRAL . . . continued

permanent, while a lost signal with full rudder gives a tight descending circle, not a vicious spiral dive as in power models. The Kestrel normally would not sustain any damage of a serious nature in a landing of this sort.

Construction of the Kestrel is quite straight-forward, in fact, the only curved cuts are the wing ribs. The remainder of the parts should be cut with the aid of a good straightedge. This will help alignment throughout. No special sequence need be followed in choosing which part to construct first, but I will start with the fuselage. Unless otherwise mentioned, the entire model should be built from light, stiff balsa. I used Titebond cement throughout the original, and recommend it.

Cut the two fuselage sides and three bulkheads from ⅛ inch square for the stringers and glue them to the sides now, one left and one right please! Cut the nose doublers from 1/16 inch and cement in now. A contact cement is handy here. I use Weldwood brand. Glue the three bulkheads to one fuselage side and let the glue set briefly. After a decent interval, glue the other side to the bulkheads and set the fuselage upright on a flat surface. Check alignment now and make any necessary corrections.

After this is dry, the stringer should be cut through and the sides scored on the inside surface just behind the third bulkhead. This will allow the sides to be pulled together in the rear without exerting too much force. The stringers must be shaved down on either side at the rear to the angle shown on the top view. This will allow the sides to come together as shown in the top view. Glue the tail together now and also work some glue into the cuts in the stringers to strengthen them. When this is dry, the top and bottom may be sheeted with 1/16 inch balsa, grain running fore-aft.

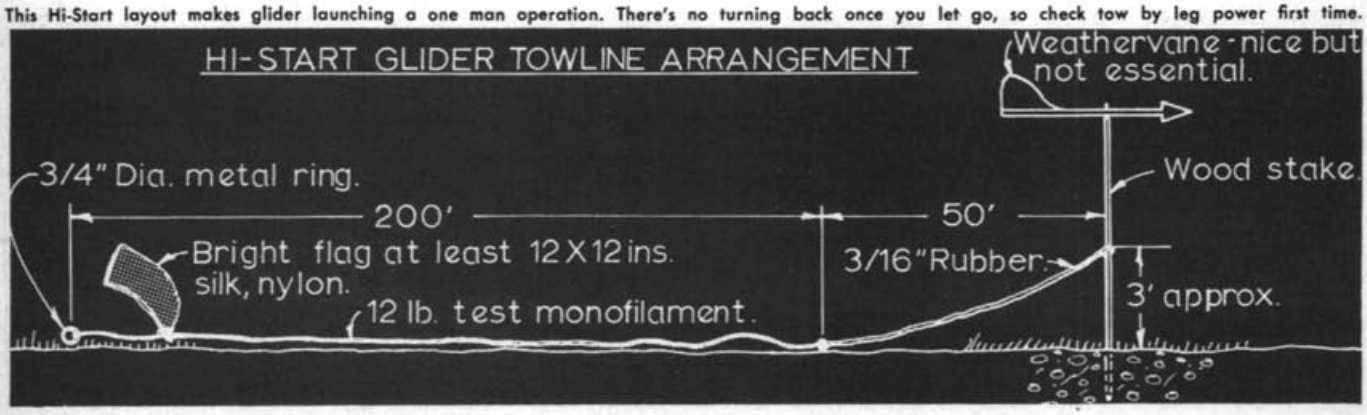
The noseblocks may be added next. It will help if these are cut to the side outline before attaching. The small triangular block at the top of bulkhead 2 may be added now. Let all this dry at least overnight and then carve and sand to the cross-sections shown. A long, flat sanding block will be very handy in achieving a smooth contour. The windshield is a flat piece of celluloid bent around the cockpit . . . consider this when shaping the nose. After sanding to satisfaction, the fin may be glued in place. Hinge the rudder in your favorite fashion, but keep it very free. Avoid any large gaps at the hinge line if using Rand or similar hinges. Do not install dowels or the radio yet, also leave the stab platform off for now.

The stabilizer may be started by cutting two skins from 1/32 inch balsa. Use very light wood and make them identical. Pin one of them down to a flat work surface and glue in all 1/16 by 1/8 inch framing. When this is dry, the top skin may be glued in place. Let the assembly dry overnight, pinned or weighted flat. When the stab is dry, sand the edges round, and smooth any rough places. When satisfied, set aside.

The wings are started by cutting the skins from 1/16 by 6 inch balsa. Cut the top skin ⅛ inch wider to allow for bending. The ribs may be cut from the 1/16 inch triangular pieces left from the skins. Cut the two center ribs from ⅛ inch hard balsa. Pin the bottom skins to a flat workboard and mark rib locations. The ½ inch square balsa leading edges may now be glued in place. Make one left and one right, remember?

Glue all ribs in place, tilting the two W1 ribs to match the W13 braces. When the (*Continued on page* 79)

This Hi-Start layout makes glider launching a one man operation. There's no turning back once you let go, so check tow by leg power first time.



ribs are dry, the top skins may be glued in place. Trial fit the skins in place without glue and trim for a good fit as necessary. Now lock the door and station your wife by the phone (or baby) and get plenty of pins. Put a bead of glue on the front edge of the top sheet and then on each rib and the trailing edge of the bottom sheet. Working swiftly but carefully, pin the top sheet in place and work out all ripples and gaps. Try especially hard to get the skins down tight against the W1 ribs. Let all this dry overnight.

The leading edges should be trimmed to the airfoil contour after removing the wings from the work surface. Working slowly and carefully, trim and fit the angle on the wing roots to give the proper dihedral and a good fit. I joined the panels of my Kestrel with Titebond and they are quite sturdy. Epoxy would be good here also. Be quite careful to prevent joining the panels with any twist or misalignment, as this would be very difficult to correct for true flight. If you want the extra security, a band of fabric glued around the center section will make it quite tough.

Using the sanding block, go over the wing now and finish rounding the leading edge (1/16 inch radius) and smooth over any other rough spots. Carve the tips from good firm balsa and tack cement them on. Trial balance the wing now by setting it on a level, hard surface (no rugs, please) and noting if one tip tends to drop to the surface. Determine if any ballast is necessary and add it inside a tip. The wing must be balanced properly for nice, straight tows to the top of the line. The wing can now be mated to the fuselage. Trim the fuselage until the wing sits flush without rocking.

With the wing in place, the stab platform can now be cemented to the fin. As soon as the cement begins to set, place the stab on the form and sight down the model, checking the alignment closely. Correct any tilt before the glue sets hard.

The equipment may now be installed and the model finished. It is preferable to have the radio receiver wired with a connector so it can be removed during the finishing process. If an Adams actuator is used, install it on bulkhead 2, following manufacturer's instructions. The torque rod and plywood tailplate may be installed now. The tailplate shape is not shown, as this will vary with individual fuselage cross-section. I used a one-piece .045" wire torque rod between the actuator and the rudder, splicing with brass tubing under the wing. This has been very satisfactory, however, any type will serve. Whatever you use, please keep it light. I used the linkage on the rudder as the stops for my Adams, and it has been very satisfactory. The hairpin loop on the rudder is positioned by trial and error until the torque rod rotates about 20 degrees each way and the rudder moves at least 20 degrees each way. Moving the hairpin fore and aft will alter the amount the torque rod rotates while moving the hairpin up or down the rudder alters the amount of movement of the rudder.

While I have dealt mainly with the Adams installation, almost any system for rudder control will be fine if the weight is not excessive. If other equipment is used, the balance of the model should be checked before anything is installed permanently. In any case, do not fasten the batteries or receiver permanently until the model has been completely finished.

Speaking of finishing, it is about that time. Almost any method of finish will be satisfactory IF IT IS LIGHT! I will detail the method used on the original for those among you who do not already have a pet method. Any type of finish material will be fine because there is no messy engine throwing fuel around. The original Kestral is finished with Aero Gloss dope, so I will detail that finish.

First, the entire model should be sanded very smooth with progressively finer sandpaper, ending with 400 wet or dry. Any nicks or pits should be filled now. I use Aero Gloss plastic balsa for deep cracks, etc., and Hobby Poxy "Stuff" on shallow scratches and cracks. When satisfied, put three coats of clear dope on the wing and stab, sanding lightly with 400 wet or dry (use dry) after the first and second coats. The original Kestrel is covered with yellow Japanese tissue over the entire wing and stab. This gives an attractive color and is very light. Attach the tissue to the surfaces by smoothing it in place and doping thinner through the tissue around all the outlines. Thick clear dope may be used to help fasten down the outer edges. Use of a finger to rub the tissue down will also help.

After all of the tissue is attached, the parts should be sprayed with a fine mist of water, as from a Windex bottle. This will shrink the tissue tightly into place. After the wing and stab are throughly dry, they may be doped with clear dope. The original has eight coats on the wing and four on the stab. The stabilizer should not be heavily doped or it may warp. Also there is a chance the model will be tail heavy.

The fuselage and vertical tail are finished differently from the wing and stab. I used Aero Gloss Balsa Fillercoat to fill the wood grain, about six coats with liberal sanding after each coat should do the trick. Now is the proper time to install wing and stab hold-down dowels. Use 1/8 inch diameter hardwood for the wing and 1/16 inch diameter hardwood for the tail (Q-tip stick). The fuselage of the original Kestrel is painted white with metallic blue trim. If possible, spray on all color dope. It is much lighter this way.

After a good drying period, the model may be assembled with the batteries and receiver loosely set in place for the moment. Balance the aircraft on your fingertips, supporting the wing near the cabin sides rather than out at the tips. Shift the batteries and receiver around until the fuselage hangs level with the wing supported at the prescribed point. If necessary, add ballast to the nose, but do not allow the model to be tail-heavy.

The receiver should be shock-mounted, while in most cases it is wise to anchor the batteries in firmly. This will prevent these heavy items from bouncing about in a hard landing and doing unnecessary damage.

This is the time to range-check the receiver system and attend to any other questionable matters. Do not compromise on radio reliability. . . . No airplane needs built in troubles.

The hatch cover for the radio, by a pleasant coincidence, just happens to look something like a windshield. Now isn't that nice? I found the celluloid for mine in a loose leaf notebook, you know the kind you slip important papers inside. Any plastic sheet will serve, just so it bends easily over the fuselage contour. Trim the plastic for a slight overlap all around, 1/8 inch is about right. I hold mine on with strips of 1/4 inch masking tape; this is quite serviceable and not too offensive looking.

The towhook should be installed now. Bend it to the shape shown. Don't bend the bottom leg up any higher or the model will not release easily in an emergency. Also, smooth off any sharp burrs left by a wire cutter. This too helps easy releases. Fasten the towhook at the location shown on the side view and on the model's centerline. Use a model cement to hold in place. Ambroid is useful here.

Unless you have access to a suitable slope soaring site, there are a few things to round up before going flying. The Kestrel is designed for high-start towing so we need to put together a high-start set. Taken from one end to the other, this consists of: a stake about 3 feet tall, 50 feet of 3/16 inch flat rubber (Sig) attached to the top of the stake, 200 feet of 12 pound test mono-filament fishing line (attach to the loose end of the rubber band), a smooth ring about 3/4 inch in diameter (a tear tab from a beer can is useful here, also small curtain rings). Attach the ring to the end of the mono-filament. A bright nylon or silk flag about 12 inches square should be fastened to the line about 2 feet from the ring. This aids in finding the end of the towline, helps pull the ring off the hook when releasing, and also helps the breeze to lay the line down straight on the ground. The mono-filament line may be made longer if space permits—as much as 400 feet. This, however, is not essential for good thermal hunting.

Let's go flying! On the first day out, make the test flights either in the early morning or later evening so as to avoid strong thermals. There is no need to wait for a dead calm, however.

The first step is to hand glide the Kestrel into some soft grass or weeds. If necessary shim the stabilizer for a flat, smooth, but fast glide. Also correct any tendency to turn now. The model should glide straight ahead with neutral controls. Make a number of tosses until you are certain of the results.

Let's set up the high-start now and get some real altitude for gliding. Rig the high-start, in the sequence described earlier, over some smooth ground that is reasonably free from tall weeds. Avoid paved runways like the plague! The towline

should be directly downwind from the stake so the model will climb exactly into the wind when released. Pull the tow ring back until the rubber band in the high-start is stretched about three times its relaxed length. Now have a helper walk along the line, or anchor the tow ring and do it yourself, to make certain it is not snagged on a hidden weed. It is best for the first flights to have an assistant launch the model while you stand to the rear, ready to make any necessary corrections. Check the radio very carefully and hook the model onto the line.

Have the assistant hold the model with the nose up about 30 degrees and pointed directly at the anchor stake. The release should be a gentle upward shove, not a violent throw. Do not give any control during the climb unless the model seems to be pulling too far over to one side and not recovering. The Kestrel is very stable during tow and normally will climb all the way to the top with no assistance. If you achieved this on the first try, congratulations.

For those who might need it, I will list a few possible towing troubles and their corrections.

1) The model does not climb . . . Either the rubber band is not stretched tightly enough or the towhook is too far forward of the balance point. First try stretching the band more tightly until a good strong pull is achieved. The pull on the line measured at the towring should be 1½ to 2 lbs. This may be measured with a spring type fishing scale. If this does not help the climb, and the model balances at the point indicated, move the towhook back about 1/4 inch and try again.

2) The model climbs at a good steep angle, but will not tow straight. Instead, it pulls to either side about equally and seems too sensitive to control during the tow . . . First check back to the glide and make sure it is trimmed to glide very straight with no turns. Then, if the model balances at the proper location, the towhook should be moved forward about 1/4 inch. (Note-the important part is the relationship between the towhook and the C.G., not the position of the towhook relative to the wing L.E.)

3) The model starts to climb at a good steep angle, and nice and straight, but always pulls to one side near the top of the tow. This indicates that the model is balanced off center. Check the wing again for balance, and, if necessary, weight the light tip with modeling clay temporarily. Try the tow again. If the clay helped, but did not clear it up completely, the fuselage must have a heavy component to one side. The idea here is to add weight to the side that the model turns toward until the tow is straight all the way to the top.

The original Kestrel weighs 15 ounces with the indicated equipment. If your glider is much heavier than this, and does not climb to the top of the towline, use a heavier strip of rubber in the high-start. Try 50 feet of 1/4 inch flat rubber instead of 3/16.

I hope by now that your model is climbing to the top of the line smoothly and casting off with good height. This sure beats running doesn't it? We should check the rudder response before the Kestrel is flown in strong thermals. The model, ideally, should be set-up to descend nose-down in tight circles with full rudder. A steep spiral dive is not necessary or desirable. This gives a frightening speed build-up.

Always be ready to shim the stabilizer slightly for the best glide to suit the conditions. If the breeze is high, the model, of course, should be trimmed fast and flat for adequate penetration; but, on those nice calm days, go ahead and shim the stab for the slowest glide possible without stalling.

You are now ready to go fishing for thermals. The best time to expect thermals around my neighborhood is in the late morning, after the sun has been up a while. A useful piece of equipment for thermal riding is a chaise lounge or lawn chair. If you don't believe me, fly a couple of flights standing up and craning your neck to watch the model high up in that thermal. Get's you in the back of the neck, doesn't it? I also have tried lying on my back on the ground, but this spoils my orientation when I can't see the horizon.

The final argument for the Kestrel or any other true glider is the joy of bringing home a clean, neat airplane. That model engine is suddenly going to seem noisier, messier, and altogether much less pleasant than ever before.

If all the foregoing has failed to convince you that a sailplane is just the thing for your next project, please forgive me, for I have not presented the evidence properly.

As for myself, well, you might not even know I am at the field unless you notice that fellow over in the striped lawn chair, holding a transmitter and watching the same piece of sky. That just might be me. (Dave, they'll notice you if you don't have your frequency clip with you! R/C Ed.) HAPPY THERMAL HUNTING!