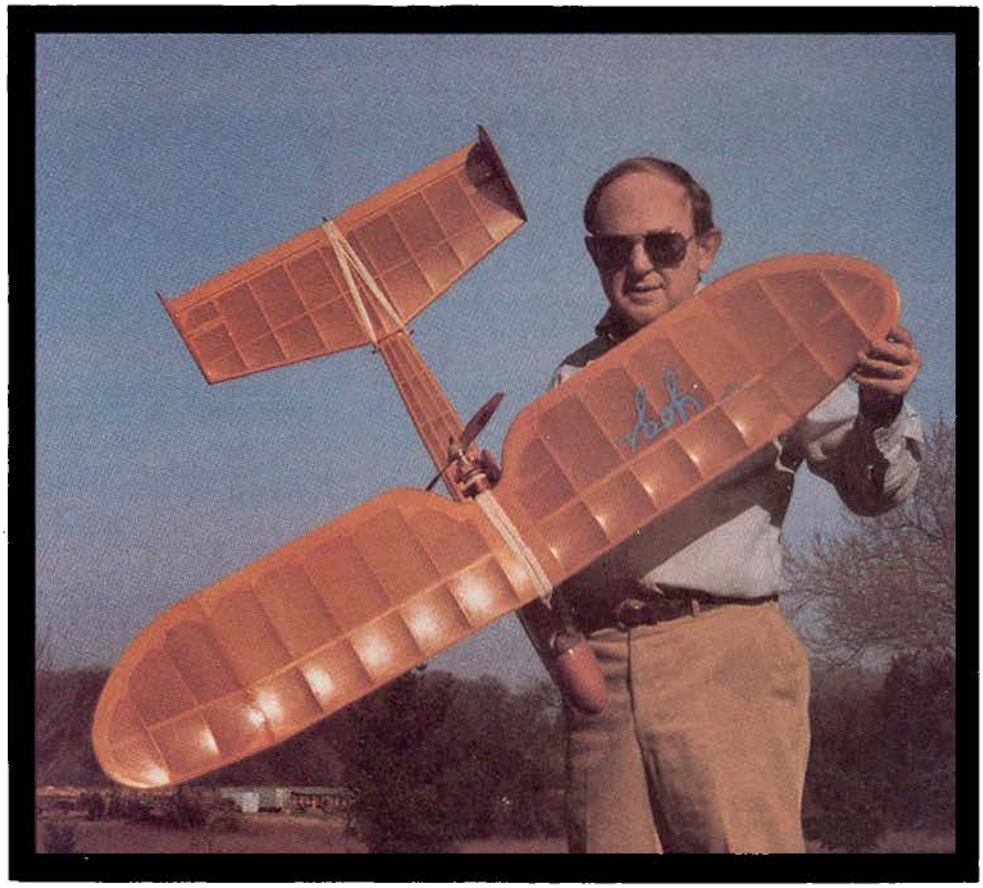
ELECTRIC YOGI

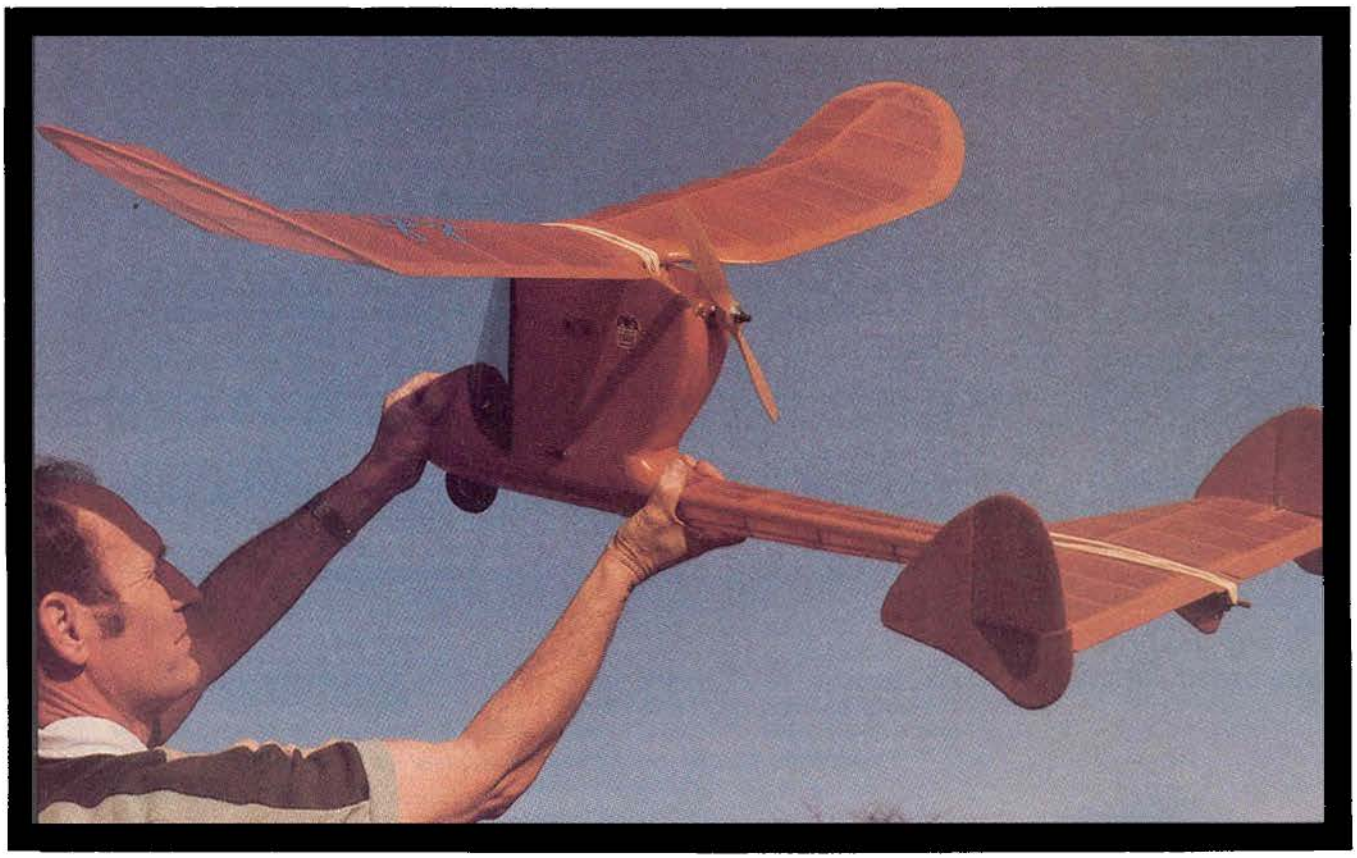


By Don Srull

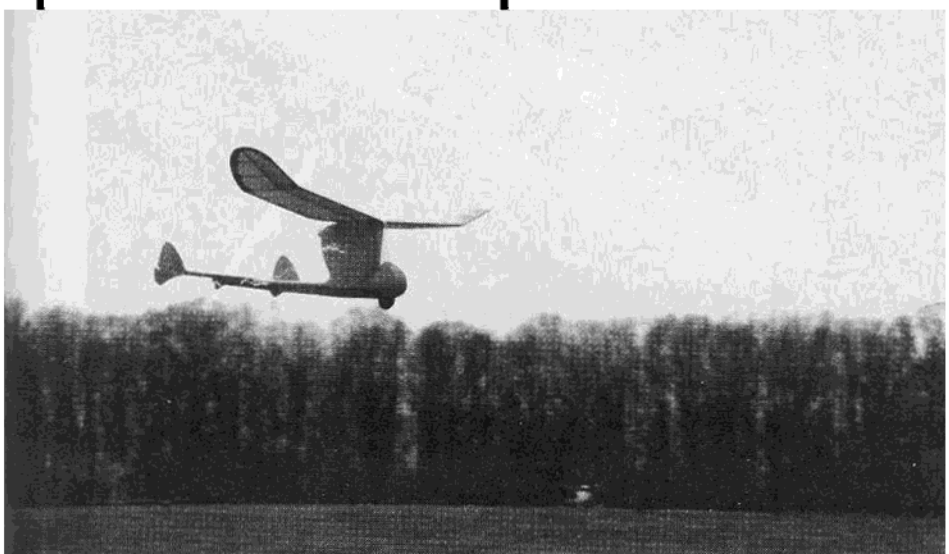
Photos By Tom Schmitt

Another old-timer adapted for electric power and R/C by Don Srull. This time it's the 1944 offbeat contest winning design by Jerry Stollof --- the Yogi.

In 1944 Jerry Stollof published one of his many popular free flight contest gas model designs. The Yogi's unconventional layout and distinctive look has a purpose; winning contests. The high thrust line pusher engine and the tall pylon wing arrangement were intended to help prevent looping under high power and to prevent



YOGI ELECTRIC
Designed By:
Original 1944 — Jerry Stollof
Electric R/C — Don Srull
TYPE AIRCRAFT
Old-Timer (Pusher)
WINGSPAN
50 Inches
WING CHORD
9¾ Inches
TOTAL WING AREA
430 Sq. In.
WING LOCATION
Pylon Mount
AIRFOIL
Flat Bottom
Undercamber (Opt.)
WING PLANFORM
Constant Chord
POLYHEDRAL EACH TIP
1st Break — 1¾ Inches
Tip — 2¾ Inches
O.A. FUSELAGE LENGTH
36 Inches
RADIO COMPARTMENT SIZE
(L) 10" x (W) 2¼" x (H) 4½"
STABILIZER SPAN
21 Inches
STABILIZER CHORD (incl. elev.)
7¾ Inches (Avg.)
STABILIZER AREA
160 Sq. In.
STAB AIRFOIL SECTION
Flat Bottom
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
6 Inches
VERTICAL FIN WIDTH (incl. rud.)
5 Inches (Avg.)
REC. MOTOR SIZE
05 (Direct or Geared)
FUEL TANK SIZE
NA
LANDING GEAR
Single Wheel
REC. NO. OF CHANNELS
3
CONTROL FUNCTIONS
Rud., Elev., Throt.
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa & Ply
Wing ..... Balsa & Ply
Empennage ..... Balsa & Ply
Wt. Ready To Fly .. 2½-2¾ Lbs. (40-45 Oz.)
Wing Loading ..... 13.4-15.1 Oz./Sq. Ft.



spiraling-in when turning in tight circles. There were two problems that plagued early power models. It must have worked — the Yogi racked up an impressive win record in the 40's. The design was also kitted for a short period by the Eagle Model Aircraft Company.

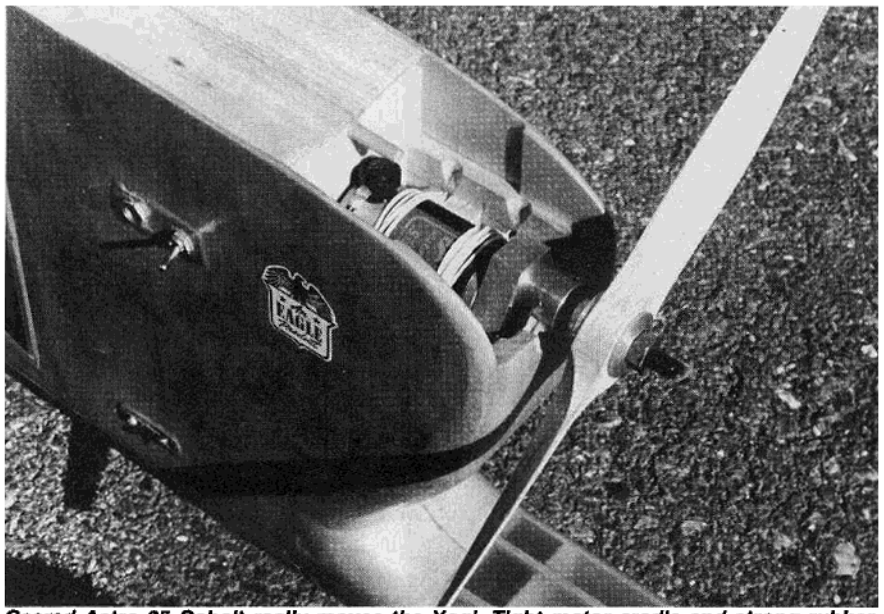
For our purpose the Yogi makes an ideal R/C electric sport machine, in addition to capturing some of the feeling of an old classic free flight design. Electric power also eliminates the problems that went along with starting an awkwardly positioned pusher engine; and it does spare us from that oily mess such an engine placement would create. We can even use the fairly heavy electric motor flight batteries to our advantage by locating them in the solid balsa nose, thereby helping to move the Center of Gravity to a respectable location. In the original Yogi all of the ignition system components — the coil, batteries, and timer — had to be located as far forward as possible to help offset the weight of the Bantam .19 engine located behind the wing.

For any of you out there who would enjoy flying the old Yogi design, but don't have an antique ignition engine or a giant model field suitable for power free flight, why not try the electric R/C version? If you want to have a go at it, read on.

Model Design:

The model was adapted to use any of the popular 05 electric motors currently available, either geared or direct drive. To provide a suitable wing area for such a model, the original Yogi was enlarged 20%. This gives our R/C version a span of 50" and a wing area of 430 square inches. The total weight can easily be kept down to under 45 ounces, which will result in a wing loading of less than 15 ounces per square foot. That's in the right range for an easy to fly, good performing sport model. The only other intentional deviations from "scale" include a slight decrease in dihedral, an increase in the size of the fins, and a flat bottom airfoil instead of the original undercambered airfoil section.

In our prototype model we used the most powerful of the 05 motors, a geared Astro Cobalt 05. With seven



Geared Astro 05 Cobalt really moves the Yogi. Tight motor cradle and strong rubber straps hold it in. The "Eagle Product" decal is a copy of the one used in the Yogi kit back in mid-40's.

800 mAh cells, this powerhouse gives sizzling performance to the Yogi — about all that it can handle. With this motor set-up I recommend the use of a good motor speed control device, such as the controllers available from Jomar Products, 2028 Knightsbridge Dr., Cincinnati, Ohio 45244, (513) 474-0985, or Astro Flight, Inc., 13311 Beach Ave., Marina Del Rey, California 90291, (213) 821-6242. Fully adjustable power settings makes for much more pleasant flying with any model, but on a high powered model like the Yogi and Cobalt 05 combination, hand launches and landing approaches will be much safer and easier than they would be with a simple off, full on, switching arrangement. If you are not going to incorporate a motor speed controller, then I recommend using only six cells with the Cobalt 05; or use one of the less expensive Ferrite 05 motors, several of which are available from both Leisure Electronics, 22971-B Triton Way, Laguna Hills, California 92653, (714) 581-1198, and Astro. These motors will provide plenty of performance for a sport model the size of Yogi.

Our model, carrying a medium size radio and sporting a silk and dope covering, grossed out at exactly 40 ounces. With a six cell battery pack instead of the seven cell pack, the total weight came down to about 38 ounces. The resulting wing loading of around 13 ounces per square foot is not much higher than the original free flight model, which carried about 11 ounces per square foot. Not surprisingly, our model has a very nice glide indeed; plenty good enough for thermal hunting and soaring in modest lift. In fact, the old free flight spirit of the original model still seems to reside in this R/C version. While repeatedly launching and landing the model one day for photographer Tom Schmitt, the fuselage hatch came unlatched, going unnoticed. At the next launch the hatch fell off, followed by the receiver battery pack! Straight out into the teeth of a good breeze the Yogi climbed at a 20° angle like an arrow. Nothing to do but turn off the transmitter and watch. In 4 or 5 minutes it was out of sight upwind. After another 15 minutes a tiny speck appeared.

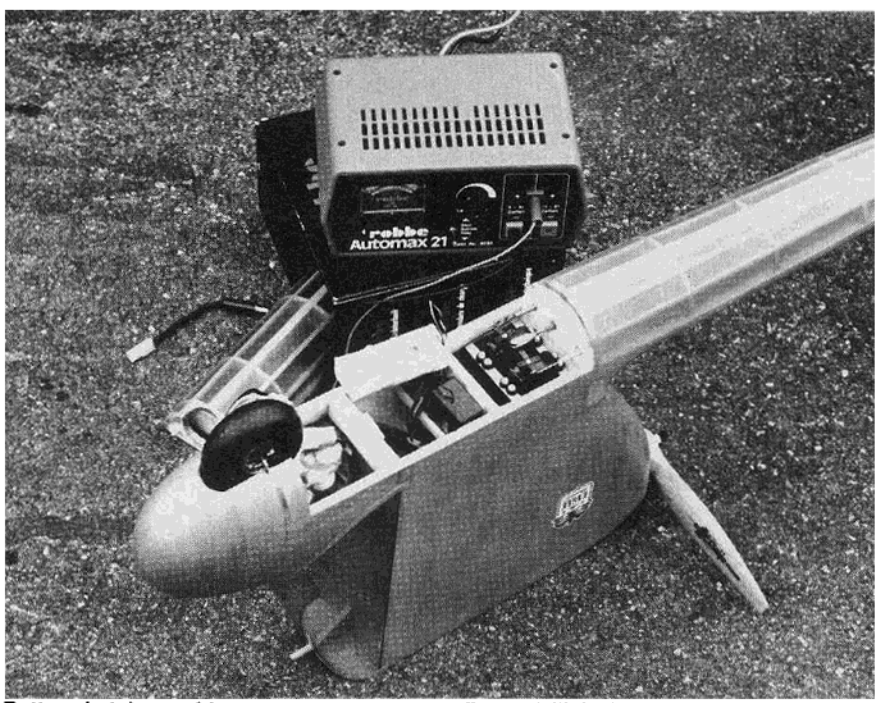
With the motor now run down, the Yogi transitioned to wide gliding circles to the left, slowly drifting back toward the field. Over the next hour or so we chased and watched the shiny orange model as it soared over and beyond the launch point, going in and out of thermals as if it would never come down. Tom Schmitt finally found the model a few days later in a cow pasture a couple of miles from the R/C field, unharmed. It was partially filled with water, having sat through a couple of rain storms. After drying out for a week or so, and steaming out a warp in the stab, the model and all equipment, including the motor, flight batteries, and radio seem to be perfectly okay and are still in use.

Let's build.

CONSTRUCTION

Very lightweight balsa should be used for construction throughout, except for the wing and stab spars, wing leading edge, and the 1/4" x 1/2" fuselage crutch pieces. These should all be very firm, straight grained balsa. Keep the tail surfaces and rear end of the fuselage as light as possible to help get the C.G. in the right place.

Before starting the fuselage, you will have to select the motor and radio servos you intend to use since their installation is customized to the particular equipment used. The crutch-type fuselage construction is typical of many old-timer designs. It's simple, quick, and assures a straight fuselage. Lay down the hard 1/4" x 1/2" balsa crutch pieces over the top view on the plan. Add cross pieces and Formers F-2 through F-4, making sure all the formers are perpendicular to the work surface. Next add the stringers, the pylon shaping blocks,



Bottom hatch provides access to servos, radio, and flight batteries. Automatic peak detection chargers (such as the Robbe or Kyosho) take the hassle out of charging at the field.

and the soft 3/32" sheeting on the pylon sides. While the fuselage is still attached to the workbench, temporarily fit and install the motor, along with its wiring harness, to the arming switch, charging jack, and the motor controller (or on-off micro switch). The motor can be mounted by means of a thin sheet aluminum strap (as shown on the plans), or strapped with several stout rubber bands attached to hooks in the motor mounting blocks (as shown in one of the photos). Since there is virtually no vibration from an electric motor, and in this case the motor is trying to push itself into the model, mounting is much easier than the usual glow motor installation. Just make sure your mounting method will resist the considerable torque applied between motor and model. Once the motor installation is okay, add the 3/16" dowel wing hold-down, and the 1/8" sheet balsa wing saddle sheeting.

The fuselage can now be removed from the work surface. From the bottom side, install the rudder and elevator servos, and the pushrods to the tail. Cut out plywood nose Former F-1 and bend the 1/16" piano wire cable through the 2½" wheel. Bind the wire to F-1 with fine copper wire and epoxy, and add this former and the other bottom formers to the fuselage framework. Make provision for a removable hatch between F-2 and F-7 to provide access to the flight batteries and the radio system. The nose block is laminated from three layers of 1" balsa, the rear two laminations being cut out to receive the six or seven cell motor battery pack. A little shaping and sanding will now make the fuselage ready for covering.

The wing and stab are of conventional construction. In the interest of simpler covering and added pitch stability, I used a flat bottomed airfoil on my Yogi rather than the slightly undercambered one used on the original free flight model. Both are shown on the plans. Also, since relatively few, widely spaced ribs were used on the original, you may wish to add false ribs (i.e., nose ribs) between every full length rib. I didn't do this on my model, but it would tend to preserve the leading edge shape of the airfoil between ribs. Both options are shown on the plans.

Notice that when adding the center dihedral and installing the full depth 1/32" ply dihedral braces D1 and D2, you will have to cut through ribs W1 and W2. A razor saw will make short work of this chore.

The stabilizer contains the bellcrank and pushrods for the twin rudders. The bellcrank must be fairly stiff, and should be made from 1/16" aluminum or phenolic. It is mounted to a 1/32" ply plate which is built in flush to the stab bottom surface.

The fins and rudders are cut from light 1/8" sheet balsa. The rudder horns are cut from 3/32" plywood and inserted into slots in the rudders. Before permanently gluing these in place, tack glue the stab and fin/rudder assemblies together. Make up and attach the 1/16" piano wire rudder pushrods, adjusting their lengths and the rudder horn position so that both rudders are parallel. When lined up, glue in the horns with CA glue and attach the pushrods at the bellcrank end permanently with soldered washers.

Covering:

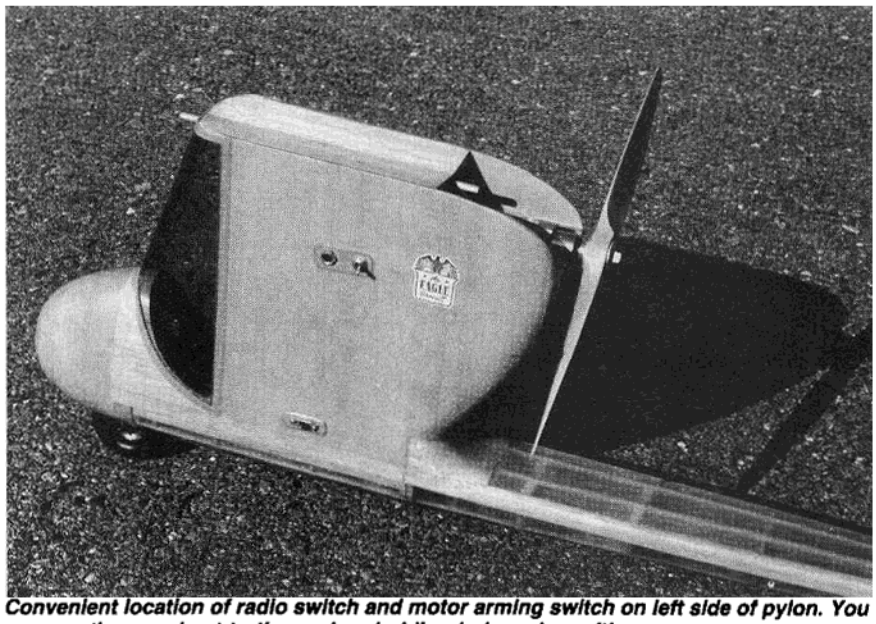
After shaping and sanding, assemble all components to assure proper alignment and fit. Install the radio and motor equipment to make sure everything goes in and works properly.

The quickest and simplest way to cover and finish the Yogi is to use an iron-on plastic film. Nevertheless, I like to cover old-timers with something a little more authentic looking. My Yogi is covered in orange silk and finished with several coats of clear dope. The trick in getting a nice looking **and** a quick silk job is to use a close weave, high quality silk rather than the very porous "lightweight" silk commonly available to modelers. The lightweight, porous material can be a nightmare to try to fill with dope --- kind of like cheesecloth. Tricky techniques with foam brushes or paper towels don't really work all that well and certainly don't compare to simply using good, close weave silk. The only remaining source of high quality model silk that I know of is the Model Covering Company, 2320 Ocean Parkway, Brooklyn, New York 11223. Surprisingly, the good covering, closer weave silk is less expensive than the porous stuff. If you do use silk for covering, finish it off with four or five coats of thinned low-shrink nitrate dope, or a low-shrink butyrate dope (such as Sig Lite-coat dope) to minimize warping.

Finally, paint "Super Yogi" on the wing of your model so fellow modelers will know what they're gaping at, and let's go fly!

Flying:

Adjust the servo arms and control horns to get about 3/8" of elevator throw each way and 1/2" of rudder throw left and right. When installing the flight batteries, make sure the arming switch is in the "off" position, and the radio controlled switch or controller is also "off." In fact, you should make it a habit to keep the arming switch in the "off" position **at all times** except when you step out to the launch line, ready to fly. The most dangerous aspect of electric power is that the motor will start immediately at full power the instant the circuit between motor and batteries is completed. Don't take chances; keep that arming switch "off." That's what it's for.



Convenient location of radio switch and motor arming switch on left side of pylon. You can see them and get to them when holding in launch position.

Balance the model, making sure the C.G. is within the range shown on the plans. Move equipment, batteries, or add ballast if necessary to get it right. If a Ferrite direct drive motor is used, the C.G. may be toward the nose heavy side, which is okay. Make a final check for warps and remove any that are visible.

Install a left hand propeller (pusher) of the size recommended by the motor manufacturer. If you can't find exactly the right size in a left hand prop, go to a smaller diameter and/or a lower pitch than recommended, rather than vice versa. For the initial test flights,

this will cut down a little on power output, which is fine, and will also prevent overheating and possibly damaging your motor. By the way, Graupner makes a large variety of very nice left handed nylon props which are sold by Hobby Lobby International Inc., 5614 Franklin Pike Circle, Brentwood, Tennessee 37027, (615) 373-1444.

Try some test hand glides over a grassy area before power tests. The Yogi's rather light wing loading means that its gliding speed is reasonably slow. Our model glided okay right off the board with just a little up trim. After the glide looks decent, try some low power test flights. Use your speed controller to get about half power for these first tests, or only put a very low, partial charge on the motor batteries if you don't use a speed controller. When the trim looks okay, go to higher power test flights. Remember that under increasing power levels, the Yogi will tend to keep its nose down in a shallow, fast climb. This is very unlike a conventional configuration, but that's what it was designed to do, remember? For this reason it is much easier to launch Yogi at reduced power and wait until it has built up a little speed, and gained some altitude before full power is applied.

In addition to some really respectable climbs to high altitude and long thermal searching flights, you can simulate the Yogi's old original climb and glide pattern. Find a trim setting in which Yogi, without radio input, will spiral up in a fast, tight circling climb and, when power is cut, transitions into a smooth wide glide circle. You can cycle through four or five of these powered free flight-like patterns by simply turning the power on and off at appropriate intervals. It's very much like good old free flight flying except for one thing — you can land at your feet when you need to "gas up" for another go!

Good luck and good thermals.

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