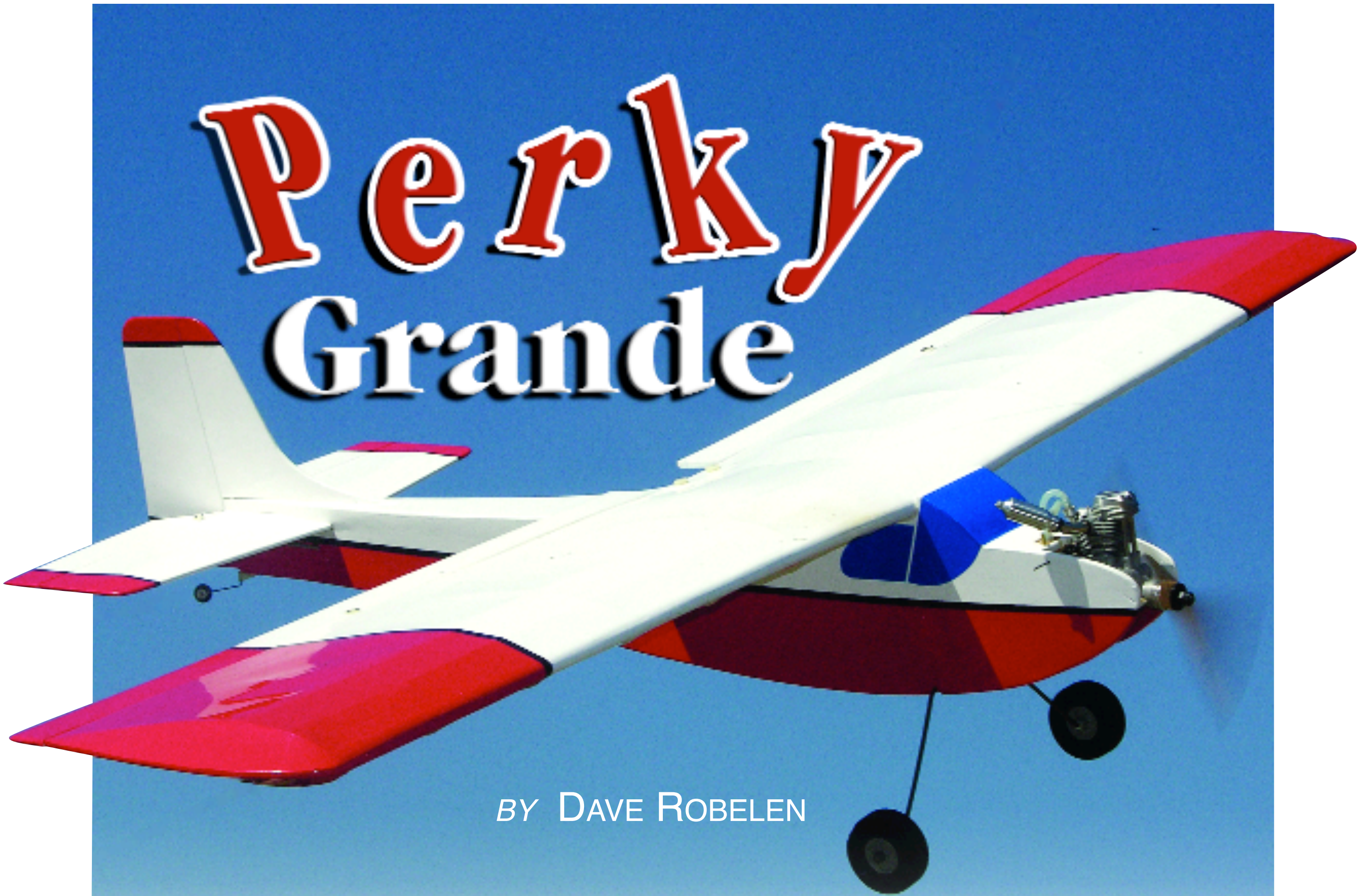


Perky Grande

BY DAVE ROBELEN

A four-stroke-powered candidate for that first model-building project

TO MOST OF you I am probably best known for my micro and indoor projects. My modeling activities actually span a wide range of sizes/types including quarter scale and FF.

I have owned and run a variety of nitromethane and gas engines in my time, but somehow I managed to miss out on the four-stroke power plant. I recently had the opportunity to purchase a new O.S. .40 Surpass at an attractive price. A review of this engine's capabilities made it clear that it would be well suited to a large, light model.

Meanwhile, I have had enough birthdays to slow my reflexes a bit, and watching larger models can be a help. I have never been content to just "fly around" with an RC model; I enjoy flying Aerobatics (Pattern) maneuvers. These considerations framed the reference for my new project.

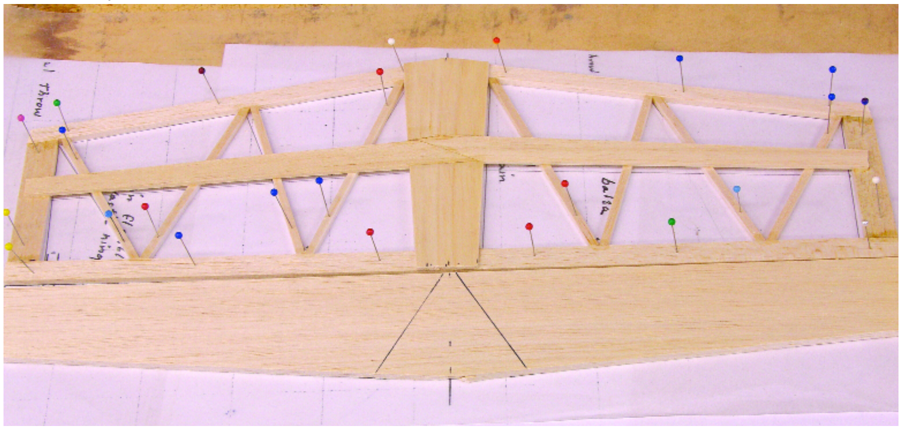
The original Perky was an .010 two-channel model and did well for its size. Later I enlarged it to the Perky Plus, which spanned 33 inches and was powered with a Norvel .061 engine. Its performance went well beyond my expectations. It had a broad speed range and the ability to fly a wide variety of maneuvers on limited power.

The basic Perky design has some useful features that may not be immediately obvious. Although it is a high-wing model, the wing is set fairly low on the fuselage. When this is coupled with low dihedral, the roll performance is great. The deep fuselage provides valuable side area for knife-edge flight, and the simple, boxy shape lends itself to light construction.

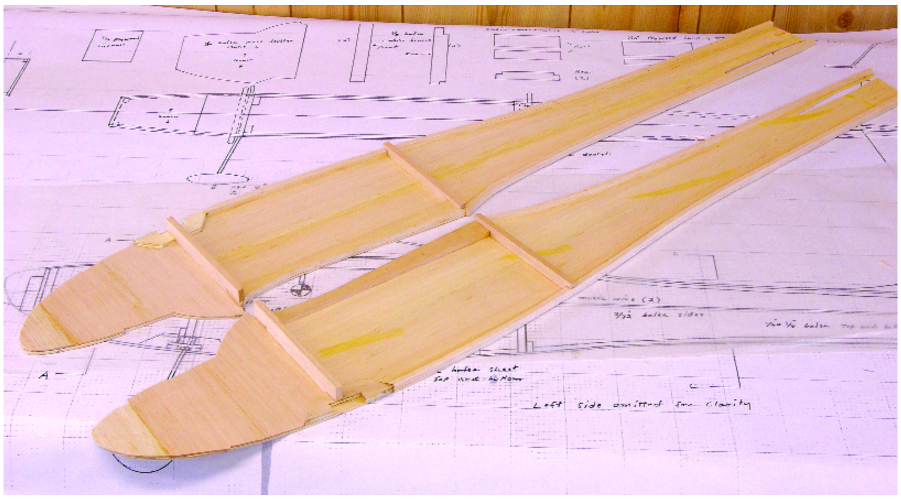
With that background I decided to scale up the Perky Plus to a wingspan of 63 inches, yielding a wing area of 775 square inches. I changed the airfoil to a semisymmetrical section and added aileron control. It was clear that a model this size could become too heavy

Dave checks out the control functions before beginning the first takeoff run with his Perky Grande.

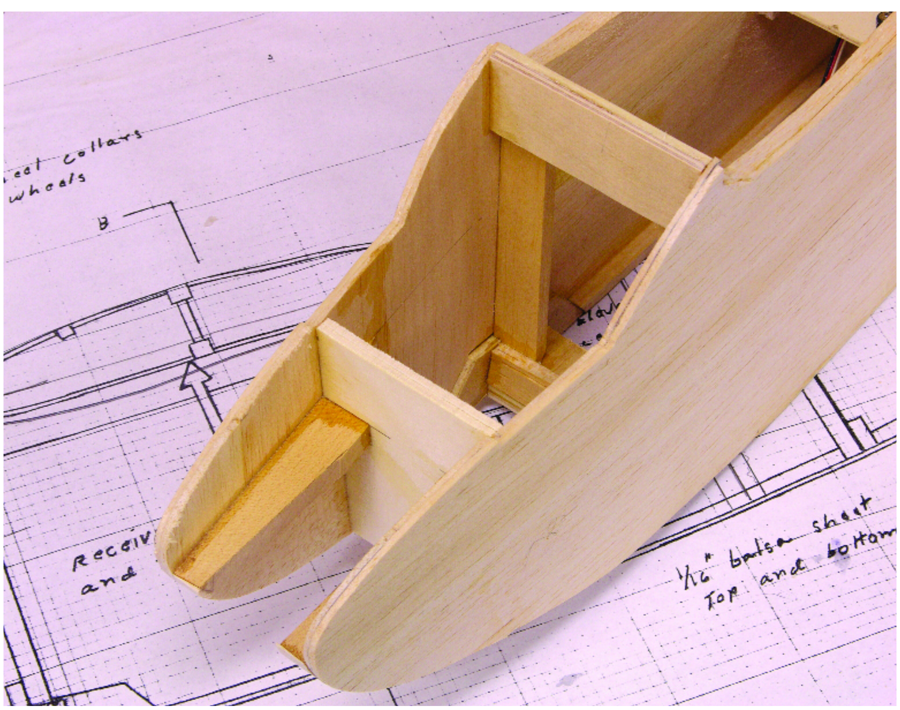
Photos courtesy the author



The stabilizer is built over the plans. Note Warren truss ribbing for extra rigidity and the massive center spar. The elevators are made from sheet balsa.



Fuselage construction is easy and durable. The fuselage sides have had the vertical-grain nose doublers and the wing-saddle doublers attached.



The front end of the assembled fuselage reveals the engine mounts, firewall, and built-up former at the front of the wing mount.

for the .40 Surpass without serious weight control. Therefore, I used 6- to 7-pound-per-cubic-foot balsa in the construction. An excellent source is www.lonestar-models.com.

I used park flyer-size servos for the ailerons and throttle and a 720 mAh, AAA-cell NiMH four-cell battery. Covered with MonoKote, the Perky Grande's total weight came out at 3.5 pounds without fuel. That seemed reasonable, especially with a wing loading of only 10.5 ounces per square foot.

I installed a seven-channel receiver and set the model up to my Hitec RCD Optic 6 transmitter. This allowed the strip ailerons to be drooped in a flap model and still function as ailerons. It was time to take the airplane outside.

With a satisfactory range check completed, it was time to break in the new engine. The furnished literature sheet recommended a maximum of 10%-nitromethane fuel, so that was what I started with. Starting and basic running went okay, but the needle valve seemed overly sensitive and the idle was too fast with a sloppy transition.

I have been fortunate to have access to a master modeler—Forrest Mason—who really knows his engines. He pointed out that I should be using a minimum of 15%

Type: Sport aerobatic

Wingspan: 63 inches

Flying weight: 3.5 pounds

Wing area: 806 square inches

Engine: O.S. .40 Surpass four-stroke

Propeller: 12 x 6 Master Airscrew

Fuel-tank capacity: 6 ounces

Controls: Five channels (five servos)

Equipment: Seven-channel Futaba receiver, two Futaba S148 servos, three GWS Naro servos

Battery: 720 mAh, 4.8-volt NiMH AAA cells

Control mixes: Flaperon, rudder with aileron (15%)

Construction: Balsa and plywood

Covering/finish: MonoKote

nitro and a composite propeller such as a Master Airscrew on a four-stroke engine. With these changes my engine settled down and ran like a charm.

With all the excuses used up it was time to go flying. Even on the takeoff roll it was becoming clear that the .40 Surpass would be more than ample power for the Perky Grande. As the flight progressed I worked my way through the Pattern maneuvers, delighting in the realistic speed and quiet sound during the flight.

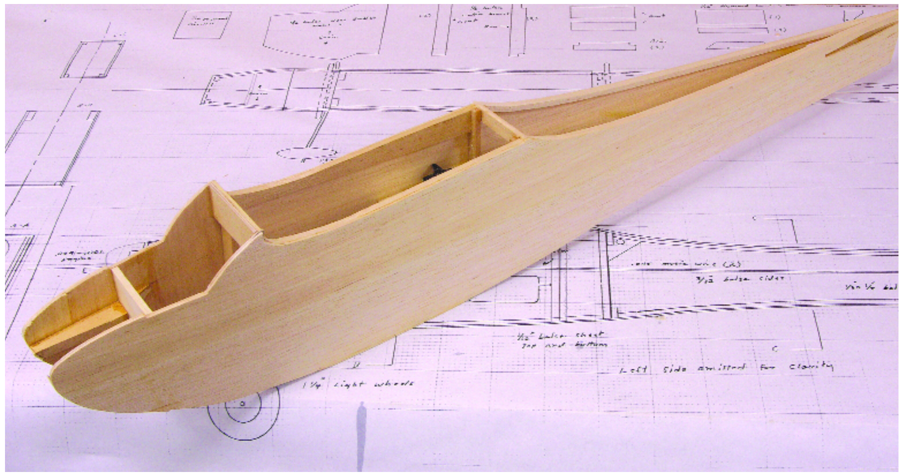
Although the stalls were completely benign, I noted some yawing with aileron when flying at low speeds. I ended up mixing in 10% rudder with the aileron for a complete solution. An alternative is to add differential to the ailerons; that should accomplish the same thing but with a reduction in the maximum roll rate.

That deep fuselage really shone in knife-edge flight. Only approximately 30% rudder is needed to hold altitude. The stalls are gentle with the rudder and ailerons centered, and the generous controls provide positive snap rolls and spins, both positive and negative.

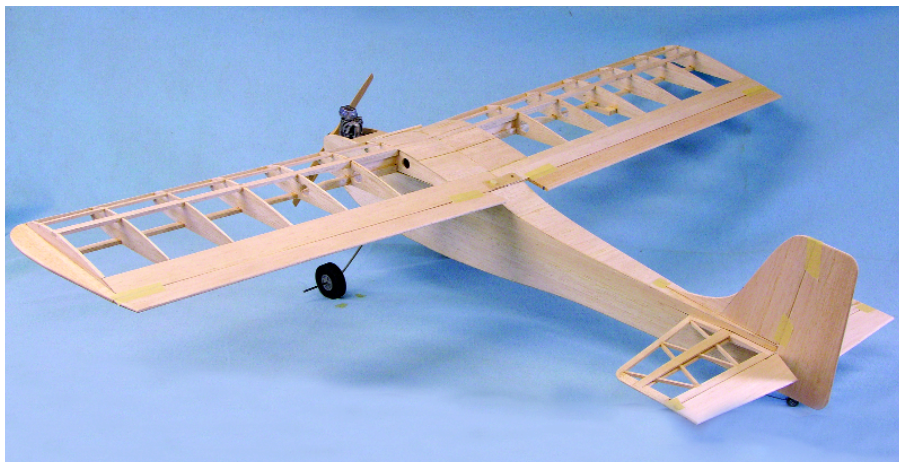
There was a mild surprise with the flaperon deployment. Instead of adding drag along with extra lift, it appears that in this case there is only an additional increment of lift without added drag. This brought the minimum speed down, allowing short landing rolls.

CONSTRUCTION

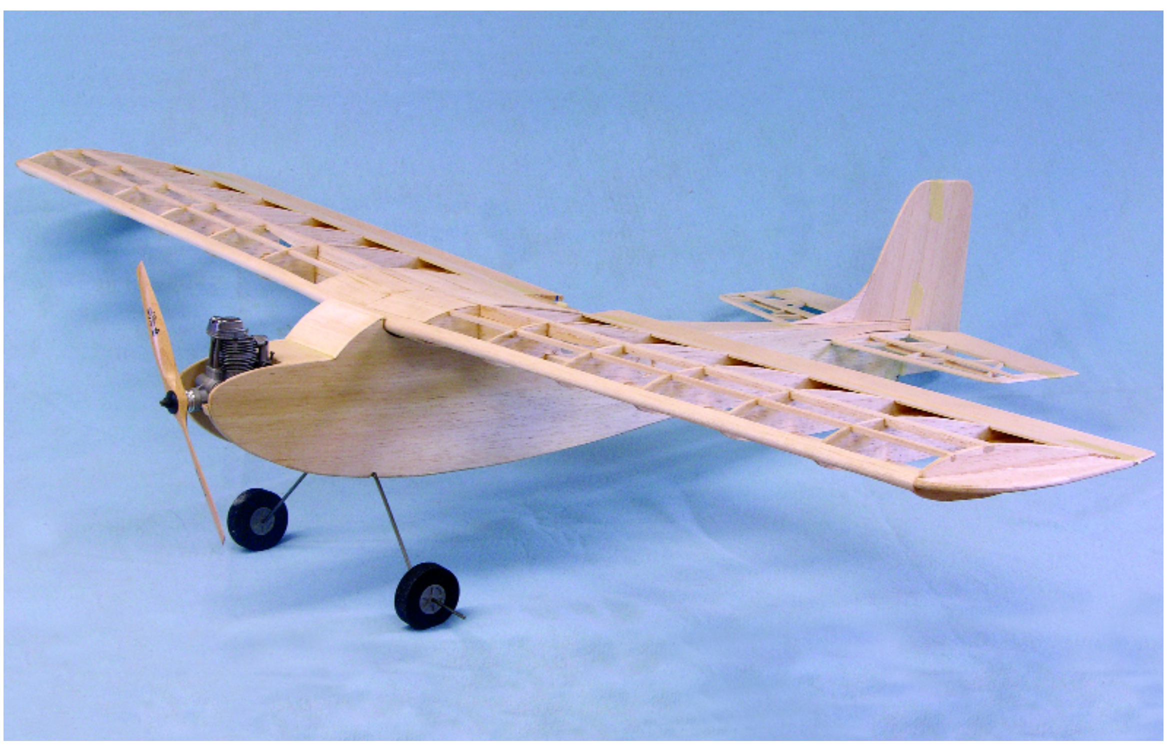
I benefit in my projects by rounding up the amount of materials needed at the beginning. I used a variety of glue products during construction: Elmer's Carpenter's Wood Glue, medium cyanoacrylate, thin cyanoacrylate, and 3M Super 77 spray contact cement.



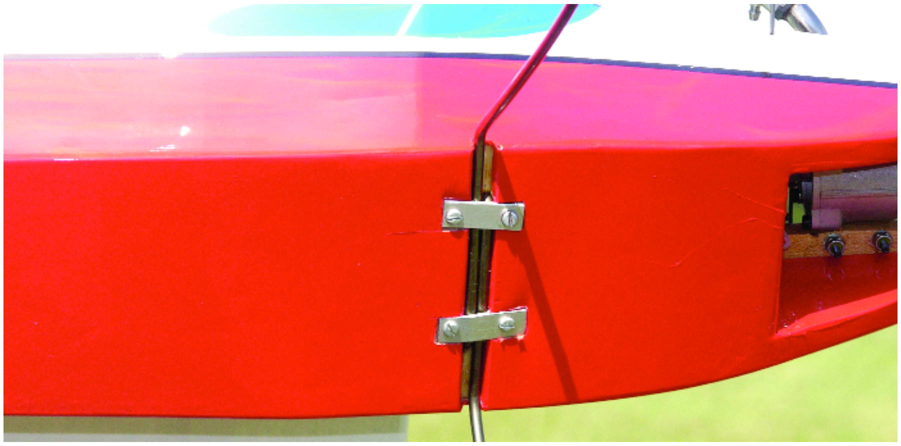
This view of the entire fuselage crutch assembly shows just how few parts are needed to achieve a strong, accurate structure.



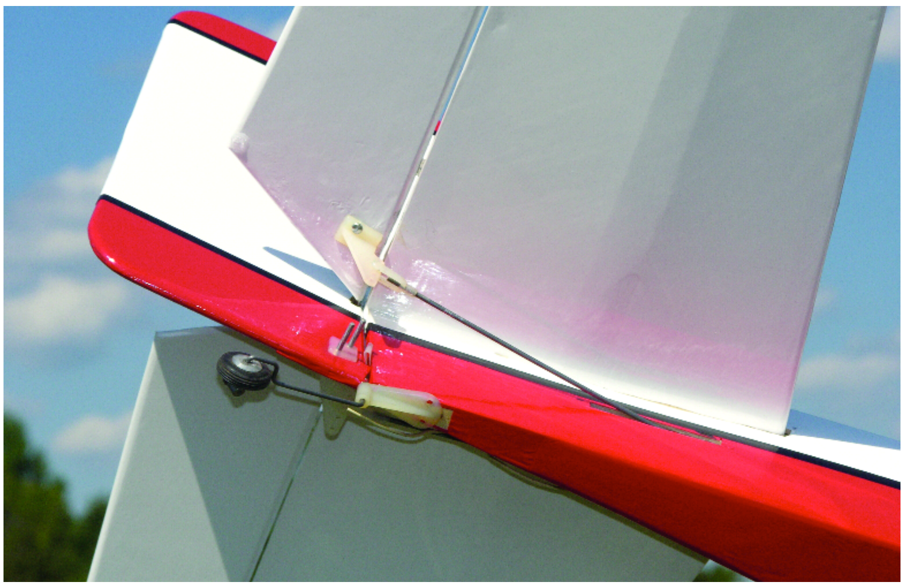
The wing ribs are flat-bottomed, allowing accurate assembly on a flat bench. This is a logical first built-up model.



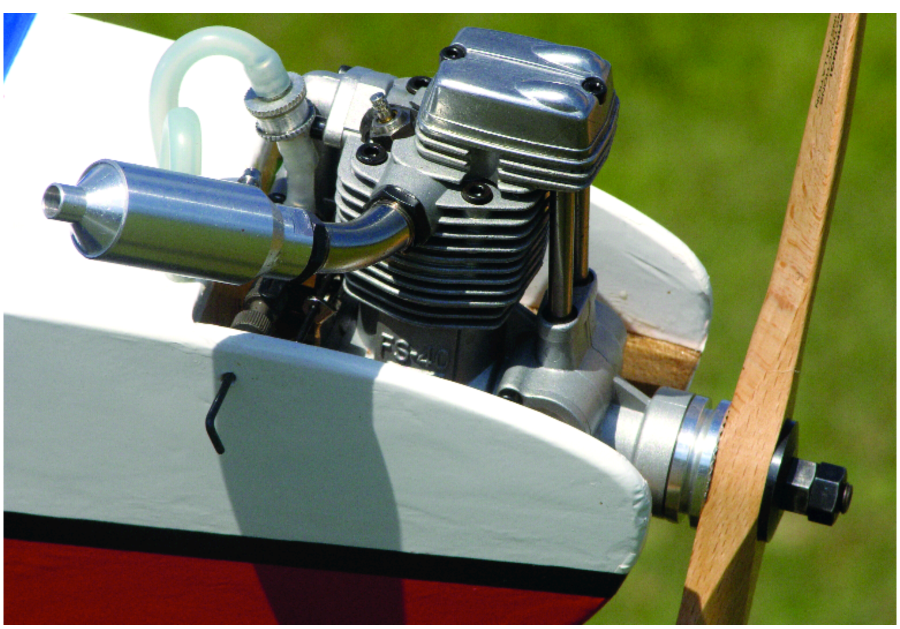
Note the turbulator strip spar that runs along the front of the wing just behind the LE and in front of the main spar. No LE sheeting is required!



In traditional fashion the landing gear is held into the mount slot with metal straps and wood screws.



Also traditional is the elevator pushrod and horn arrangement. It's easy to adjust at the field. Notice the steerable tailwheel.



An O.S. .40 Surpass four-stroke was chosen for power on the original Perky. Many other two- and four-stroke engine choices are available.

Fresh, sharp cutting blades are a big help, as are a variety of sanding blocks. I have found the "Sand Blaster" brand of sandpaper to be especially useful on models. I found mine in the paint department at Wal-Mart.

Some sort of power saw, either a small band saw or a jigsaw, will be a big help. I also enjoyed using my Dremel circular saw for stripping wood.

As I mentioned, this model should be built with light balsa. The .40 four-stroke engine does not put excessive strain on the airframe, and the material sizes are adequate for the stresses. If you choose to go with more power, you are on your own. A .40-.46 two-stroke should be fine as an alternative to the .40 four-stroke.

Wing: Construction should begin with the wing. I made a "kit" of parts before assembly so I could keep moving once I started pinning and clamping. The wing panels may be assembled on a flat surface.

For the 1/2 x 1/2-inch LE strips I laminated two 1/4 x 1/2-inch strips with carpenter's glue, which trims and sands well and is plenty strong. Notice that one rib-cutting pattern is adequate for the various ribs. Except for the center ribs that are undercut for the sheeting, the only difference in the rest is the depth of the notches and holes for the servo cables.

This is also a good time to laminate the four spars. Be sure to taper the outer ends to avoid a stress concentration.

I started constructing my wing panels by clamping down the lower spar and TE. I added the center-section lower sheet between the spar and the TE, and I added all the ribs. Notice the webbing in the center-section; this will be stronger with the grain vertical. Be sure to add the filler blocks for the center-section and hinges at this stage.

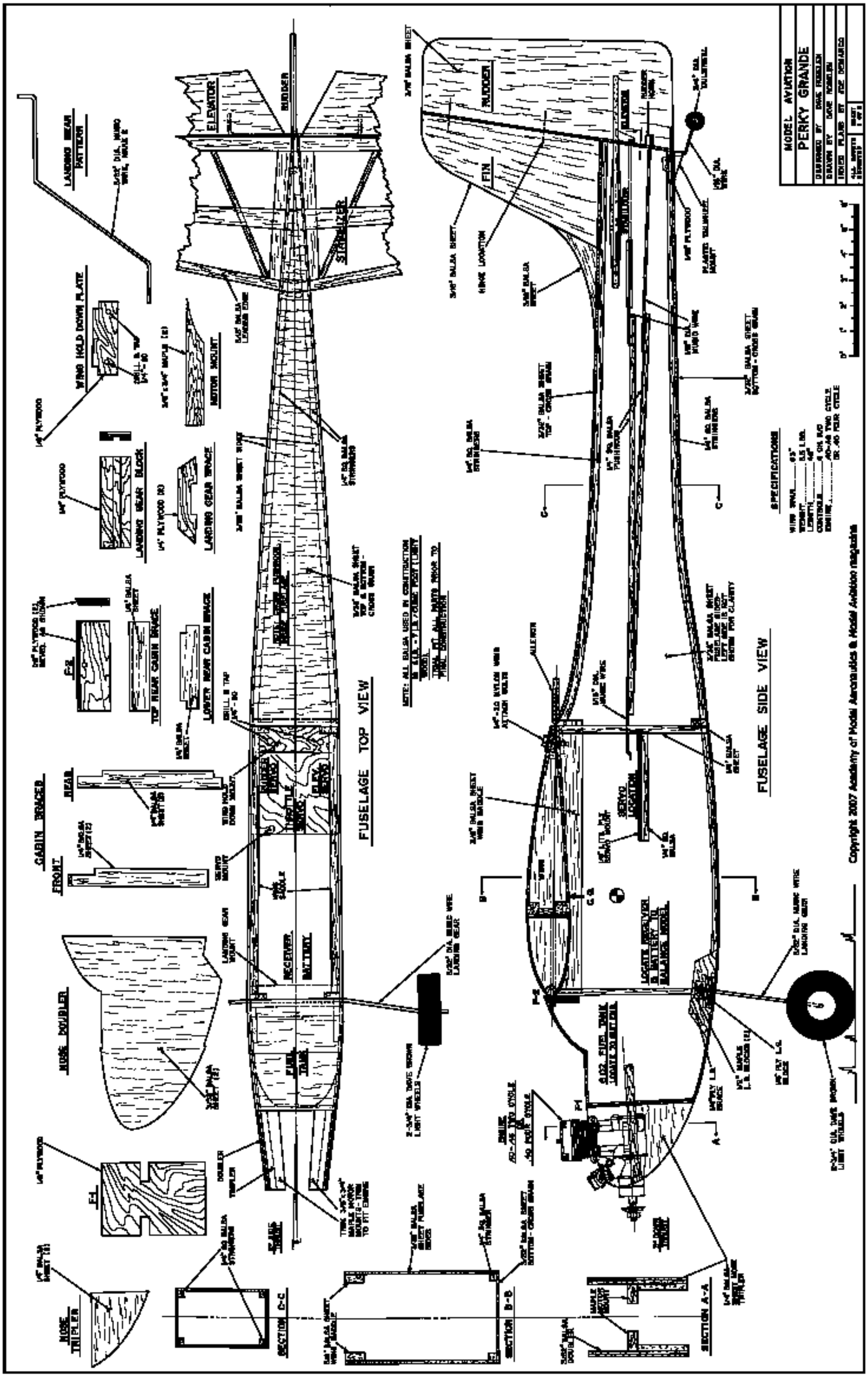
Glue in the LE, upper spars, upper TE, and tip plate, and one panel is finished. Repeat for the second panel. A minute amount of sanding will be needed on the root ribs to get a tight fit with the dihedral. At this point you can join the panels and add the center-section brace. Finish the sheeting to complete assembly.

Trim and sand the LE to the shape shown. A female template is a big help to check that both sides match. After a general sanding of the glue lumps, etc., set the wing aside until later.

Fuselage: Begin the fuselage construction by splicing the side sheets for adequate depth. You need to make a decision here. If you purchase 48-inch-long wood, no additional splicing is necessary. Wood that is 36 inches long will require some length to be added at the tail.

When splicing the long pieces, fit the edges carefully, trimming if necessary to get a tight seam without warping the sheet. If you splice length on the tail, use a scarf joint for adequate strength.

My favorite technique for long splices is to hold the two sheets together and add patches of masking tape every few inches


MODEL AVIATION
PERKY GRANDE
FUSELAGE TOP VIEW
FUSELAGE SIDE VIEW
SPECIFICATIONS
NOSE DOUBLER
CABIN BRACES
FRONT
REAR
LANDING GEAR BLOCK
LANDING GEAR BRACE
MOTOR MOUNT
WING HOLD DOWN PLATE
LANDING GEAR PATTERN
TOP REAR CABIN BRACE
LOWER REAR CABIN BRACE
SECTION C-C
SECTION B-B
SECTION A-A
NOSE TRIPLER
ELEVATOR
RUDDER
STABILIZER
FIN
FUEL TANK
RECEIVER
BATTERY
SERVO LOCATION
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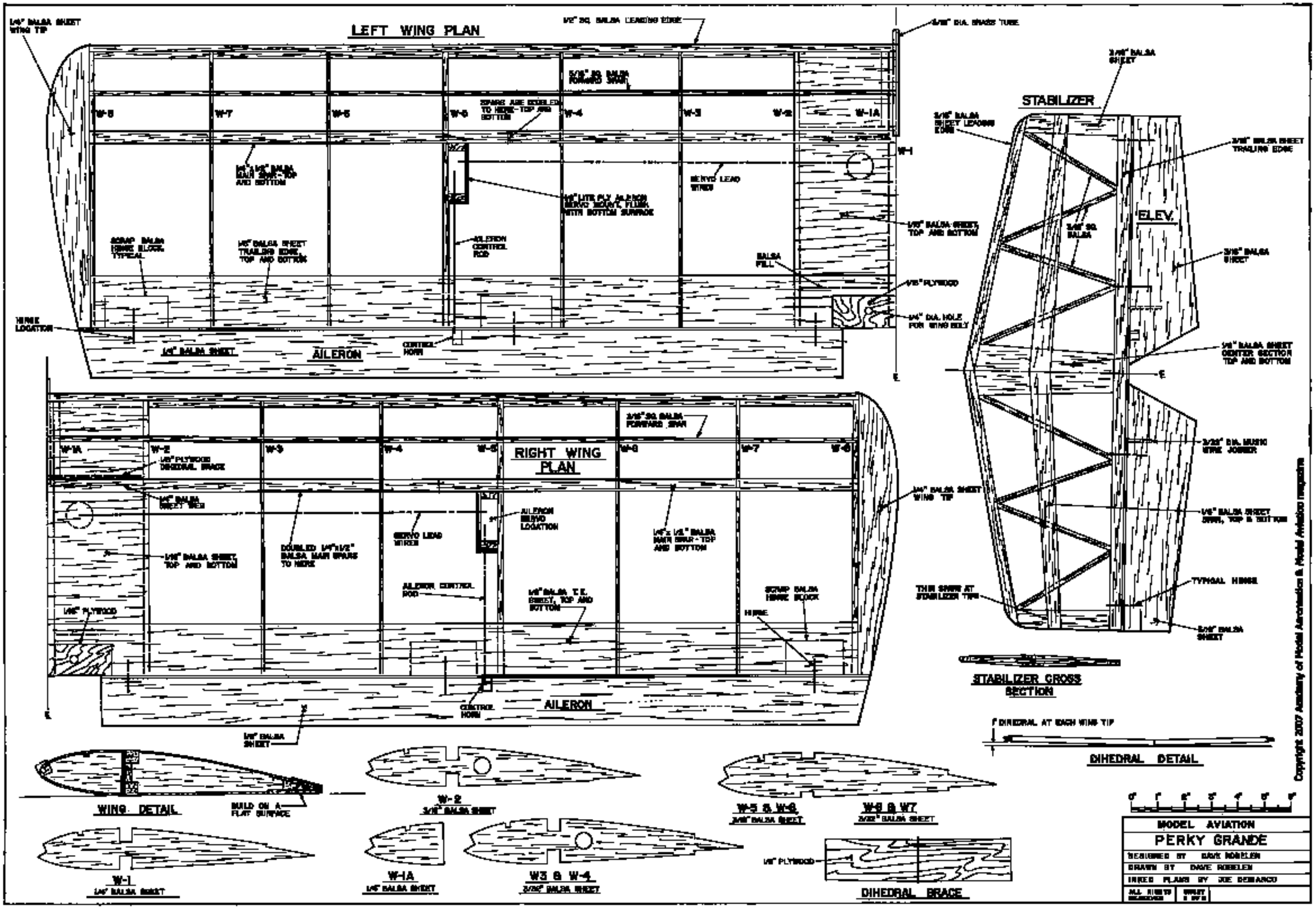

LEFT WING PLAN
RIGHT WING PLAN
STABILIZER
ELEV.
AILERON
AILERON
1/2" SQ. BALSA LEADING EDGE
1/4" BALSA SHEET WING TIP
5/16" SQ. BALSA FORWARD SPAR
1/4" x 1/2" BALSA MAIN SPAR - TOP AND BOTTOM
1/16" BALSA SHEET, TOP AND BOTTOM
SERVO LEAD WIRES
AILERON CONTROL ROD
AILERON SERVO LOCATION
CONTROL HORN
HINGE LOCATION
1/4" BALSA SHEET
1/8" PLYWOOD
1/4" DIA. HOLE FOR WING BOLT
BALSA FILL
SCRAP BALSA HINGE BLOCK
3/16" BALSA SHEET
3/16" BALSA SHEET TRAILING EDGE
3/32" DIA. MUSIC WIRE JOINER
TYPICAL HINGE
STABILIZER CROSS SECTION
DIHEDRAL DETAIL
DIHEDRAL BRACE
1/8" PLYWOOD
WING DETAIL
BUILD ON A FLAT SURFACE
W-1
1/4" BALSA SHEET
W-1A
1/4" BALSA SHEET
W-2
W3 & W-4
W-5 & W-6
W-6 & W7
MODEL AVIATION
PERKY GRANDE
DESIGNED BY DAVE ROBELEN
DRAWN BY DAVE ROBELEN
INKED PLANS BY JOE DEMARCO

along the seam. Turn the sheets over, open the seam, and put a bead of carpenter's glue along one edge.

Press the assembly flat on the table with the masking-tape-side down and wipe off the excess glue with a paper towel. Little sanding will be needed to obtain a smooth seam.

The nose doublers go on next. The 3M Super 77 spray cement can make a real mess of a floor, so lay down adequate newspaper at the start. Mask off the part of the main side that is not glued and spray on a light coat of cement. *Make a left and a right side.*

You can join the doublers to the fuselage sides when the glue becomes tacky to the touch. Rub the area firmly for a permanent bond. Add the rest of the edge stringers, landing-gear brace, and vertical cabin strips to complete two side assemblies. I chose this point in construction to cut the stabilizer opening in the two sides.

The two sides should be joined with the cabin braces first, making sure things are square. Pull the tail together and glue.

After I glued the F1 former in, I installed the engine mounts. I clamped a flat plate across the top of these in the engine area to ensure a flat mounting zone. I have found that medium cyanoacrylate glue gives me a stronger bond in this area than epoxy and is less messy.

Add the landing-gear block and wing hold-down plate, and plank the top and bottom with $^{3}/_{32}$ balsa. Running the grain crosswise will result in more glue seams but is stronger and easier to install around the curves.

The one part of planking to leave off at this point is the windshield piece. You will need access to this area to drill for the wing hold-down tube.

Speaking of this, once the fuselage has been smoothed up, fit the wing and trim as necessary for a tight fit. I used a rather long drill to reach through from the front to the wing center brace. Slide a piece of tubing in place and carefully square up the wing. Once satisfied, drill and tap for the $^{1}/_{4}$-20 rear hold-down screws.

Remove the wing and pull the tube out. I waited until I had covered my model before I finally glued the tube in. Now you can install the windshield sheet.

The stabilizer construction is basic. Assemble the $^{3}/_{16}$ balsa frame and add the $^{1}/_{8}$ balsa capstrips and sheeting on the top and bottom. Refer to the side view for shaping the center-section. Round the tips and LE, and leave the TE square.

The ailerons may be sliced from $^{1}/_{4}$ balsa stock. Round the tips and TE, and put a generous bevel on the LE. The elevators and vertical tail are cut from $^{3}/_{16}$ stock. I left the elevators joined until I had installed the $^{3}/_{32}$-inch-diameter piano-wire connector.

The landing gear is bent from $^{5}/_{32}$-inch-diameter piano wire. I used a husky bench vise and hammer for this task.

(Editor's note: A better method might be to use a heavy-duty K&S wire bender for this. It will ensure smooth bends with no chance of cracking the wire. If you do choose to use the vise-and-hammer method, be sure to grind a radius into one of the vise jaws and then bend the gear around that radius.)

The tail-wheel assembly uses a Goldberg bearing with a $^{1}/_{16}$-inch-diameter wire strut and $^{3}/_{4}$-inch wheel. Install the landing gear after covering.

Covering: I would offer some words of wisdom for the task of covering, but my work bears witness to my lack of skill in this area. There are several good choices of material; I selected MonoKote for a combination of light weight, stiffness, and gloss.

Final Assembly: Once I glued the wing hold-down tube in place, I mounted the wing to use as a reference for aligning the tail. Measure carefully here and get the stabilizer parallel and square to the wing. The fin should be on the centerline and square to the stabilizer.

I used the "fuzzy" plastic cyanoacrylate hinges on all the control surfaces. This is where the thin cyanoacrylate was put to use. Once I had the control surface pressed into place and could move it freely through ample throw, I flowed a small amount of cyanoacrylate into the hinge slots. Give the glue time to dry and pull on the hinges to ensure that they really are secure.

You can mount the landing gear now, drilling for the vertical leg into the mounting blocks. I used a pair of aluminum straps to secure the legs.

Mount the tailwheel using a hand grinder fitted with a parting wheel to cut a slot for the tab on the bearing. The assembly was glued in place with medium cyanoacrylate. I ironed four layers of MonoKote over the tiller arm to secure it to the rudder.

Mount the servos and control horns. I used a pair of Futaba S148 servos on the rudder and elevator and GWS Naro servos on the ailerons and throttle. My pushrods are made from stiff $^{1}/_{4}$ square balsa with wire ends for the tail controls. The ailerons are connected with the threaded end wire rods and snap links.

When it came time to mount the engine, I ran into a conflict with the carburetor linkage fitting and the F1 former. My mentor Forrest Mason suggested fitting a cap from a Sharpie pen in the firewall to provide clearance for the ball link I had chosen, and this worked to perfection.

I coated all the exposed wood in the engine area with five-minute epoxy before mounting the engine. I chose clear polyurethane soaked into the fuel-tank compartment for protection there.

Locate the receiver and battery so that the CG is on the mark. (Do not attempt to fly the model tail-heavy.) Wrap these delicate parts in soft foam for vibration protection.

At the Field: Run the engine as necessary before leaving home to ensure that it is well broken in and that the radio system has adequate range. A good starting point for control throws would be $^{1}/_{2}$ inch up and down on the ailerons, $^{3}/_{4}$ inch up and down on the elevator, and at least 1 inch right and left for the rudder. These may be "seasoned to taste" after the initial flights.

If your Perky Grande is as light as mine, it will lift off easily with a rapid rate of climb. There is no reason to use full power except for those maneuvers requiring vertical pull.

I wish you every pleasure with your project. I would love to see pictures from anyone who builds one of these models. **MA**

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