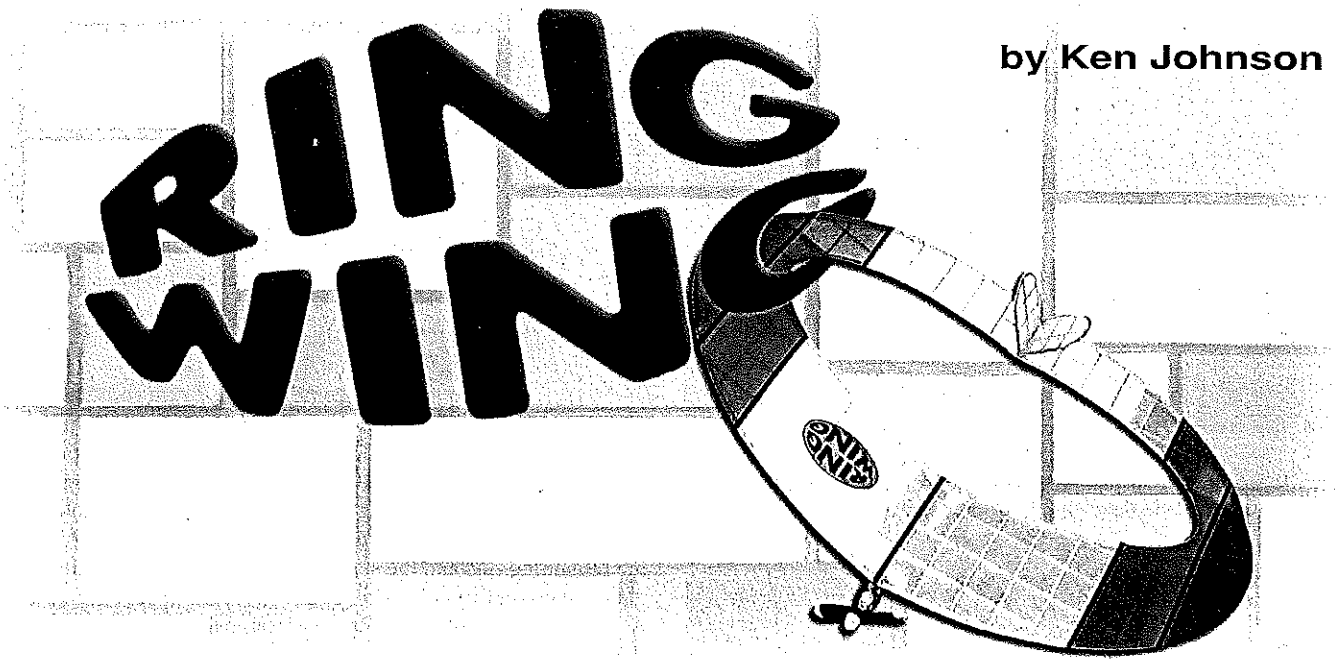
#975

RING WING

by Ken Johnson



IF YOU ARE the type of FF modeler who enjoys trying something unique, this model may be just the thing for you. Anyone can build a Piper Cub that flies. Show me someone who can make a flying wing or a canard fly, and I'll show you a real modeler. This is not to say there's anything wrong with Piper Cubs, but the challenge of a radical planform is intriguing.

I started playing with air-powered models awhile back. Specifically, I used the Air Hogs compressed-air motor unit that is marketed by Spin Master Toys of Toronto, Canada. This little power plant puts out a great deal of torque and has a fair running time.

My first air-powered model was a standard free-flight tractor style. It flew quite well and got me hooked on air power, which is clean and inexpensive (roughly $15 if you purchase the motor from Spin Master), and the fuel is free. It's hard to beat that! An airplane that weighs approximately 100 grams total is ideal. The span would be 30-40 inches.

I have built various models since then, including the Diamond Gem joined-wing design, a Dragon Fly, a Butterfly, a scale-type flying wing, and a Sea Gull. My latest design also uses the joined-wing concept, only this time it has an oval shape.

My first try with this planform flew well. The problem was that it was built too light, thus was too prone to warping. The stabilizer portion began to distort after several weeks of flying, which changed the stabilizer's angle of attack. The model was rendered damaged and unflyable in the succeeding weeks.

I decided to try again, but this time I built the model stronger. The first one weighed 88 grams, and the new one weighs 110 grams. My earlier plans were hand-drawn and slightly inaccurate in outline shape. I drew the newest design on the computer, and it is better.

I made the outlines on my Macintosh and then photocopied them and enlarged them to the 35-inch-wingspan size. I redrew the plans more completely and then got a same-size copy, which I used to pinhole the outline shapes. This worked well.

Since the tail of the number two model is slightly larger (and a bit tail-heavy), it requires a small amount of ballast at the nose.

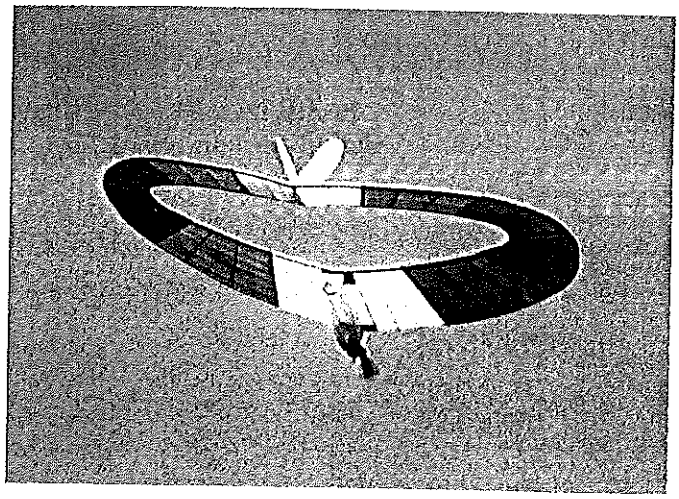
The Ring Wing climbs to the left and reaches 100-150 feet of altitude before transitioning to the glide. It requires roughly ⅛ inch of right thrust to open up the left turn. This design has not flown in thermal air yet, but I'm convinced that it could do so quite well.

CONSTRUCTION

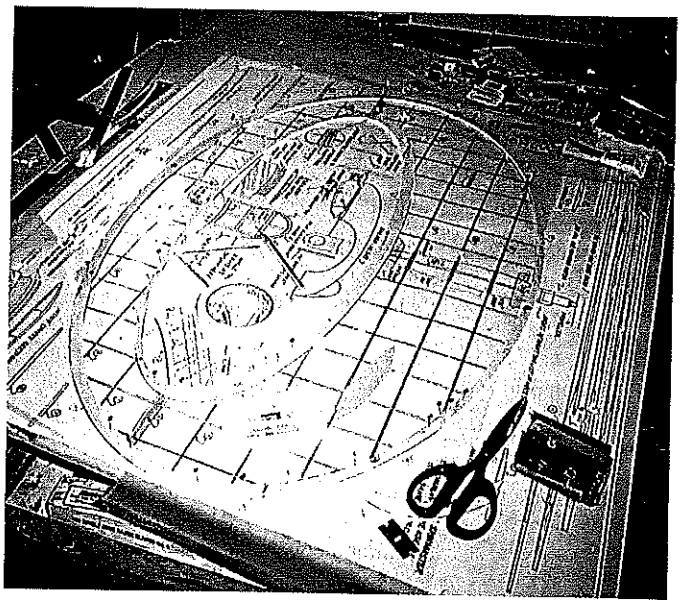
See the plans for the wing and stabilizer outlines. The wing LE is made from 3/16 sheet, quarter-grain balsa. Position the wood (with the grain running lengthwise) under the proper plans outline.

Photos by Barry Dougherty

Ken launches the 110-gram, air-powered model. The slight bank to the left is essential. Begin trimming with 25 pumps, and fly over soft grass or weeds.



Ring Wing number one glides overhead. It was too light and fragile. Both models flew well, but number two was more durable.



The first step in the Ring Wing's construction is to cut out and pin down the wing-outline pieces.

Use a pushpin (from the art-supply store) to make a hole through the paper and into the wood—approximately ⅛-inch deep—every ¼ inch. Make the wingtips and the wing TE from 5/32 balsa.

Once the shapes are made with the pinholes, use a marker that will produce a thin line to connect them; draw carefully. Cut around the outlines using a sharp #22 blade in a modeling knife. Make the stabilizer outlines in a like manner.

Using a sanding block, make the outlines smooth and accurate. Place a sheet of waxed paper over the airplane plans, pin down the outlines, and cement together.

Cut 3/32-inch square strips to form the underside portions of the ribs on the wing and stabilizer. Cement the LE of each piece, let dry, trim the rear edge to length, and cement to the TE of the wing and stabilizer. Cut the spars to the sizes shown and cement them onto the 3/32-inch square under the ribs.

Cut an aluminum template (with scissors or tin snips) to the shape of the top ribs (airfoil), and file the edges smooth and clean. Place a properly sized length of 3/32 sheet balsa (for ribs) under the upper curved edge of the template, and cut along the edge of the aluminum through the balsa. Move the template down 3/32 inch, and make another cut with the #22-blade knife. Make the remaining ribs and the stabilizer ribs in the same fashion. See the plans for clarification.

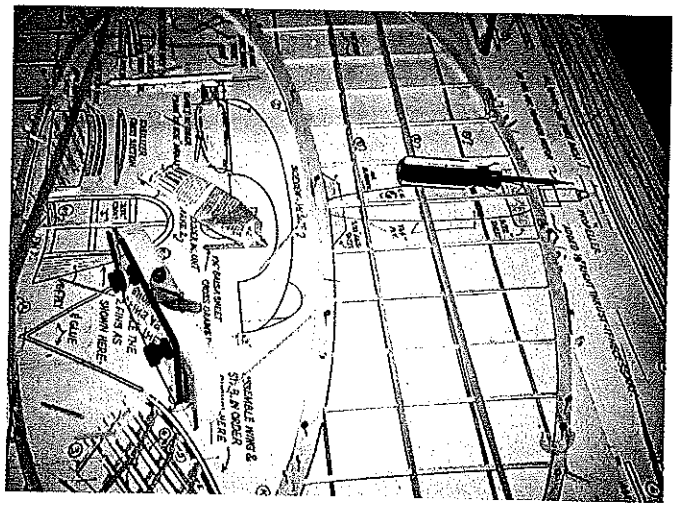
Cement the front edge of each rib in position on the wing. When dry, trim the back of each rib and cement to each spar and to the front of the wing TE. When all ribs are cemented in position on the wing and the stabilizer, the work is essentially finished.

Unpin the outlines and carefully lift the structure from the plans. Cut the wing and stabilizer apart at the center (front to rear), and pin one side down to the board. Cut the proper V-shaped wedge in at the center, wing and stabilizer. Fit the other side of the frame to the pinned-down part.

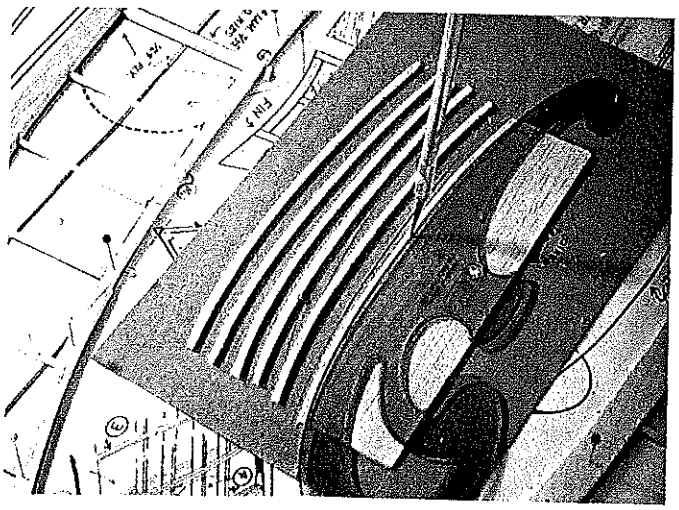
Place an 8-inch-high box or similar item under the tip of the propped-up side. This will give you 4 inches of dihedral under each tip when completed. Cement the halves together. Add the 1/64 plywood gussets front and aft to each spar, and cement.

When dry, lift the structure and you have the wing/stabilizer complete. Add the wing-mounting platform, fore and aft, under the bottom of the wing.

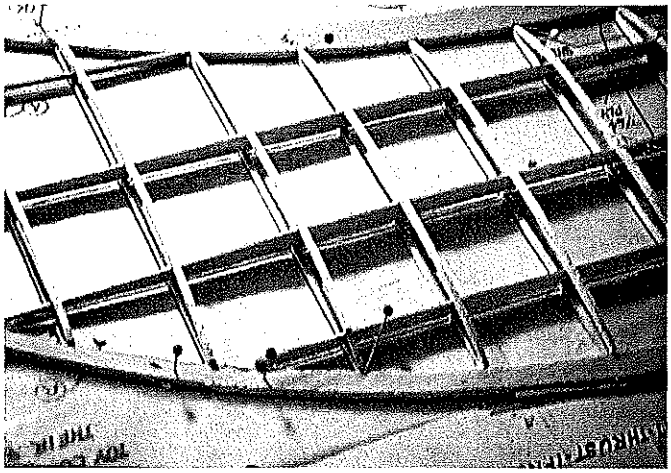
Carefully sand the entire structure. Add the 1/16-inch-sheet strengtheners where the wing and stabilizer are cut apart out at the tips. Cut the wing and stabilizer apart out at the tips and cement them back together, adding ⅛-inch incidence under the back edge of the stabilizer. You will need to cement a 1/16 balsa



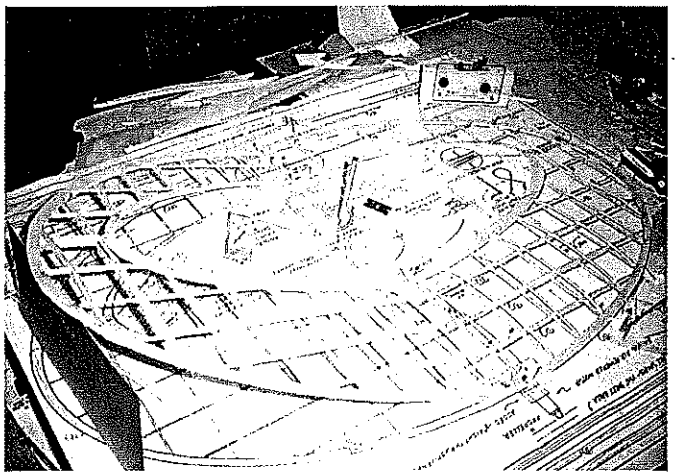
Next, you add the 1/16-inch under-ribs.



Slice the top ribs from 1/16 sheet balsa using a guide.



Glue the top ribs to the top of the spars.



Cut the center of the wing and glue in the dihedral, using 1/64 plywood bracing on either side of the spars.

wedge at the inside edge (each side) where the wing meets the stabilizer. Sand all of the joints smooth.

I used Esaki tissue to cover the structure. If this material is unavailable locally, you can order it from Tony & Addie Hobby Lobby in Burbank, California, or cover your model with Japanese tissue (the lightest available). Lightly preshrink the tissue with a dusting of water from a spray bottle.

The vertical fin's tips are pinholed and are standard construction. Before you cover the model, add the center double ribs for a sturdy platform for the fin mounts.

Mount the engine/bladder unit to the underside of the wing. The rear support is cut from two cross-laminations of 1/16 balsa sheet. Carefully cut the almost-round hole in the center of the rear mount. Cover it with tissue and cement in position as shown on the plans. Use five-minute epoxy when cementing to the plastic bladder.

The front of the bladder is held in position with formed wire. Make a loop in the center of the .045 music wire, and make it fit snugly around the neck of the bladder threads. Epoxy it to the bladder. The wire loop will have an "X" at the center; wrap its middle with thin copper wire, and cement.

Measuring 3/16 inch on top of the back of the engine housing, make a 90° bend in both ends of the wire. This bend should be toward the rear of the bladder. Measure 1/2 inch back on the now horizontal wires, and make a reverse horizontal bend so that the wire resembles a V. Make a 45° bend so that the two wire ends point vertical. Snip off each end to 3/16 inch. See the plans for a more detailed view.

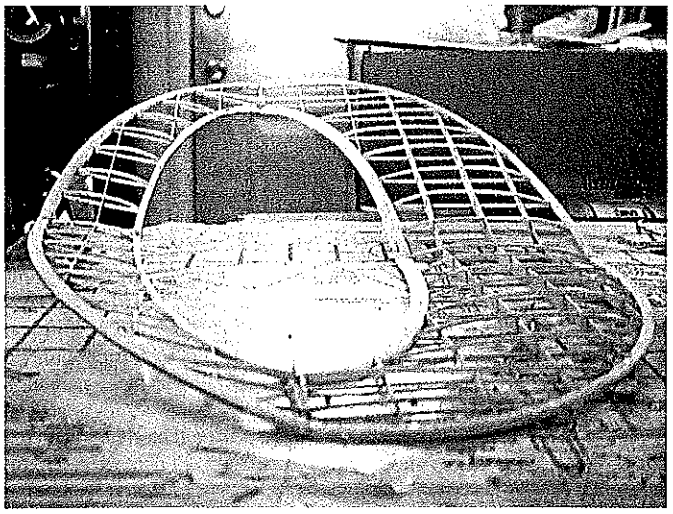
The wire can now be fitted into the two holes drilled into the 1/16-inch sheet (in the center of the wing). Epoxy the two wire ends into the bottom of the wing (at the center).

The model is complete at this point, except for attaching the "V" twin fins to the top of the stabilizer. There should be a 5/32-inch gap between the bladder and the underside of the wing.

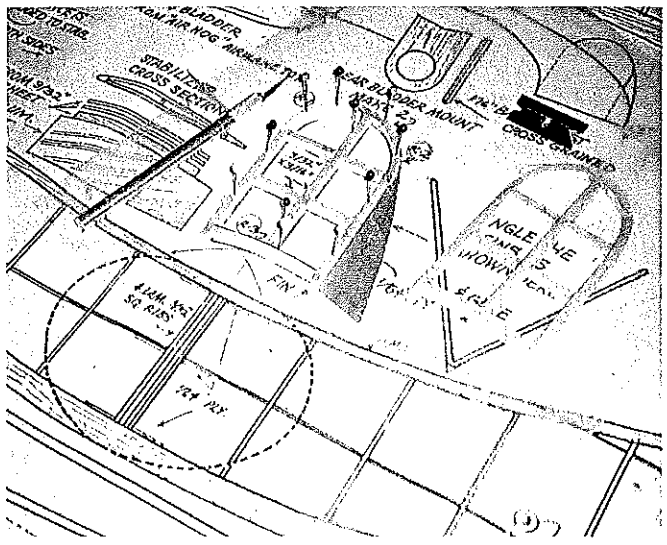
Flying: Test-glide the Ring Wing over soft grass and into the wind. A small amount of nose weight may be needed if the model stalls. See the CG shown on the plans drawing.

Put roughly 20 pumps into the motor, and launch the aircraft gently into the wind. If it banks sharply to the left, cut the rear mount loose and cement in 1/8 inch of right thrust. Don't allow the model to spin in to the left. Add clay to the right wingtip if necessary.

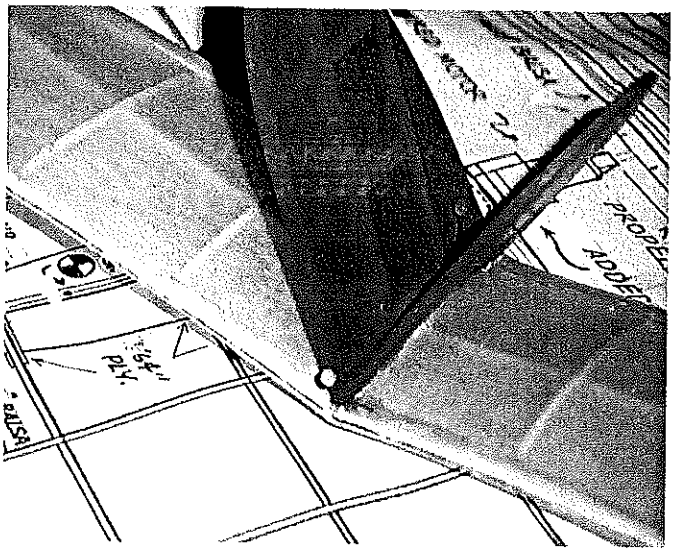
Then launch the craft with 50 pumps in it. A gentle left climb is ideal. With practice, you can try a more forceful launch. An altitude of 75-100 feet is perfect.



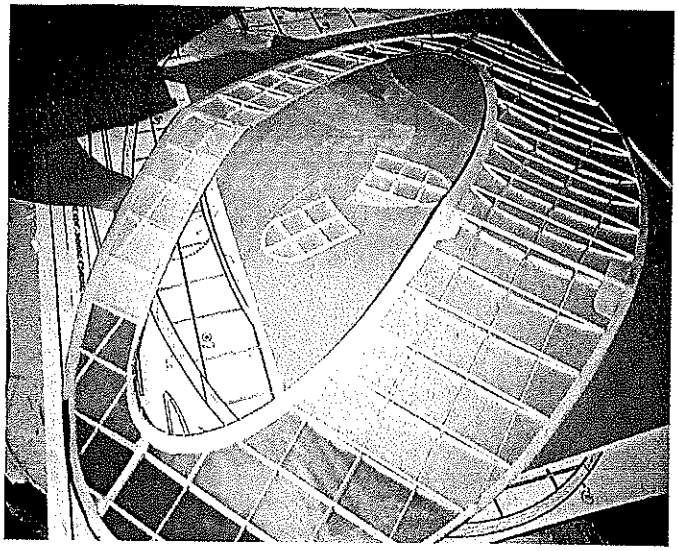
Cut the stabilizer/wing apart, add the required incidence, and glue.



Construct the fins over the plans and sand them carefully.

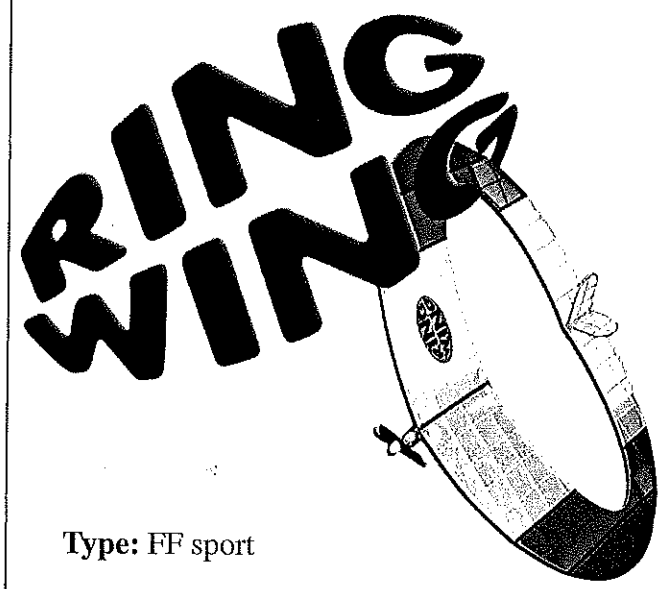


Assemble the covered fins together. When the wing and stabilizer have been covered, glue the assembly in place on top of the stabilizer.



Cover the top side of the wing and stabilizer with Esaki tissue. Ken used a multicolored pattern.

RING WING



Type: FF sport

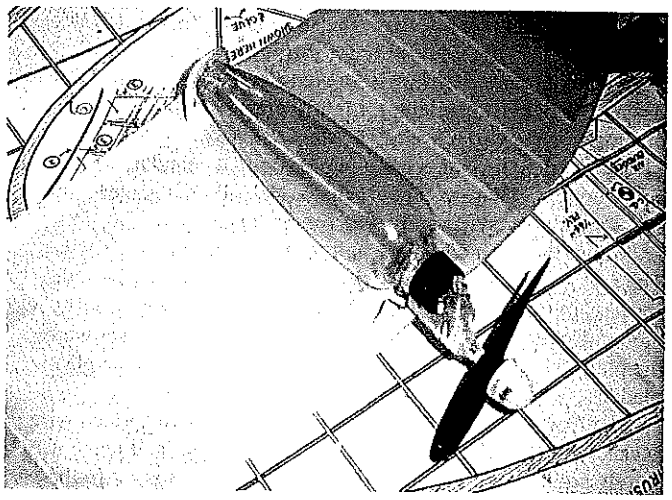
Wingspan: 34 inches

Power: Compressed-air motor

Flying weight: 110 grams (3.8 ounces)

Construction: Balsa and plywood

Covering/finish: Japanese tissue



Drill holes to underside of wing (into 1/16 sheet) and epoxy wire mounts into front of wing underside. Add rear motor-mount ring and epoxy to rear of engine bladder.

Electric Wing Version: The Ring Wing can also be built using electric power. The accompanying sketch shows the step-by-step conversion method. I found that I prefer the electric-powered Ring Wing, which I built later than the air-powered version.

I began early on using the Cox P-51 plastic-toy-airplane motor-and-battery unit because it came with the charger plug built into the battery pack. This toy came with two 180-milliamp batteries installed.

If you choose to substitute a different motor and your own battery pack (with more power), you may find that this works well. For you radio-control modelers, this airplane would adapt well to RC.

Here's wishing you good flying with your new Ring Wing. *Don't allow the model to get wet or fly over wet grass.* That will warp it. MA

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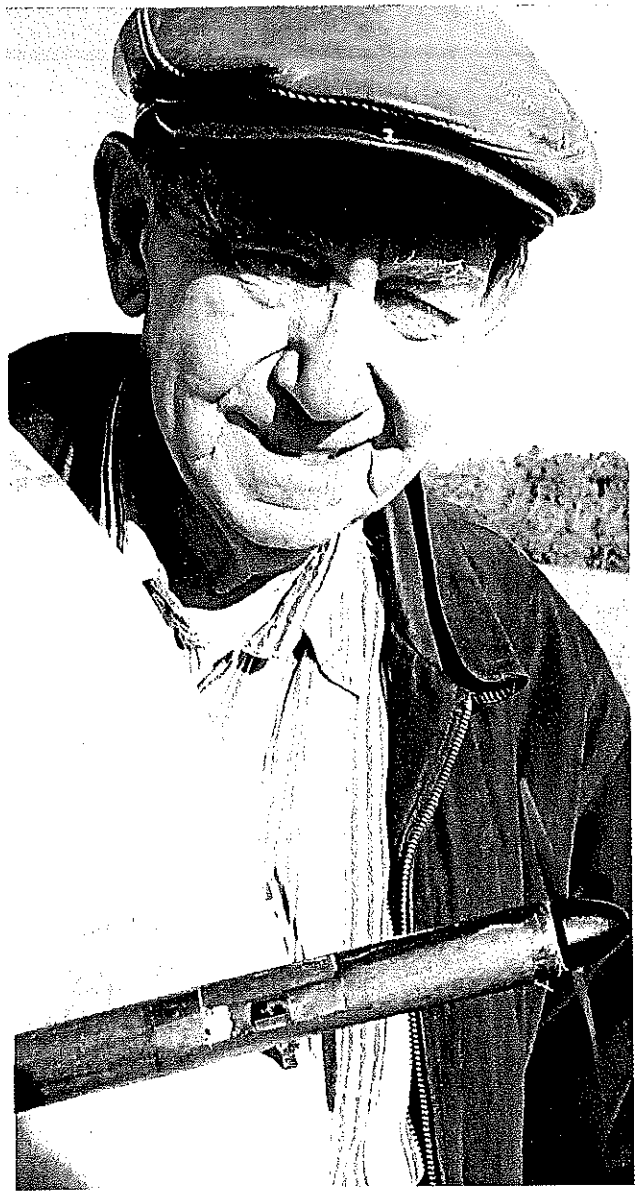

Air power not your thing? The author has supplied some information about how to adapt the Ring Wing to electric power.

Modifying the Stock Air Hogs Pump

You will need to alter the Air Hogs pump so you can use it with larger models such as the Ring Wing. The problem with the pump (as it comes with the Air Hogs toy) is that the toy airplane was supposed to be strapped to the charger pump with a hook-and-loop strap. This configuration puts the model's tail close to the pump handle; it is easy to hit the tail with your hands since they are wrapped around the pump handle.

I have tried various methods to move the model's tail away from the pump. I was given a different air-powered toy aircraft and used this pump with some success. It had a 4-inch-long plastic tube that connected the pumping nozzle, which kept the entire airplane away from the pump. Alas, that pump self-destructed after awhile!

Then I bought an airplane called the Wind Jammer from a company in Itasca, Illinois. I didn't like the model very well, but the pump was a good design. This one featured a 14-inch plastic tube, and that worked extremely well. I tried to contact the company but failed.

I purchased a tire pump and modified the end of the connecter tube to fit the model. This is okay, but it is hard to work this big pump with one hand since you have to hold the model with the other. It works fine if you have a buddy helping you.

Another air-powered airplane has surfaced from Estes Company of Colorado. The connector between the engine of the airplane and the pump is entirely different; it is larger and must be rotated a half turn to lock the pump and airplane together. It's completely unusable for my needs!

I decided that the best course of action was to modify the original Air Hogs pump. I fitted a 10-inch length of ¼-inch-outside-diameter (OD) clear-plastic tubing over the existing nozzle on the pump. To lock this down, I twisted a small paper clip (.028 inch) around the tubing and pump nozzle with pliers and trimmed it off.

I fitted a 1¾-inch length of 3/16-inch OD aluminum into the open end of the plastic tube. I used the paper-clip clamp over the plastic and aluminum. The other end of the aluminum tubing is fluted slightly so it can be pressed into the filler nozzle on the motor with a snug fit.

Now I can hold the Ring Wing in one hand while I pump the air with the other, and the airplane is a safe distance from the pump. If the model's nozzle eventually expands from usage, I can ream out the aluminum nozzle more to keep a snug fit between the pump nozzle and the engine nozzle.

I hope this works and that you can pump up the model completely and achieve many outstanding flights with the Ring Wing. MA

—Ken Johnson

Air Powered

RING WING

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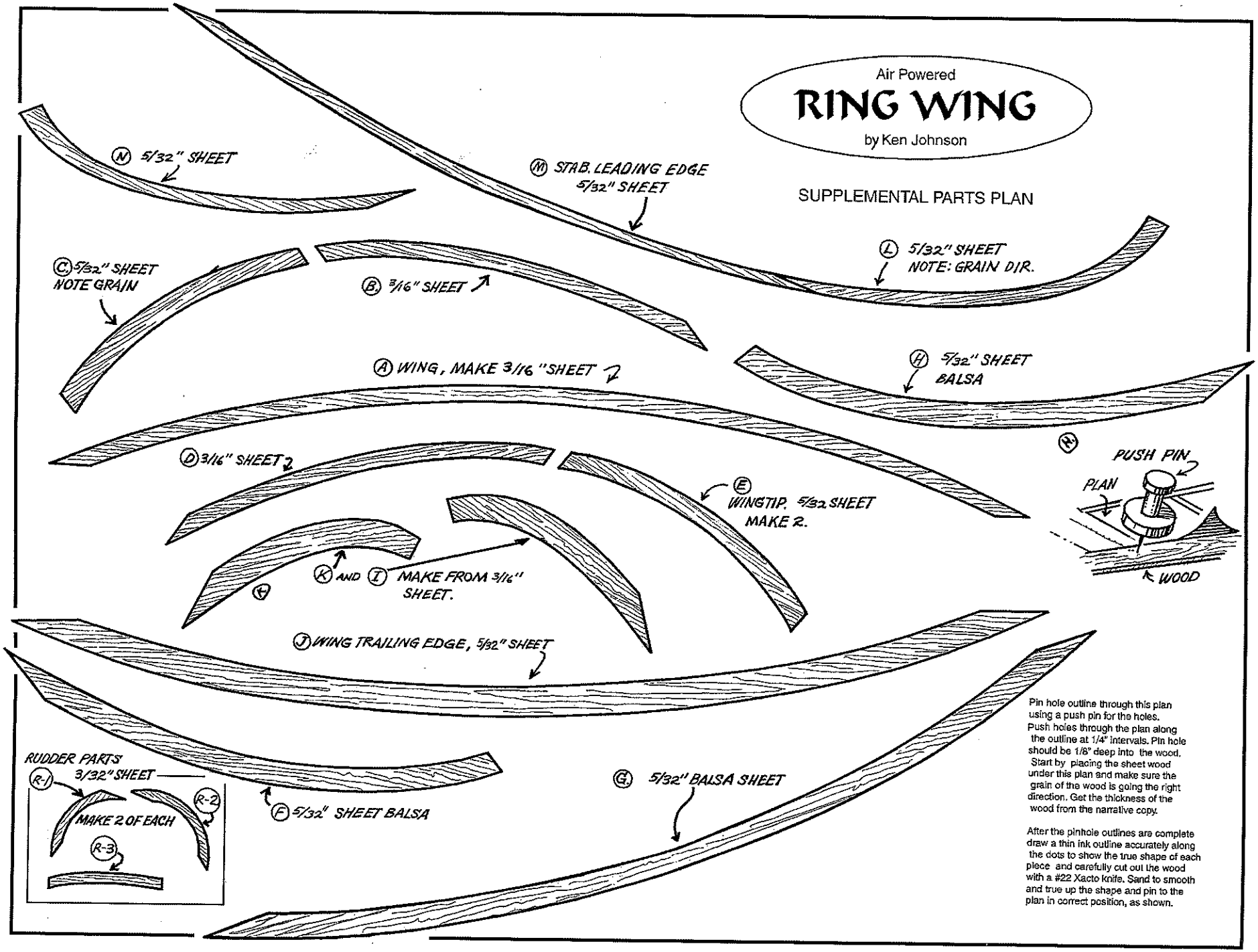
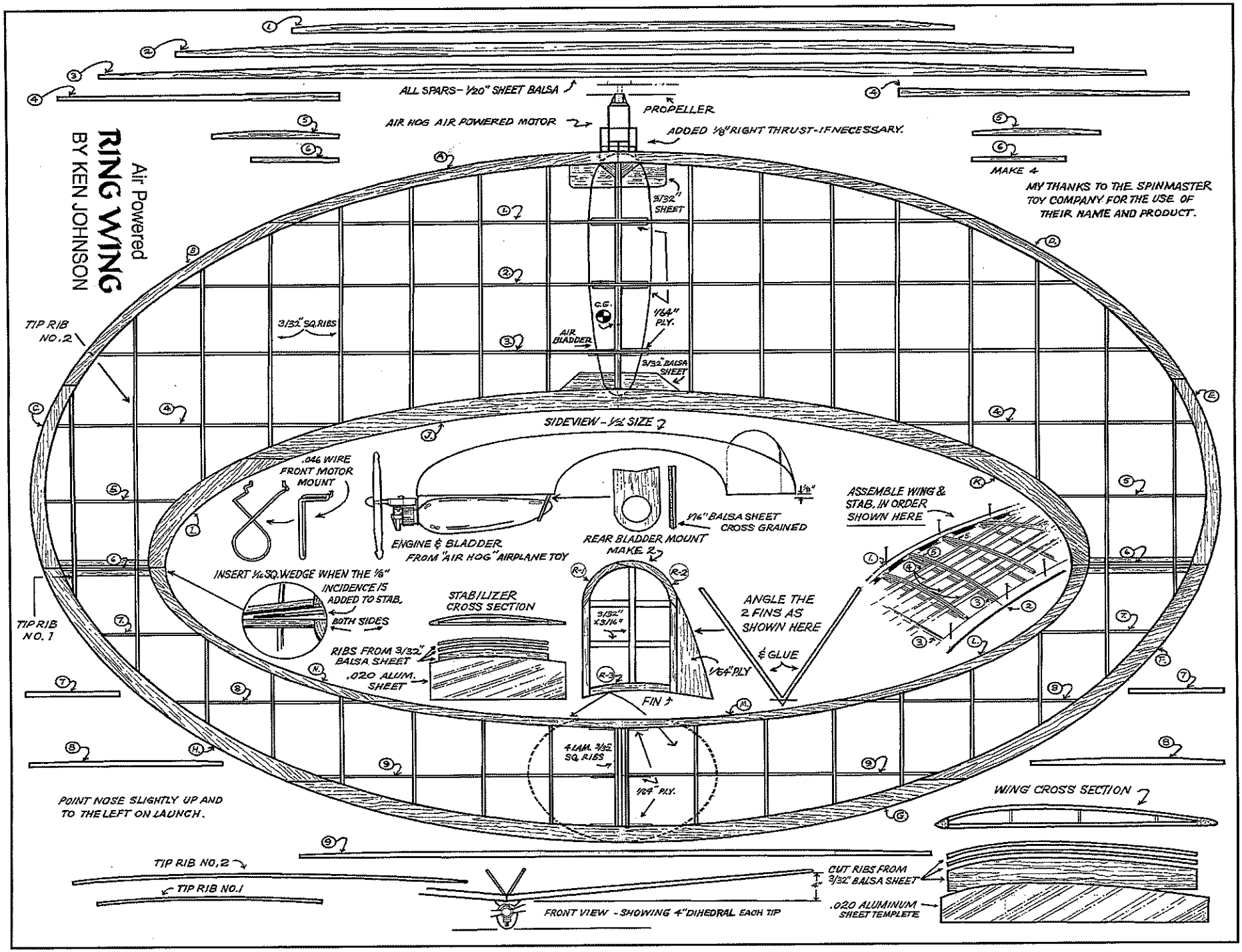
SUPPLEMENTAL PARTS PLAN



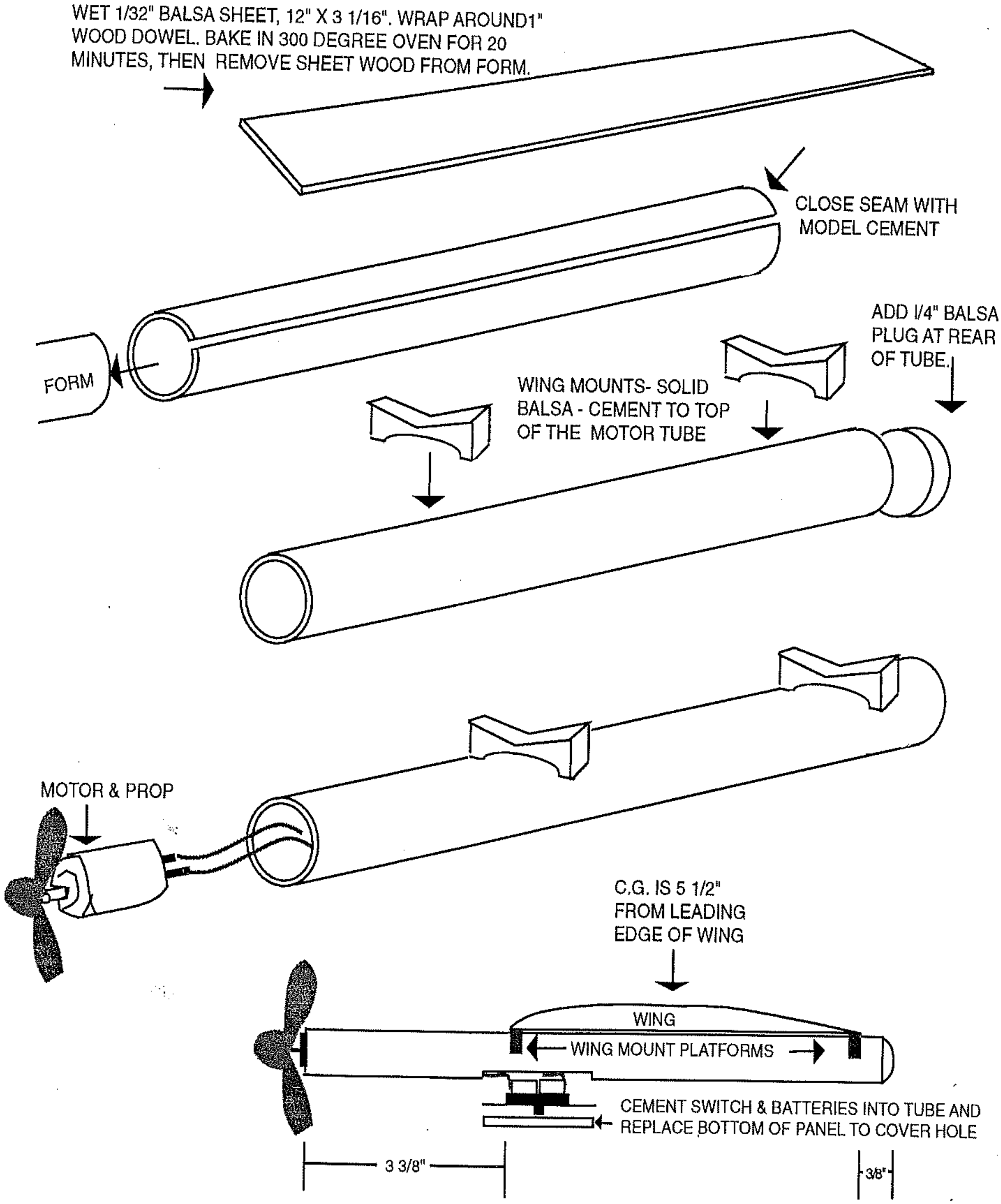
Pin hole outline through this plan using a push pin for the holes. Push holes through the plan along the outline at 1/4" intervals. Pin hole should be 1/8" deep into the wood. Start by placing the sheet wood under this plan and make sure the grain of the wood is going the right direction. Get the thickness of the wood from the narrative copy.

After the pinhole outlines are complete draw a thin ink outline accurately along the dots to show the true shape of each piece and carefully cut out the wood with a #22 Xacto knife. Sand to smooth and true up the shape and pin to the plan in correct position, as shown.

Full-Size Plans Available—see page 207


Air Powered
RING WING
BY KEN JOHNSON
ALL SPARS - 1/20" SHEET BALSA
AIR HOG AIR POWERED MOTOR
PROPELLER
ADDED 1/8" RIGHT THRUST - IF NECESSARY.
MAKE 4
MY THANKS TO THE SPINMASTER TOY COMPANY FOR THE USE OF THEIR NAME AND PRODUCT.
3/32" SHEET
TIP RIB NO. 2
3/32" SQ. RIBS
C.G.
AIR BLADDER
1/64" PLY.
3/32" BALSA SHEET
SIDEVIEW - 1/2 SIZE
.046 WIRE FRONT MOTOR MOUNT
ENGINE & BLADDER FROM "AIR HOG" AIRPLANE TOY
REAR BLADDER MOUNT MAKE 2
1/16" BALSA SHEET CROSS GRAINED
ASSEMBLE WING & STAB. IN ORDER SHOWN HERE
INSERT 1/16 SQ. WEDGE WHEN THE 1/8" INCIDENCE IS ADDED TO STAB. BOTH SIDES
STABILIZER CROSS SECTION
TIP RIB NO. 1
RIBS FROM 3/32" BALSA SHEET
.020 ALUM. SHEET
3/32" X 3/16"
ANGLE THE 2 FINS AS SHOWN HERE
& GLUE
1/64" PLY
FIN
4 LAM. 3/32 SQ. RIBS
1/64" PLY.
POINT NOSE SLIGHTLY UP AND TO THE LEFT ON LAUNCH.
WING CROSS SECTION
TIP RIB NO. 2
TIP RIB NO. 1
FRONT VIEW - SHOWING 4" DIHEDRAL EACH TIP
CUT RIBS FROM 3/32" BALSA SHEET
.020 ALUMINUM SHEET TEMPLETE

ELECTRIC POWER VERSION



USE SMALL MOTOR/ BATTERY COMBINATION SUCH AS ONE USED IN TOY COX P-51 STYLE PLANE WHICH FEATURED 2 - 180 MILLIAMP RECHARGEABLE NICAD BATTERIES OR YOUR OWN CHOICE.