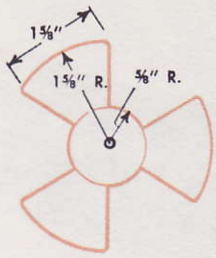


Tethered to a stake, the car will skim half an inch or so off the ground, around and around until it runs out of fuel

Model air car skims the ground

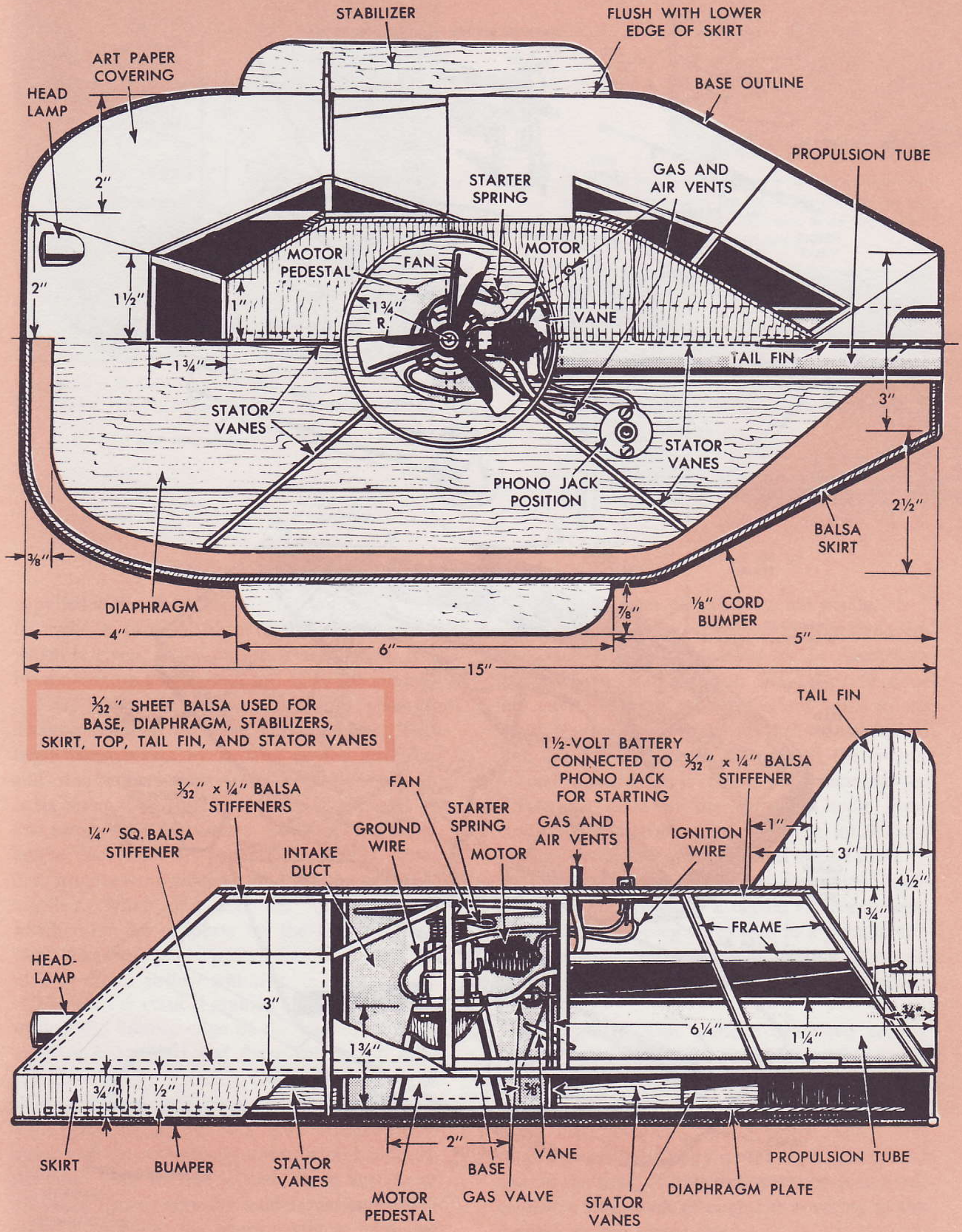
By ROY L. CLOUGH, JR.

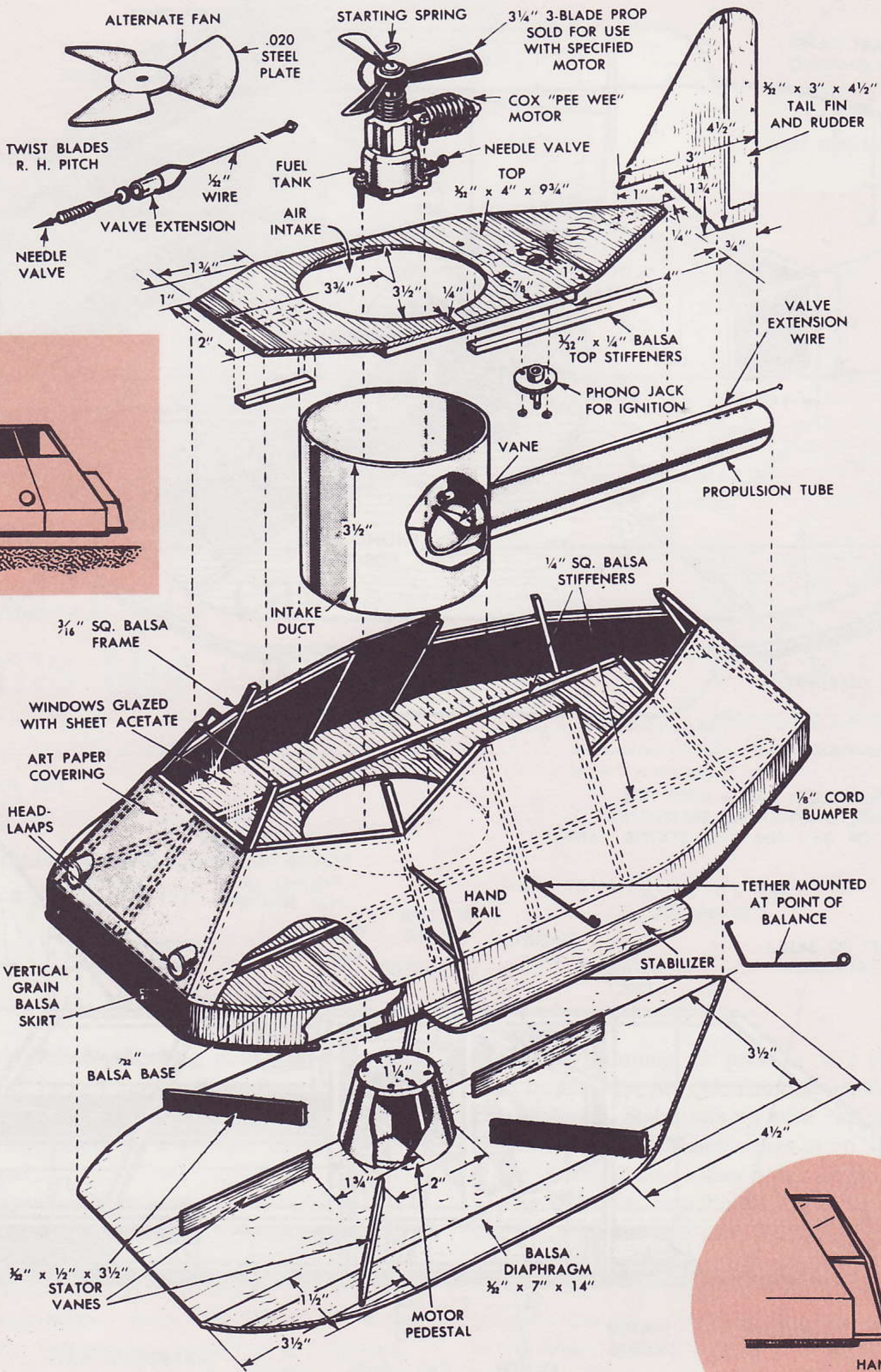
Working model of a ground-effect vehicle rides on a cushion of air from a model-airplane engine

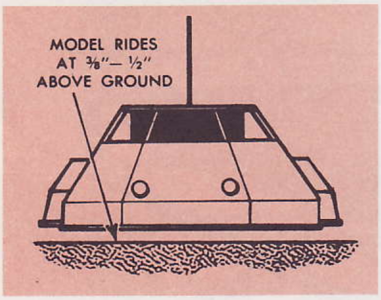
WITH A hollow whistling note audible over the whine of its tiny engine, this advanced working model of a ground-effect vehicle skims across the floor supported on a cushion of air. What makes it go?

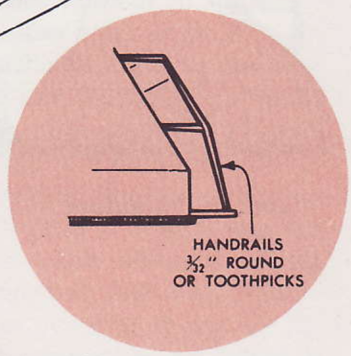
Air is supplied by a prop to a peripheral slot which produces a high-speed wall of air around the edge of the model to retain the lift. A separate propulsion-system tube bleeds off air for reactive propulsion—from the blower section, not the skirt. Supporting pressure is not reduced—a major fault of ground-effect vehicles which propel by dumping air pressure and lifting the skirt on the opposite side from the desired direction of travel. Stabilizers on each side act somewhat like the dihedralled wings of an airplane—if the model tilts to either side, air pressure escaping from the skirt builds up under the vane and returns it to even keel. The result is a model which can buzz along at a good clip on any level surface with a minimum of sideslip due to minor irregularities on the surface. Attached to a tether it will whizz merrily around in a circle until the fuel runs out. It rides a half inch or so off the floor even when running free. Any small airplane engine can be used to power it. If you use the engine installed in the original model, which is

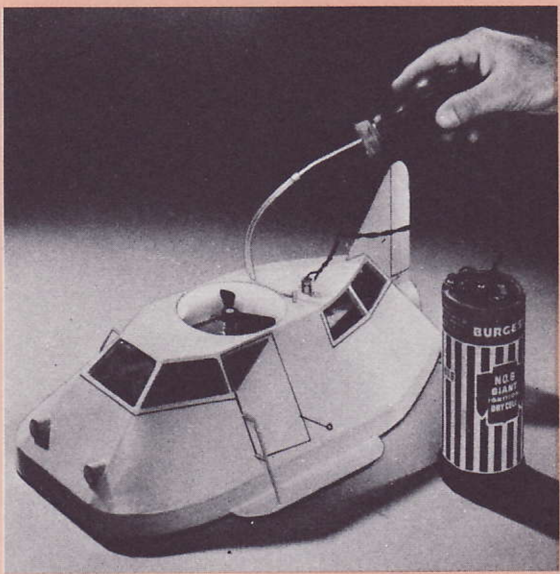
air cleaners, auto: see filters, auto


STABILIZER
FLUSH WITH LOWER EDGE OF SKIRT
ART PAPER COVERING
HEAD LAMP
BASE OUTLINE
PROPULSION TUBE
GAS AND AIR VENTS
STARTER SPRING
2"
MOTOR PEDESTAL
FAN
MOTOR
1½"
1"
1¾" R.
VANE
TAIL FIN
1¾"
3"
STATOR VANES
STATOR VANES
PHONO JACK POSITION
2½"
BALSA SKIRT
⅜"
DIAPHRAGM
⅛" CORD BUMPER
⅞"
4"
6"
5"
15"
3/32" SHEET BALSA USED FOR BASE, DIAPHRAGM, STABILIZERS, SKIRT, TOP, TAIL FIN, AND STATOR VANES
TAIL FIN
1½-VOLT BATTERY CONNECTED TO PHONO JACK FOR STARTING
3/32" x ¼" BALSA STIFFENER
3/32" x ¼" BALSA STIFFENERS
FAN
STARTER SPRING
GROUND WIRE
¼" SQ. BALSA STIFFENER
INTAKE DUCT
GAS AND AIR VENTS
IGNITION WIRE
MOTOR
1"
3"
4½"
FRAME
1¾"
HEAD-LAMP
3"
6¼"
1¼"
¾"
1¾"
¾"
½"
⅝"
2"
SKIRT
BUMPER
STATOR VANES
BASE
VANE
PROPULSION TUBE
MOTOR PEDESTAL
GAS VALVE
STATOR VANES
DIAPHRAGM PLATE

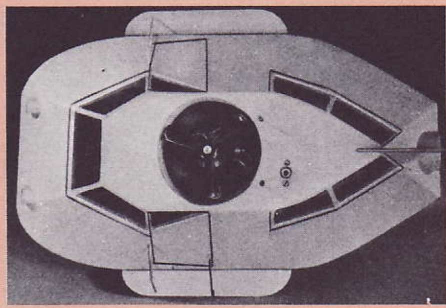

ALTERNATE FAN
.020 STEEL PLATE
TWIST BLADES R. H. PITCH
1/32" WIRE
VALVE EXTENSION
NEEDLE VALVE
STARTING SPRING
3¼" 3-BLADE PROP SOLD FOR USE WITH SPECIFIED MOTOR
COX "PEE WEE" MOTOR
NEEDLE VALVE
FUEL TANK
TOP 3/32" x 4" x 9¾"
AIR INTAKE
3/32" x 3" x 4½" TAIL FIN AND RUDDER
3/32" x ¼" BALSA TOP STIFFENERS
VALVE EXTENSION WIRE
PHONO JACK FOR IGNITION
VANE
PROPULSION TUBE
INTAKE DUCT
¼" SQ. BALSA STIFFENERS
3/16" SQ. BALSA FRAME
WINDOWS GLAZED WITH SHEET ACETATE
ART PAPER COVERING
HEAD-LAMPS
1/8" CORD BUMPER
HAND RAIL
TETHER MOUNTED AT POINT OF BALANCE
STABILIZER
VERTICAL GRAIN BALSA SKIRT
1/32" BALSA BASE
BALSA DIAPHRAGM 3/32" x 7" x 14"
3/32" x ½" x 3½" STATOR VANES
MOTOR PEDESTAL


MODEL RIDES AT 3/8"– ½" ABOVE GROUND

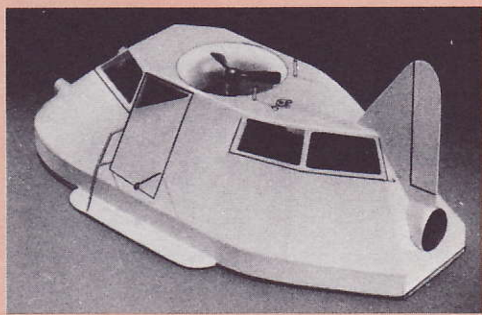

HANDRAILS 3/32" ROUND OR TOOTHPICKS



A squeeze bulb feeds fuel through the plastic fuel line connected to the tank. The dry cell plugs into the phono jack



Top and rear views above and below show the engine mounted in the intake duct and the propulsion tube outlet at the rear. Note the wire hook on the door for tethering



supplied with a three-blade prop, you won't have to make a prop of sheet metal, a pattern of which is given. If the engine is new, break it in by running on a test stand for 15 or 20 minutes.

First study the cutaway drawings given to become familiar with the various parts. Then begin construction by making up the base, top and diaphragm plate from edge-glued 3/32-in. balsa sheet. Use stiffeners where shown and allow to dry on a flat surface. Make up the 3½-in. intake duct from art paper and use this as the first structural member to hold the top and base together. When dry, add the 3/16-in. uprights which form the supports for the side covering. Next install the paper propulsion tube. Note the vane to direct airflow within it.

The skirt is vertical grained 3/32-in. stock glued around the bottom edge of the base. Use basswood or balsawood and there will be no difficulty in making the bends. Cover the framework of the car body with art paper, one section at a time, beginning at the rear. Add dummy headlights and fin, stabilizing vanes and handrails. Windows may be glazed with sheet acetate or left open. Finally turn the model over and install stator vanes. Coat the interior with at least two coats of hot fuelproof dope (clear). Dope the exterior in your favorite color. The original was painted light blue outside, fire red inside.

Make up the engine pedestal, mount the engine and cement the pedestal to the diaphragm plate. Three coats of clear hot fuelproof dope are advisable here. Attach leadout wires to the glow plug. Cut out a 3¼-in. disk of cardboard and use this as a guide in centering the engine. Actual installation is made by cementing the diaphragm plate to the stators. Use a slow-drying cement to allow time to even up the slot around the skirt and center the engine shaft.

Run out the fuel filler tubes and engine leadout wires and make up a needle valve extension shaft. The glow-plug wires lead to a phonograph jack—a great convenience in starting. A recoil spring starter is a must and is installed before the prop.

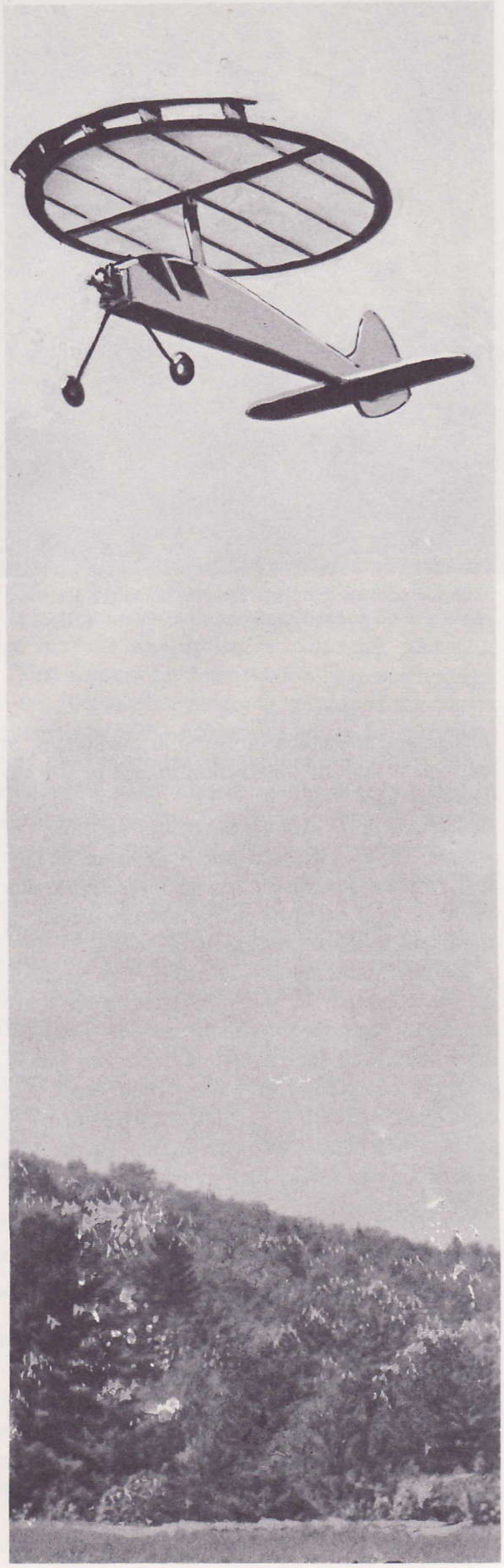
A length of ⅛-in. cord is cemented around the skirt as a buffer. (A round shoestring works very nicely.) Suspend the model by the engine shaft and balance it so that it hangs evenly. Small bits of solder, coated with cement and dropped inside the body on the light side or end will do the trick. If tethered operation is desired, cement a wire hook through the covering to the upright on the center line.

See also: airplane models; glider model; gyroplane model; jet plane model.

Free-flight parasol plane

It may look like a flying dinner plate, but this way-out model actually is a rugged performer worth a big hand at any flying competition

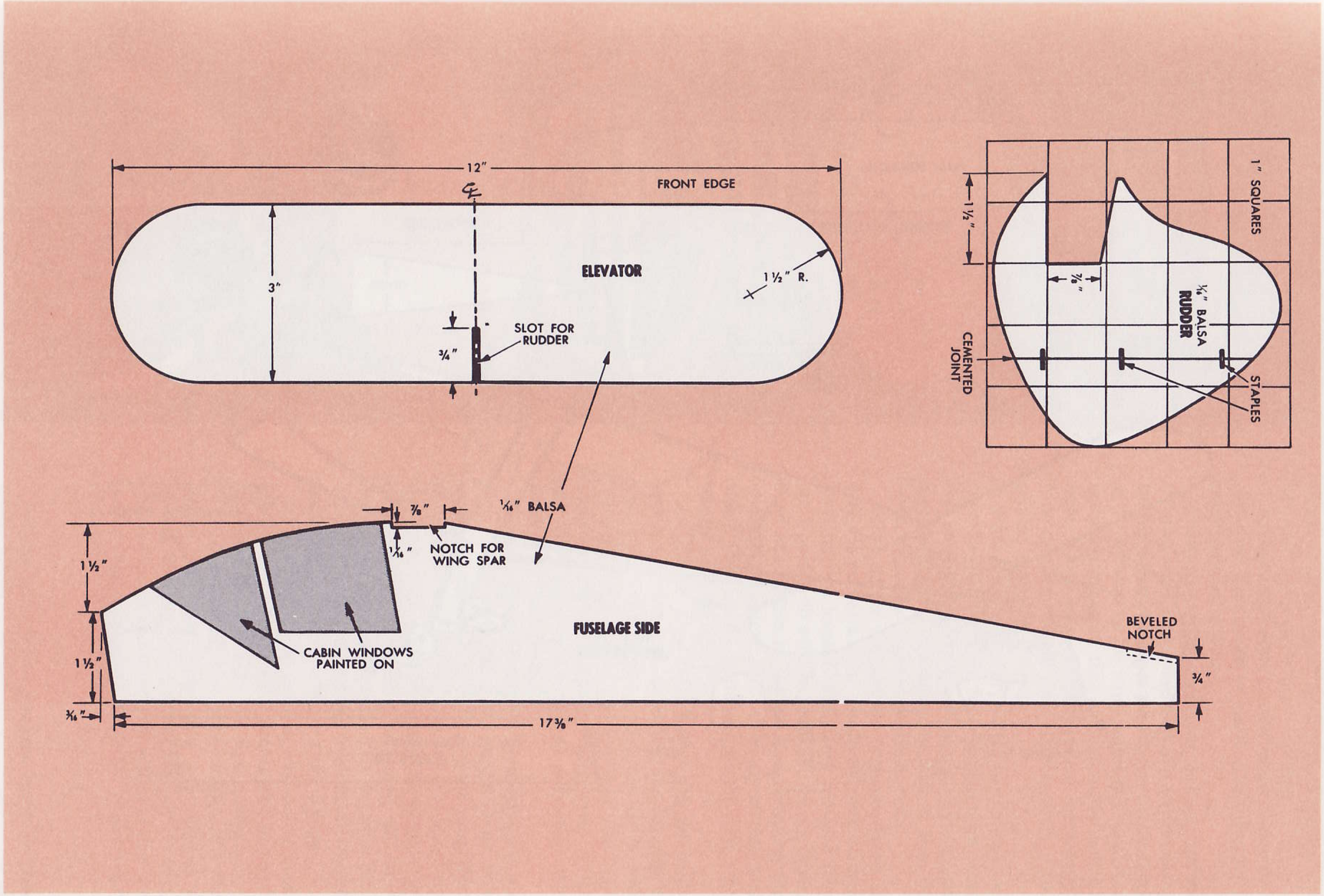
BY ROY L. CLOUGH, JR.

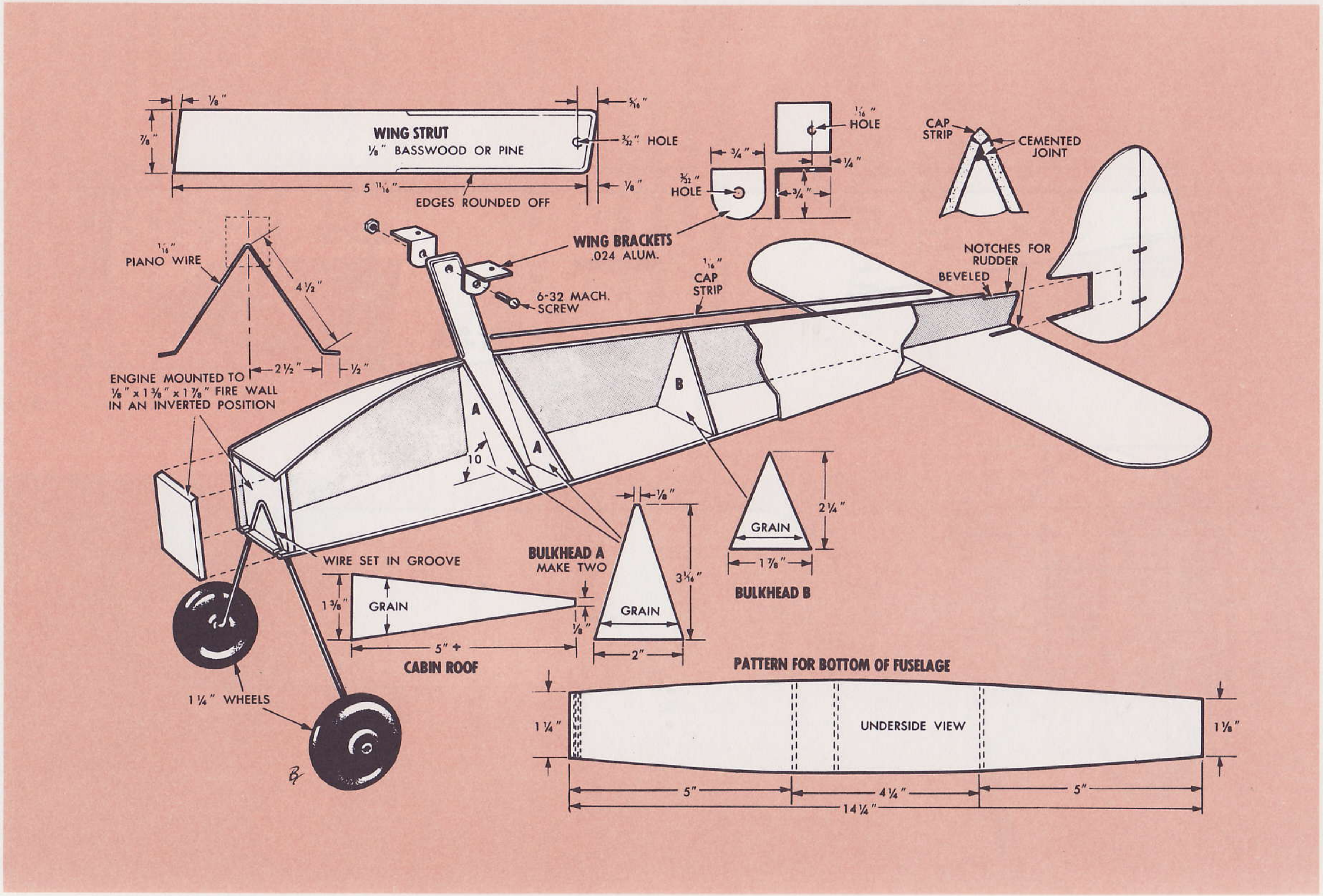


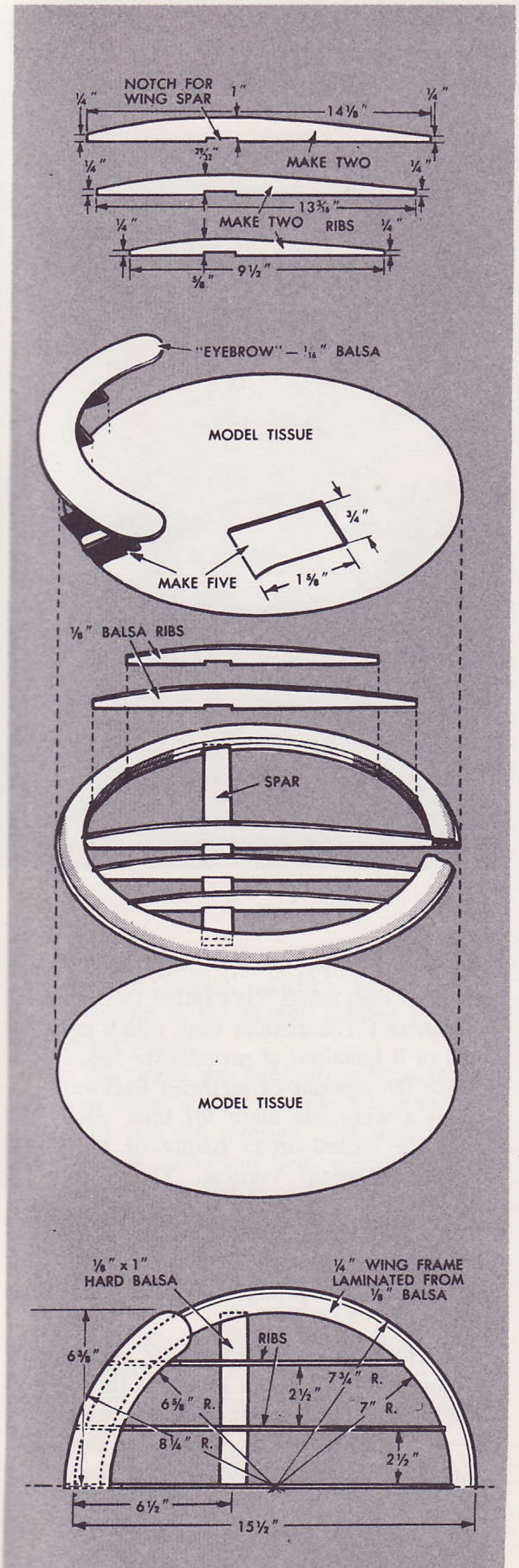
ONE OF THE MOST unusual designs in the history of aircraft is the pancake wing, a weird-looking bird that actually has a number of features to recommend it.

A circular wing presents little drag at low angles of attack, making it fine for high-speed cruising. At high angles of attack the wing develops a great amount of lift and drag, perfect characteristics for low-speed landings. The sharply curved leading edge is an effective substitute for stabilizing dihedral angle.

If you want to have some relaxation during a few evenings that is certain to produce a lot of fun for you and all the children in the neighborhood—from age six to 60—take on the job of building this parasol plane. Made mostly of balsa


12"
FRONT EDGE
ELEVATOR
3"
1 ½" R.
SLOT FOR RUDDER
¾"
1/16" BALSA
⅞"
1/16"
NOTCH FOR WING SPAR
1 ½"
1 ½"
3/16"
CABIN WINDOWS PAINTED ON
FUSELAGE SIDE
BEVELED NOTCH
¾"
17⅜"
1" SQUARES
1 ½"
⅞"
1/16" BALSA
RUDDER
CEMENTED JOINT
STAPLES


WING STRUT
1/8" BASSWOOD OR PINE
1/8"
7/8"
5/16"
3/32" HOLE
5 11/16"
1/8"
EDGES ROUNDED OFF
1/16" HOLE
3/4"
1/4"
3/32" HOLE
3/4"
CAP STRIP
CEMENTED JOINT
WING BRACKETS
.024 ALUM.
1/16" PIANO WIRE
4 1/2"
2 1/2"
1/2"
6-32 MACH. SCREW
1/16" CAP STRIP
NOTCHES FOR RUDDER
BEVELED
ENGINE MOUNTED TO 1/8" x 1 3/8" x 1 7/8" FIRE WALL IN AN INVERTED POSITION
A
A
B
10
WIRE SET IN GROOVE
1/8"
BULKHEAD A
MAKE TWO
GRAIN
3 1/16"
2"
GRAIN
2 1/4"
1 7/8"
BULKHEAD B
1 3/8"
GRAIN
1/8"
5" +
CABIN ROOF
1 1/4" WHEELS
PATTERN FOR BOTTOM OF FUSELAGE
1 1/4"
UNDERSIDE VIEW
1 1/8"
5"
4 1/4"
5"
14 1/4"



sheet, which is easy to work with, this plane can be made fairly easily in an evening.

As an extra feature on this model, "eyebrow" slots have been added to permit climbing at steep angles without stalling.

Construction begins with the fuselage. Cut out the two sides and cement them together along the top edges, starting at the tail end and working as far forward as the strut. Insert the bulkheads and the wing strut, then add the cabin roof cut from ¹⁄₁₆-in. balsa sheet mounted cross-grain. Note that the firewall must be shaped to fit the contour at the top.

When the cement is dry, install the elevator and cover the bottom of the fuselage with balsa sheet laid cross-grain. Slip the rudder into place and capstrip the top fuselage joint with a strip of ¹⁄₁₆-in. balsa sanded to the proper contour.

Make up the wing outline from two layers of scrap ⅛-in. balsa sheet. The joints in the bottom layer may be located at random, provided they are lapped with solid balsa in the second layer. Sand this outline to shape before installing the spar and ribs. Next, make the wing brackets and attach them to the underside of the spar with cement and two 2-56 bolts.

Cover the wings with lightweight gas-model tissue, applying it in strips between the ribs in the upper surface, then spray this lightly with water to shrink it and pin the wing to a flat rigid surface to prevent warping during drying. When dry, coat the covered wing with a couple of thin coats of butyrate dope.

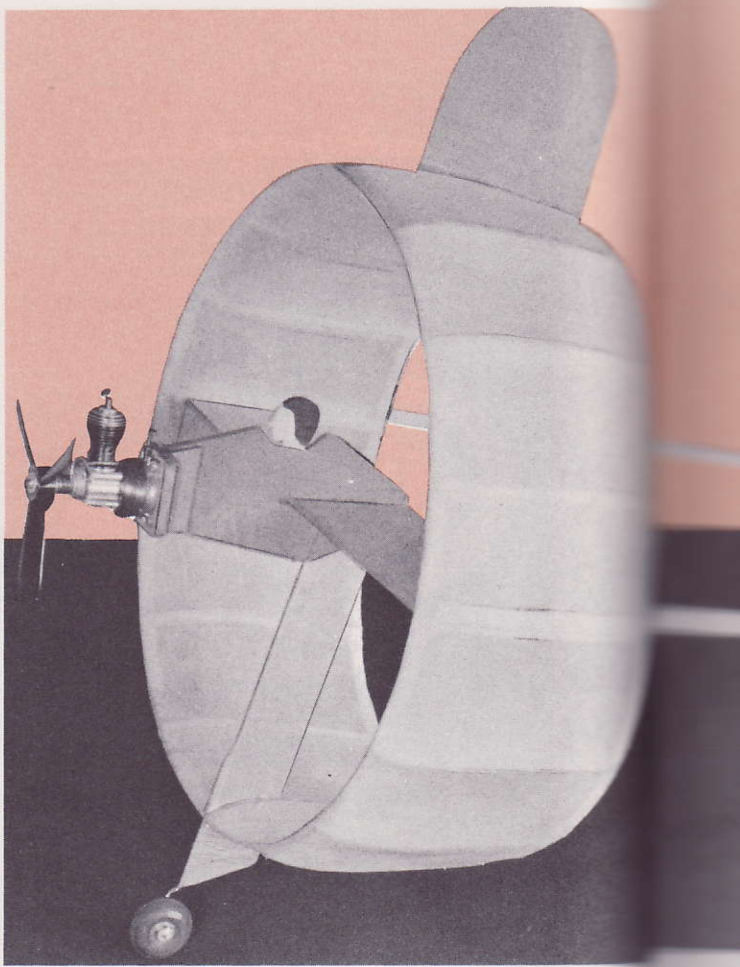
The top piece forming the eyebrow slot is cut from ¹⁄₁₆-in. sheet balsa and supported on flow separators cemented to the top of the wing. Note that the contour of the wing ribs changes from the center outward. When the eyebrow top is cemented to the separators, the result will be a down twist at the outer ends. This assists in producing the desired airflow condition over the center and prevents the model from tipping.

Attach the wing to the strut with brackets and a 6-32 bolt, then add the decorations and give the whole fuselage a coat of clear butyrate.

To discover the best wing angle, glide the model over long grass until you achieve a smooth, flat glide, then tighten the bolt. Finally, start the motor and test-fly the model to find the rudder adjustment which yields the proper angle of climb.

See also: glider model; gyroplane model; jet plane model; stick-model planes.

For a real eye-stopper, build "Hoopskirt"



BY ROY L. CLOUGH, JR.

Flying barrels have been in the air since Bleriot, but this model proves they can still turn in a top performance

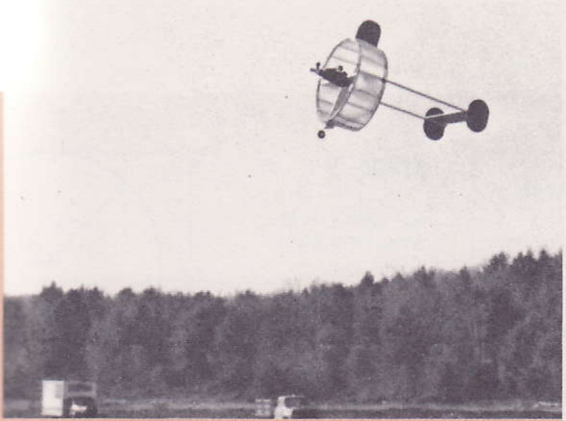
TROT THIS MODEL out on the field at your next meet and watch the eyes bug. If anybody snickers, put 'em in their place by reminding them that the annular wing is a very old aeronautical principle. Then launch your Hoopskirt. If its tradition hasn't impressed them, its performance is certain to!

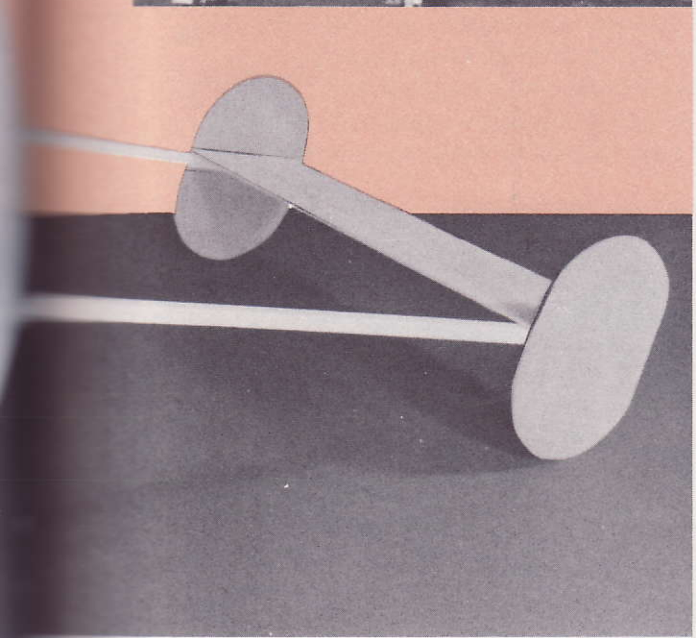
At least a half-dozen full-scale planes (plus innumerable kites and gliders) have been built on the "flying barrel" design. One of the initial aircraft made by Ellehammer—the first Dane to fly—took this form. Louis Bleriot, the daring Frenchman who was the first to fly the English Channel, perched one on floats and tried, with indifferent success, to get it off the water. The French are still at it; their latest attempt at annular-winged aircraft is a tail sitting jet.

One of the big advantages of this design is its propulsive efficiency. Efficiency in a flying system is highest when the velocity of the discharged air is almost as great as the forward speed of the plane. This means that it's better to move a lot of air relatively slowly than a small amount at high speed. (It's rather like matching impedances.) The annular wing with a propeller ahead of it functions as an effective aspirator to increase the amount of air thrust backward.

Such a wing has more *lift* than you might think. The closed-circuit nature of the airfoil eliminates wing-tip vortices. Theoretically, a hoop-wing plane shouldn't have to bank in order to turn. This model does, however, because of the vertical stabilizing fin at the top of the wing. This was added to produce an effect comparable to dihedral.

The Hoopskirt is an extremely stable flying machine. It'll teach you a lot about this off-beat configuration. Don't let the circular wing scare you—it's quite easy to build. Any cylinder with a diameter of about 10 in. (a half inch either way won't hurt) can serve as a mold for the two spars. I used a straight-sided layer-cake pan. The spars can be of any light wood that bends easily when soaked in hot water. Bind these





around the mold with a strip of rag. When dry, trim the ends in long, matching bevels to form the lap shown in the sketch; cement and bind with sewing thread.

You can trace the wing-rib pattern directly onto your balsa, stacking blanks to cut as many at once as you can manage. The slots in each end are 3/32 in. wide and 1/4 in. deep. The width should provide a snug fit over the spars. When these hoops are seated in the notches, their outer edges will protrude 1/16 in. for rounding off.

An easy way to space the ribs accurately is to set the spar-mold cylinder on a piece of cardboard and scribe around it to produce a circle the same diameter as the spars. Mark off sixteen rib positions by means of radius lines and assemble the wing vertically over this pattern.

Cover the frame one section at a time with light model-plane tissue. Sections into which the strut, fin or booms will pass can be left uncovered until assembly is completed—or you can cover the entire wing and then slit the paper of these sections when you install parts that must be cemented to the ribs. Water-shrink the paper; when dry, give it a coat of clear dope.

Careful alignment of all balsa parts pays off in good performance. Don't diminish the strength of the rock-hard-balsa booms by sanding off the corners—leave them square.

The tail plane has a deeply-notched trailing edge, backed up with parallel pieces of soft wire cemented to the wood. These wires—which can be snipped from a paper clip—will hold any flight-adjustment bends you may give the two elevator sections after trial runs. An annular wing operates at zero incidence, so you'll have to bend the elevators up two or three degrees to get an angle of attack for climb. Bending one elevator up more than the other makes the model turn in that direction. The rudders have no adjustments, and are simply cemented to the sides of the booms after the tail plane is in place.

The engine-pilot nacelle is given a coat of pigmented dope after the motor is fastened on its plywood mount. The color scheme of the model shown is: red nacelle, rudders and fin: natural white wing; silver booms, strut and tail plane—a highly visible combination against a blue sky.

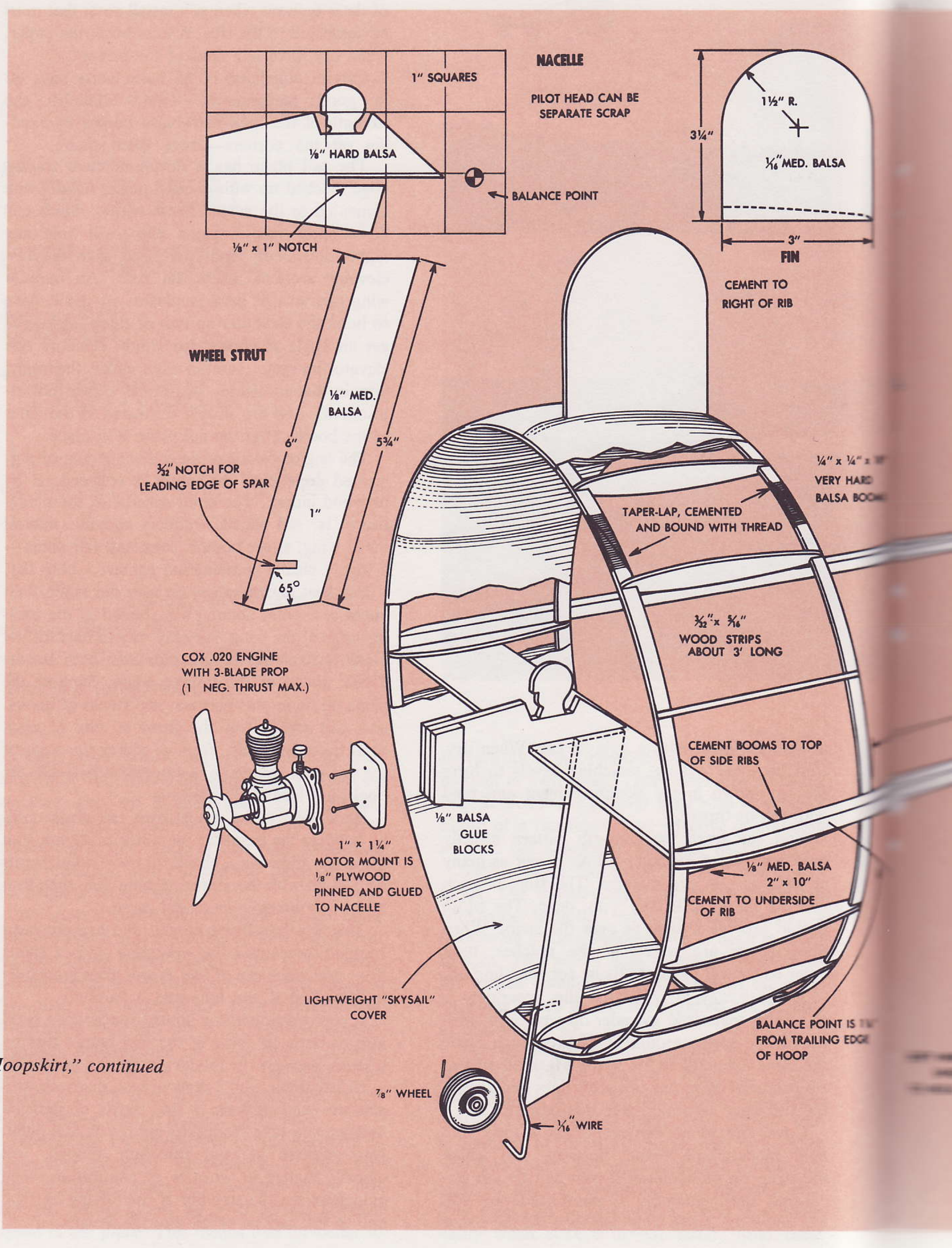
For best performance, be sure the model balances at a point about 1¼-in. ahead of the trailing edge of the wing. An easy way to balance the plane is to stick straight pins into both booms 1¼-in. ahead of the trailing edges. Support the plane on these pins between two stacks of books, and add weight—in the form of bits of clay, small pieces of lead, etc.—to either the nose or the tail until the plane is suspended between the books in a level flight position.

Hand launch the model over tall grass until, by bending the elevators up a little at a time, you get a flat glide. As a check on these adjustments try a flight with the motor running rich, then lean it out and watch your model zoom.

This is a free-flying model, and has not been adapted for control-line operation. It is a stable flyer, and when out of fuel, it will glide gracefully to a landing if you balanced it carefully.

If you're flying it in a limited space, it's a good idea to burn off some of the fuel before turning it loose, because the model travels at a good clip.

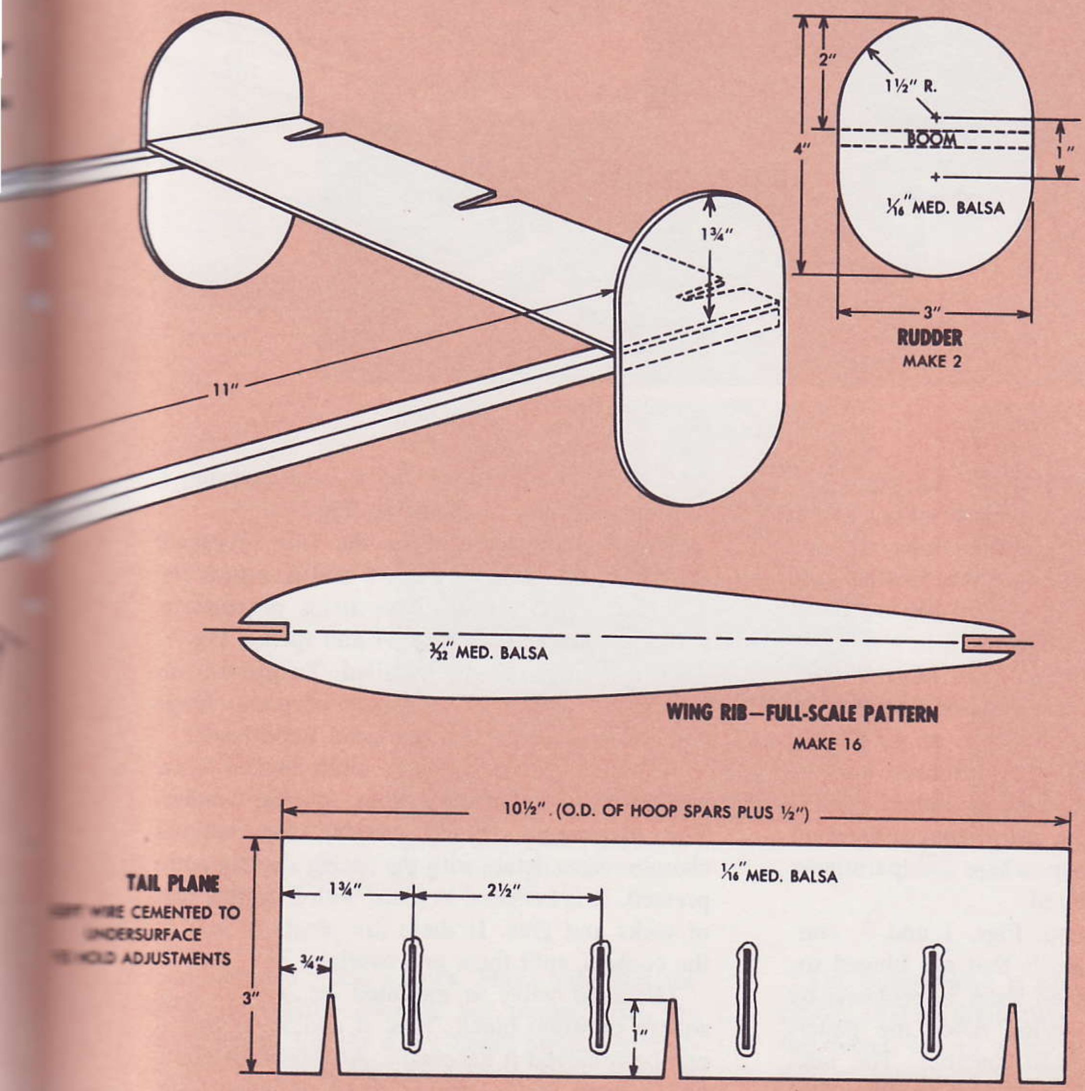
In any event, you'll draw a good many curious glances—and perhaps a few snorts of derision—when you take Hoopskirt out for its first flight. Any snickers in your direction, though, will quickly change to whistles of admiration when onlookers see the stability of the "flying barrel," one of the earliest of all aircraft designs.

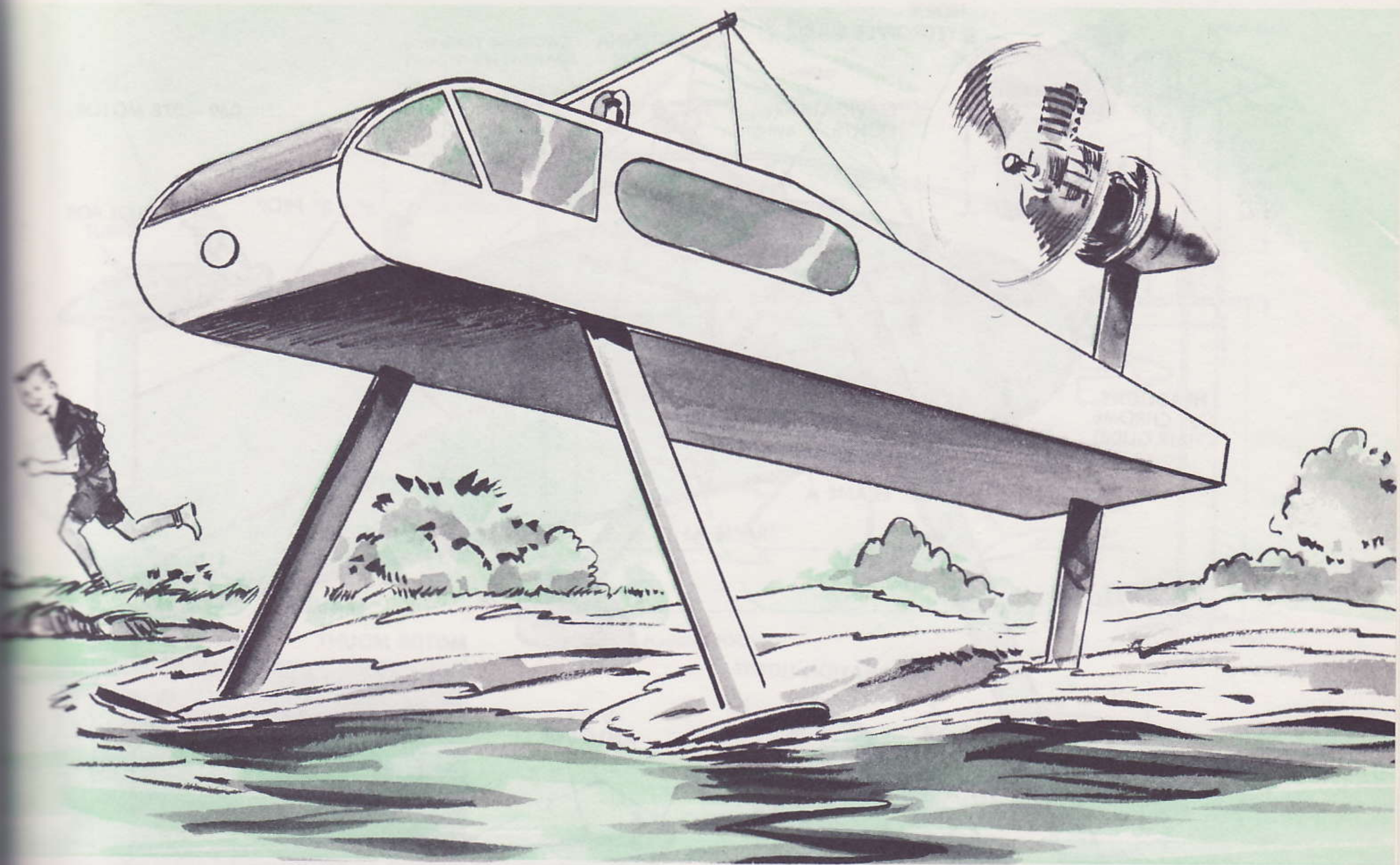


build "Hoopskirt," continued

"Hoopskirt"

You can trace the wing-rib pattern below, directly onto your balsa, stacking blanks to cut as many at once as you can manage. Note the tail plane, diagrammed at the bottom. The trailing edge must be backed up with parallel pieces of soft wire cemented to the wood. Wire snipped some paper clips will do nicely. The two spars for the circular wing, at left, can be formed in any cylinder with a diameter of about 10 in. such as a layer-cake pan





It's actually just a wooden waterskier, but it skims over the surface like a hydrofoil

Build a water bug

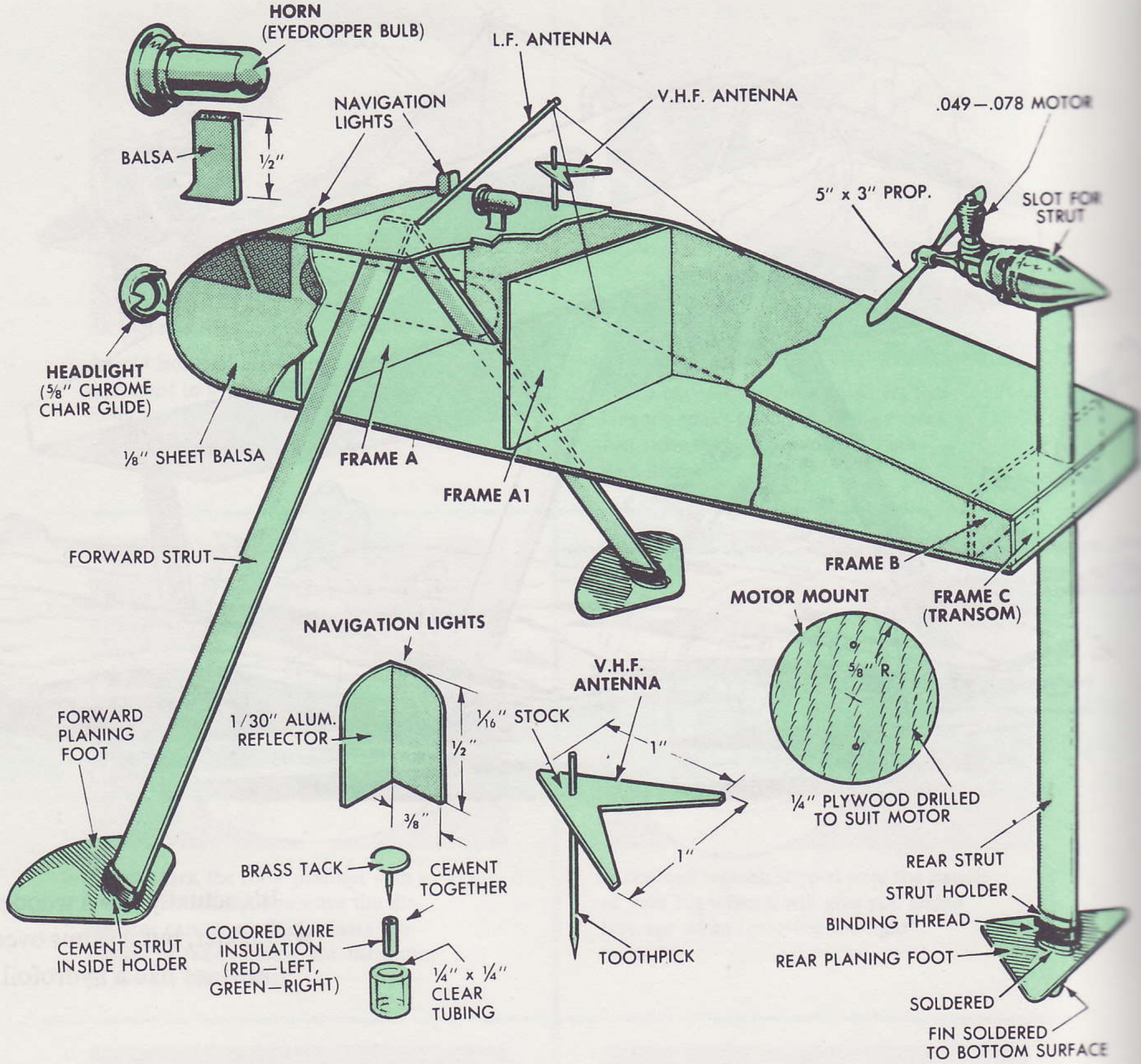
BY ROY L. CLOUGH, JR.

INSPIRED BY those little aquatic insects called "water striders," this unusual model boat flits along the surface of the water on three flipper-shaped planing feet mounted at the ends of long legs.

Although it travels fastest on calm water, *Water Bug* can run through 4 to 5 in. ripples—the scale equivalent of 5-ft.waves—with no trouble. The struts simply slice through the wavelets and keep going. The boat is very stable and can be run with a guide line or turned loose in small ponds where recovery is easy. The original model showed no tendency to trip or tip over, even with the rudder bent sharply for free-running turns.

The hull is a simple box structure of ⅛-in. sheet balsa. It should offer no problems, but re-

boat port: see cover, boat
boat propellers: see propellers, boat



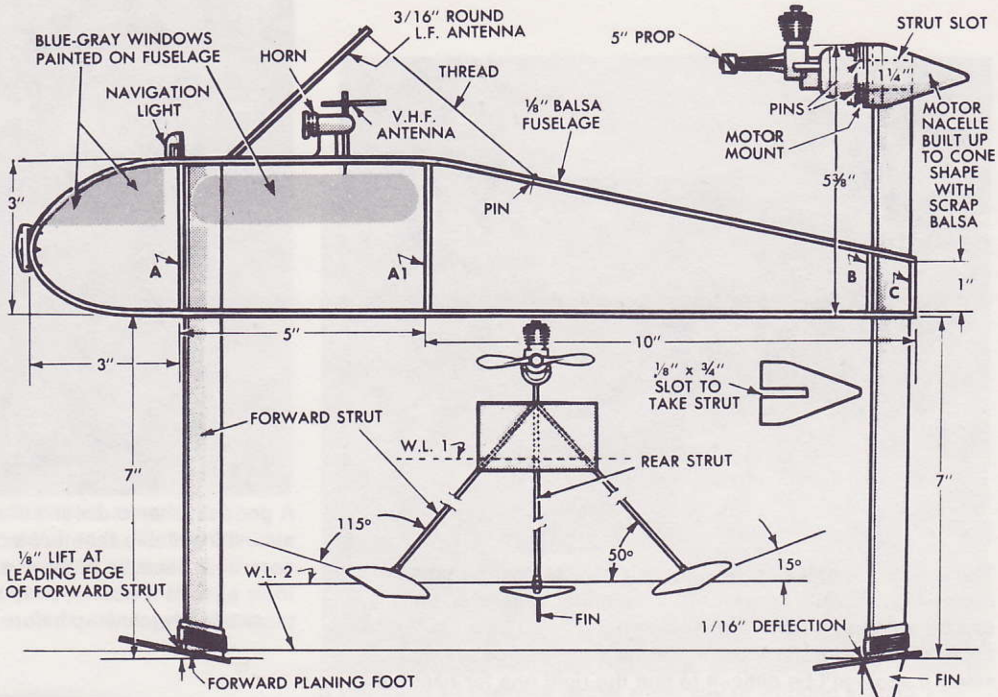
build a water bug, continued

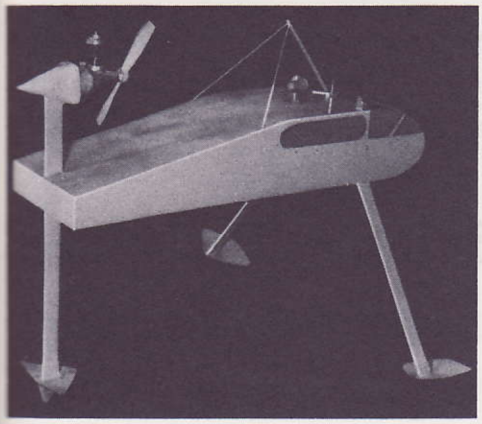
member to soak the sheeting which covers the front section in hot water before bending. Finish the boat with a couple of coats of sanding sealer and one of dope, or cover the bare wood with a layer of lightweight model tissue laid on with heavy dope.

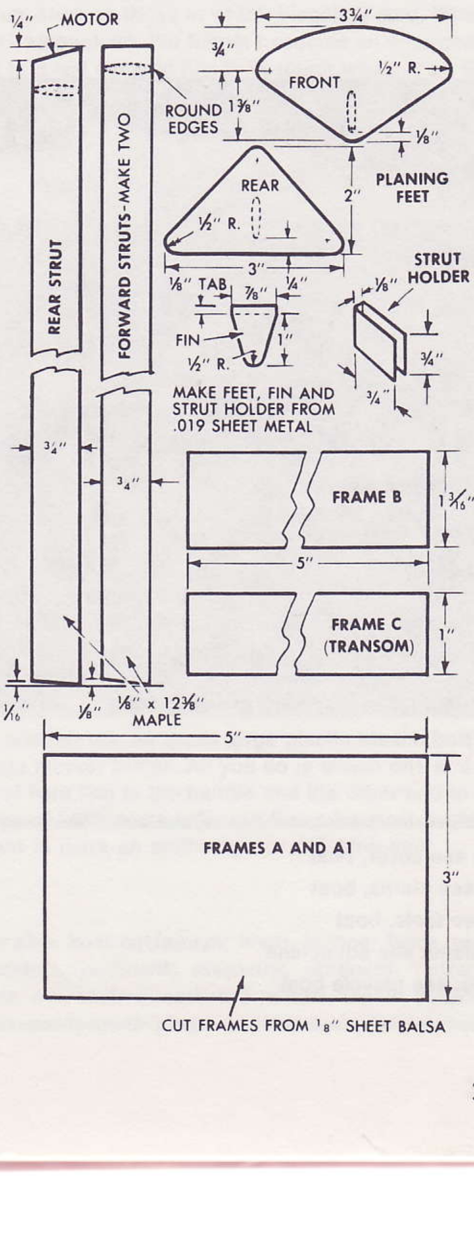
The motor mount is a disc of plywood pinned and cemented to the rear leg. Drill for the engine mounting bolts, set the engine in place and build up the fairing on the rear of the bulkhead with scrap balsa left over from the hull planking. Don't worry about access to the rear of the bulkhead to tighten up the nuts. If built-in blind this way, they'll stay put. The thrust line of the motor should be almost parallel to the bottom of the boat, but pointed slightly downward.

Cut the planing feet out of .019 sheet metal, then make up the holders and rudder and solder them to the feet at the angles shown. Attach the feet to the struts by lashing and cementing securely.

Finish off the model with scale radio masts,







running lights and foghorn. A couple of screw eyes are used for the restraining bridle. If you use a tether, attach it in such a fashion that the boat dangles level when suspended by it.

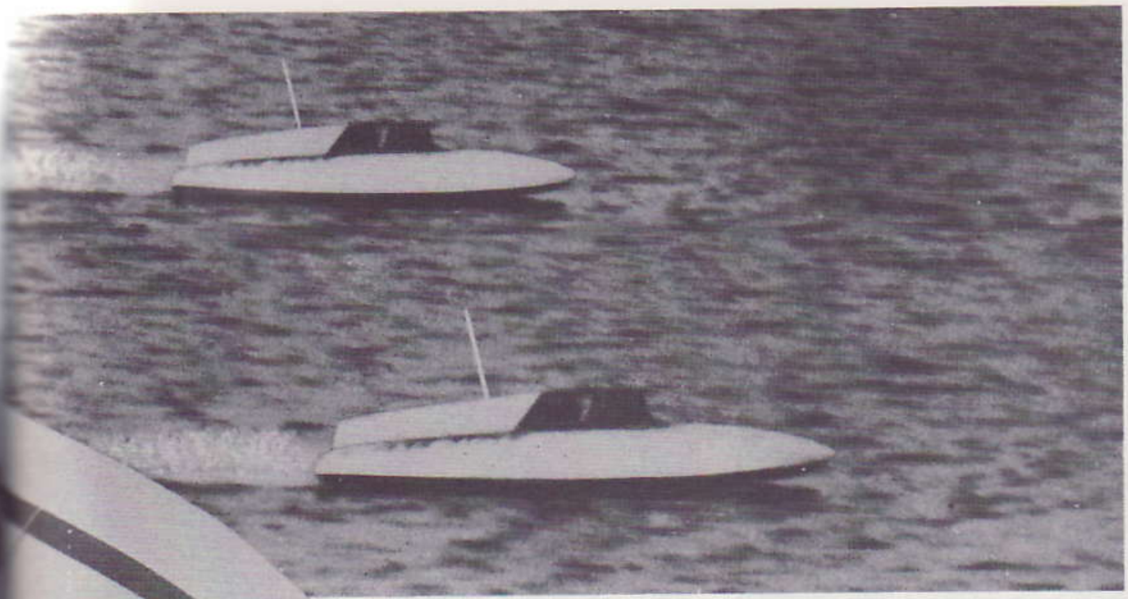
If you don't have a model boat basin with tether post, you can run *Water Bug* off a spinning rod from a rowboat.

To launch the boat hold it by the motor mount and give a gentle push. It should climb out of the water in about 6 ft. with an immediate increase in speed. If it doesn't, turn up the front edges of the forward planing feet slightly.

See also: hydroplane models; rotor ship model; sailboat model; steamboat model; submarine model.

Here's what the skeleton of the hull of this pint-size hydroplane looks like. It consists of jigsawed interlocking plywood formers

1



"Whiteheat V" is radio-controlled

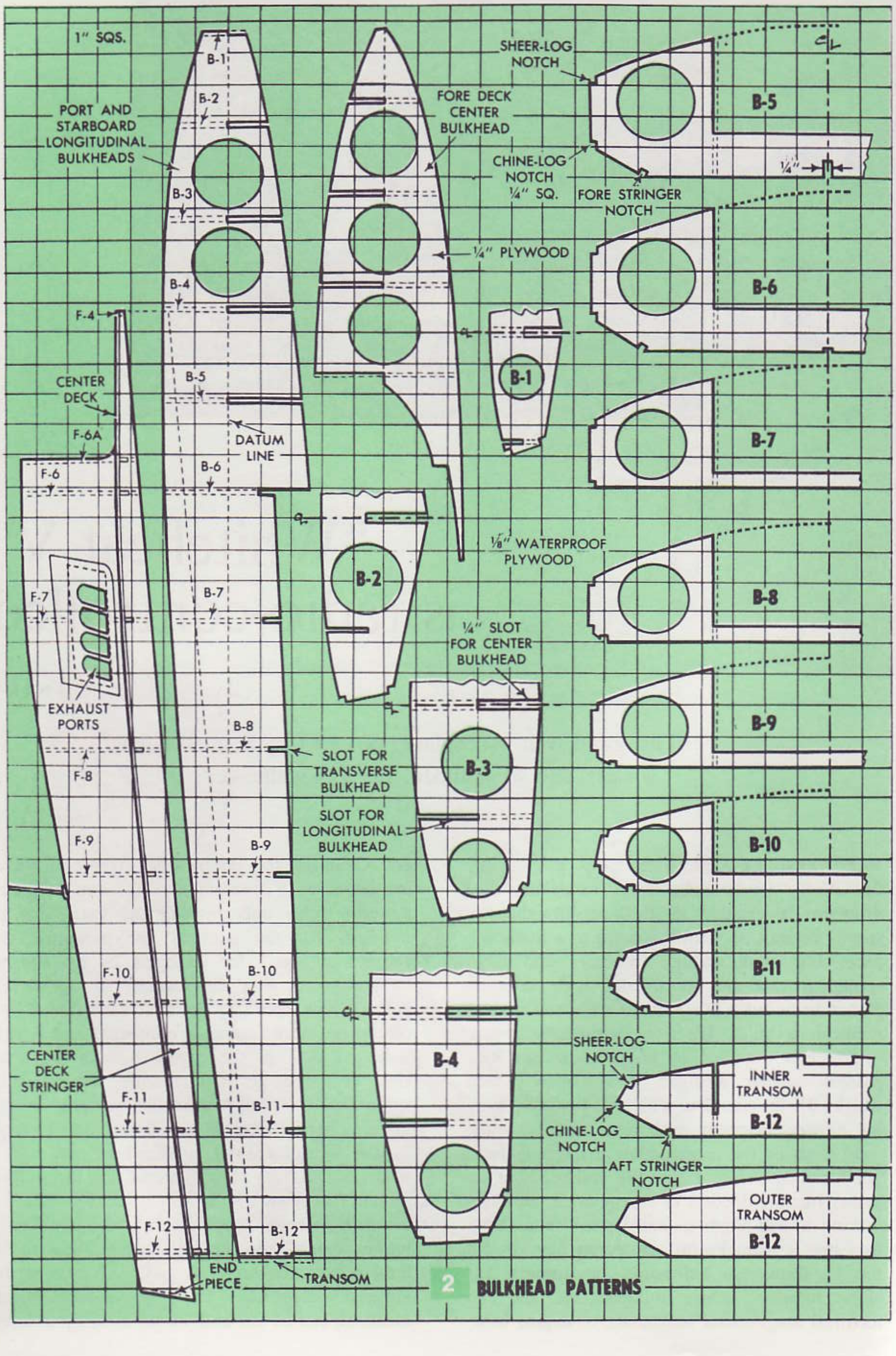
By TOM PERZENTKA

This gas-driven hydroplane, powered by a small engine, is sleek and streamlined. It's a modelmaker's dream

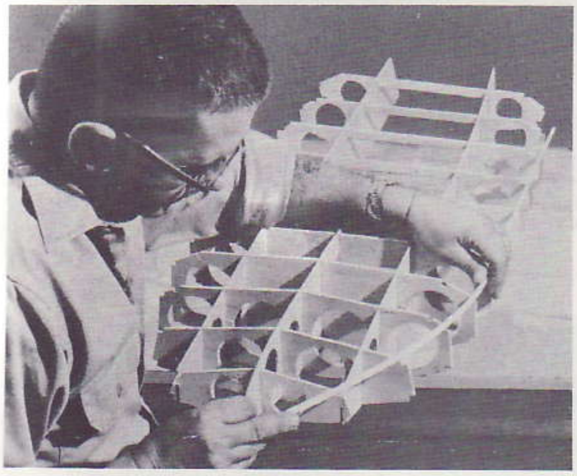
POWERED BY A pint-size, ¾-hp. gas engine, this 42-in. (radio-controlled), single-step hydroplane is capable of thrilling straightaway speeds yet can be throttled down to a minnow's pace. It's small enough to carry and large enough to race and control on rough water. It planes beautifully; it's easy to start and is economical to build. It's a modelmaker's dream.

Power is provided by an Ohlsson and Rice gasoline engine, a pigmy power plant which weighs 3¾ lb. complete with recoil starter, cooling blower, magneto, carburetor and gas tank.

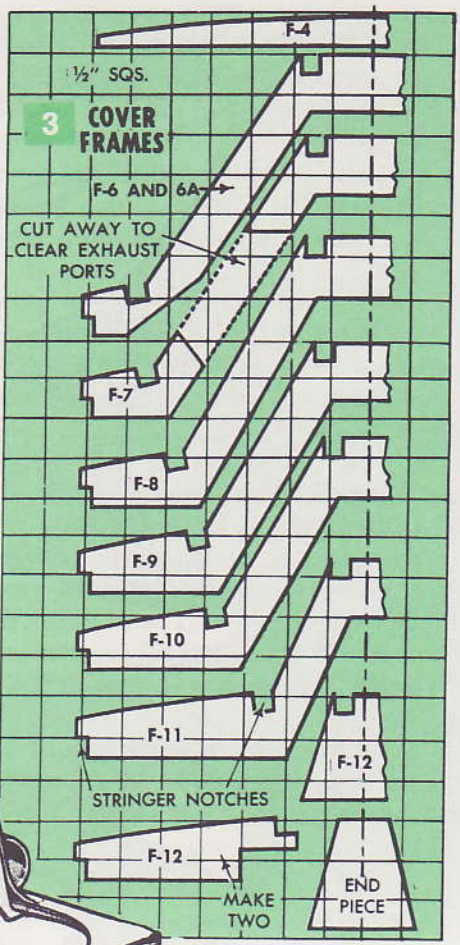
In studying the construction of the hull itself, you'll notice in Fig. 1 that the bulkheads fit together like the dividers of an egg crate, all interlocking in self-aligning, half-lapped slots. Your first step is to make full-size paper patterns for the 12 transverse bulkheads, or formers, the single foredeck center bulkhead and the two identical longitudinal bulkheads, or engine bearers. Counting the double-thick transom, there are actually 13 formers, but the two transom patterns differ only in that the inner one is notched. All the patterns are presented on squares in Fig. 2 for enlarging by the square method. Note that the formers are given as half patterns since they are alike each side of the centerline. Each former is numbered and keyed with the slots in the engine bearers to show right where they go. If you want to save yourself some work, you can buy full-size patterns, ready for pasting on the wood and sawing out. Except for the foredeck center bulkhead, or bow piece, which is cut from ¼-in. material, all the others are cut from ⅛-in., 3 or 5-ply aircraft-grade plywood. A hole saw does a quick, neat job of forming the weight-reducing holes in the formers and if used, the holes should be cut before the formers are jigsawed to shape. The engine bearers, being identical, can be cut both at one time by tacking

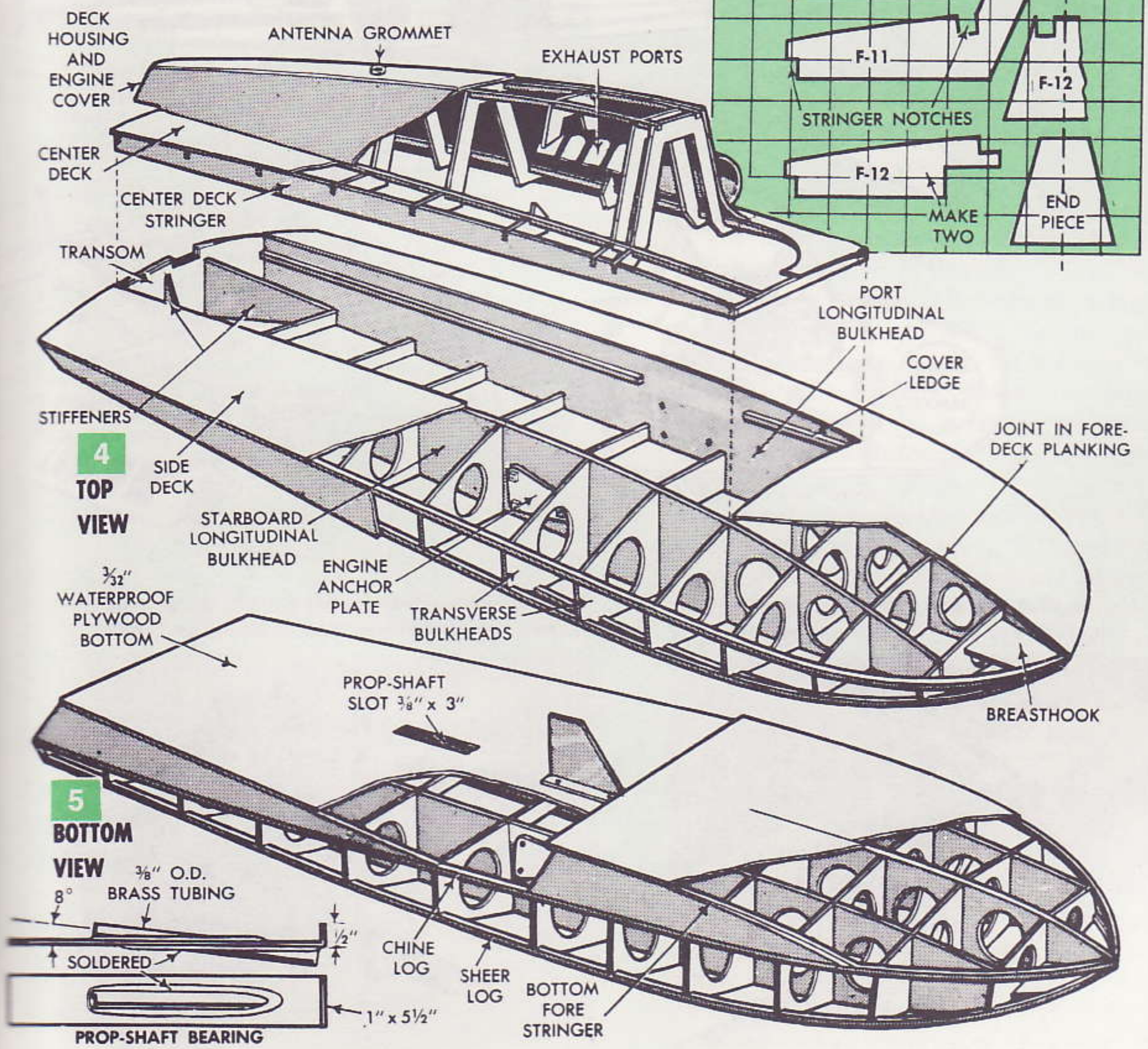


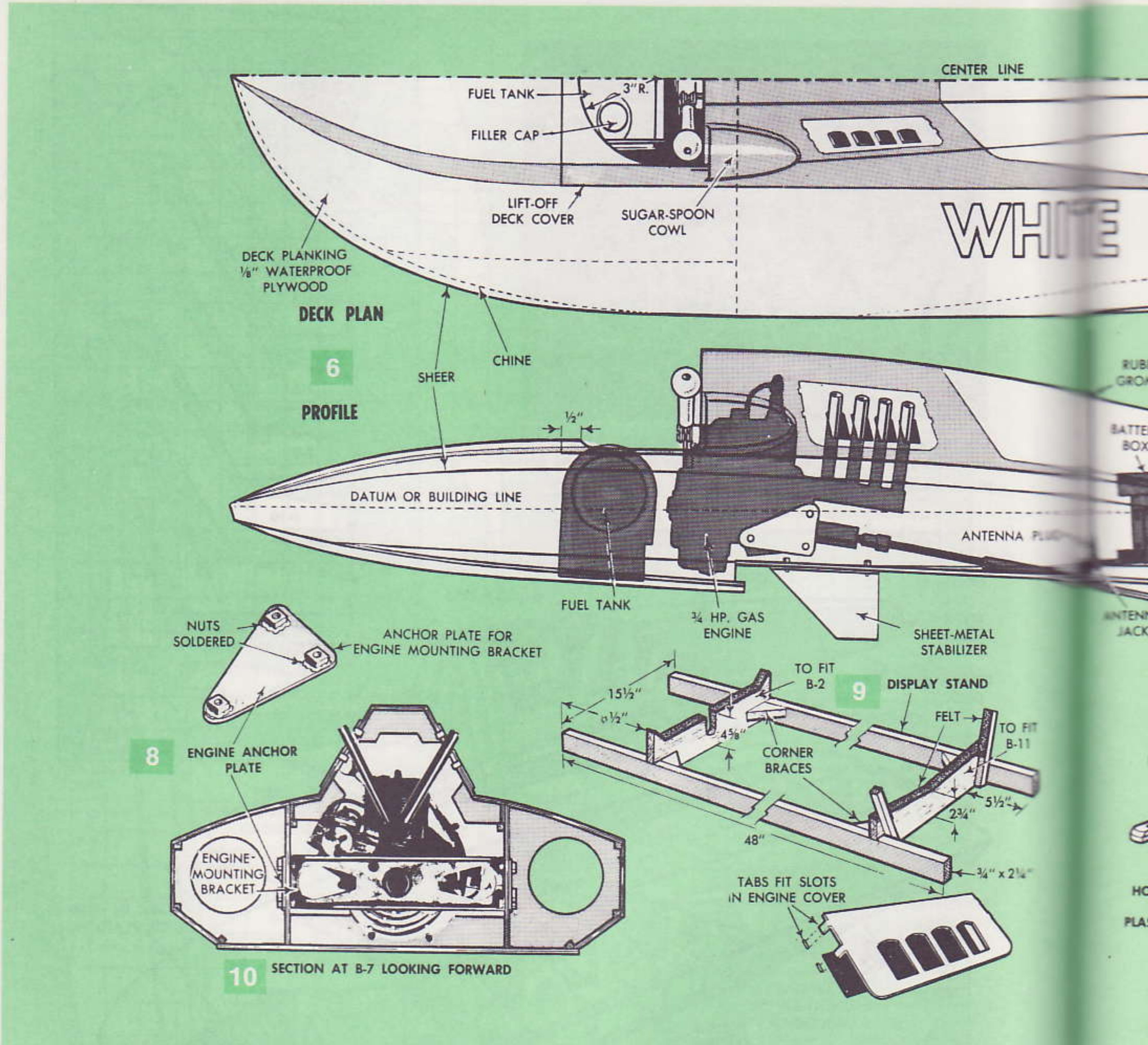
2 BULKHEAD PATTERNS



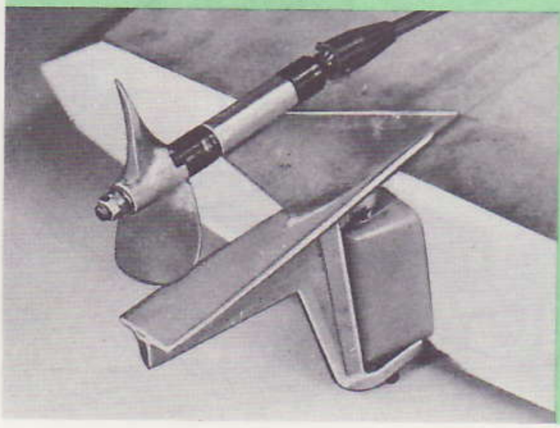
Chine and sheer logs, soaked in water, are glued in notches cut in the outer corners of the formers. The sheer piece here is being checked for fit



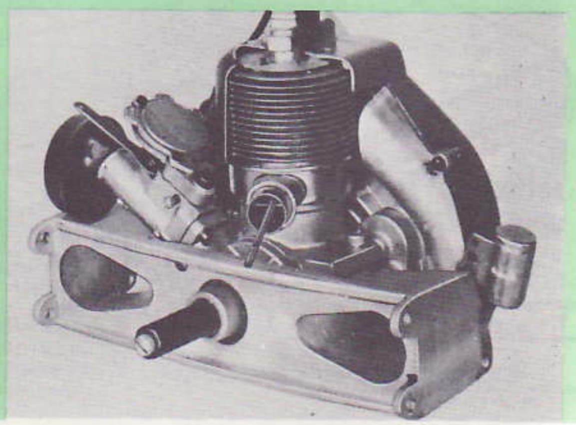


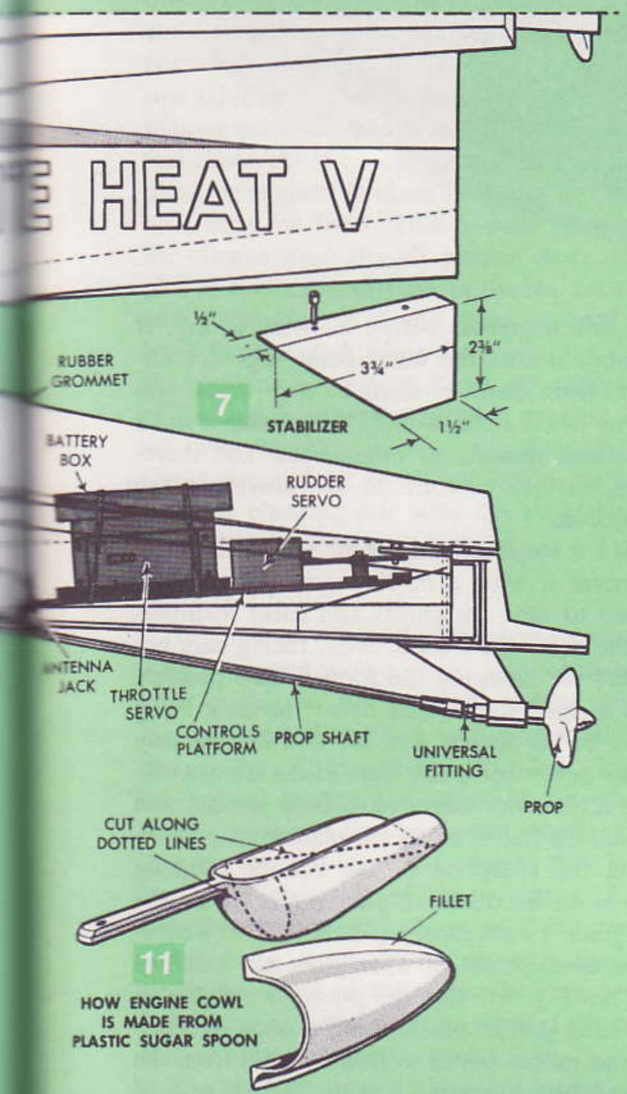


The strut and strut bracket which bolt to the transom are castings that you get in a kit

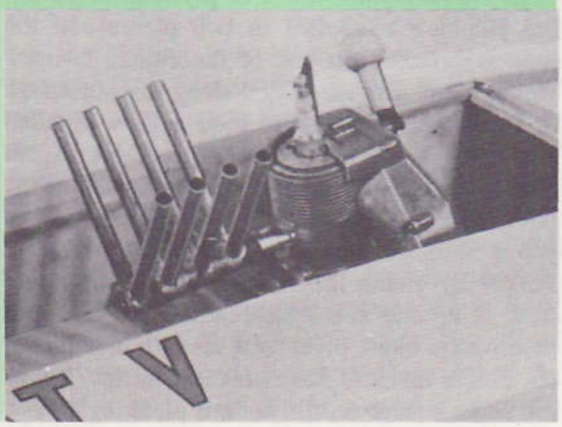


The engine-mounting casting bolts to the engine bearers to provide rigid support for the engine





Another part in the kit is the chrome-plated manifold which replaces original engine manifold



the material togther. The engine is mounted in the hull on a special aluminum casting which is installed between bulkheads 6 and 7, Fig. 10. It is best to have this casting on hand so that the holes for bolting it to the engine bearers can be located and drilled at this time. The engine mounting casting, as well as the stuffing, strut bracket, strut, manifold, prop, shaft and universals, is part of a kit available from Octura Models, 8148 Milwaukee Ave., Niles, Ill. The engine is available from the same source.

With all the formers cut out, start checking them for fit with the slots in the center bow piece and the engine bearers, making certain that the parts are flush top and bottom when in place. When all fit to your satisfaction, they can be glued. Make a number of spacer sticks beforehand from scrap wood to help align the formers in final gluing and also cut pieces for reinforcement at the bow. Use a waterproof glue or an epoxy adhesive for gluing. The formers are glued in place in stages, formers 1, 2, 3 and 4 being assembled first to the center bow piece and set aside to dry. Use the spacer sticks to assure alignment of the formers and check for squareness with the bow piece before the glue dries.

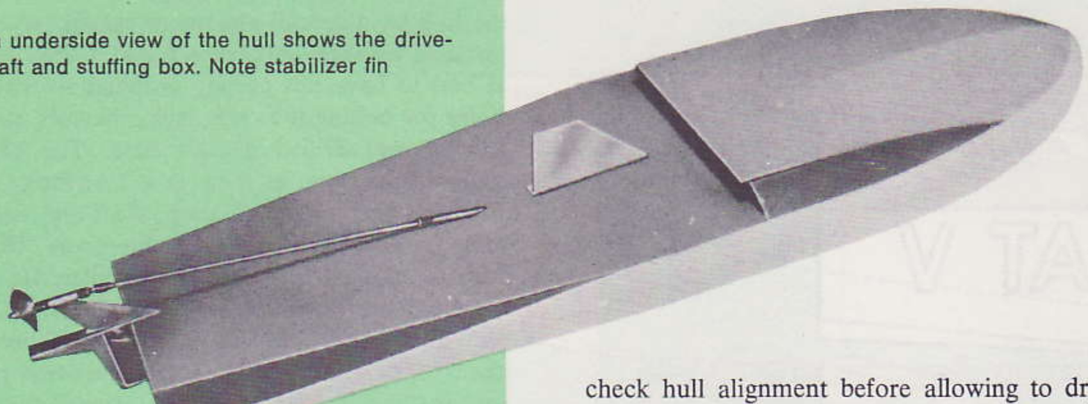
gluing is second stage

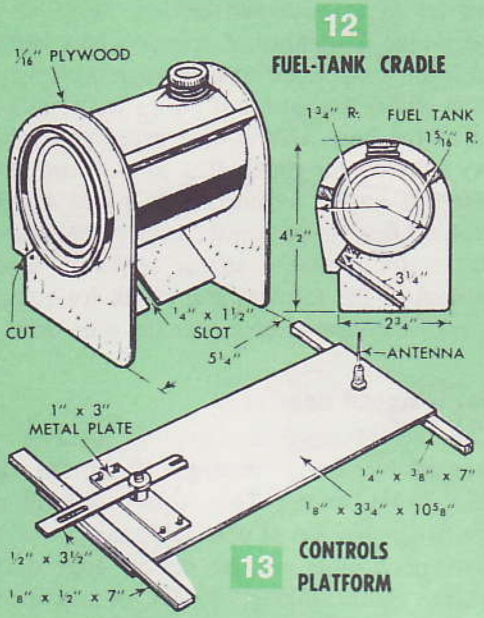
The second stage of assembly involves the gluing of formers 5 through 12 in the slots of the engine bearers. This requires a level surface, such as the top of your table saw, on which the engine bearers can be set on edge during assembly. After gluing, weight or clamp the assembly to hold it flat in contact with the work surface, check as before for squareness with the bearers and allow to dry.

Now both preassembled sections can be joined together by gluing formers 1, 2, 3 and 4 in the bow slots of the engine bearers and adding reinforcing (breasthook) blocks where indicated. Check the after plane on a flat surface to make certain the assembly has not developed a twist.

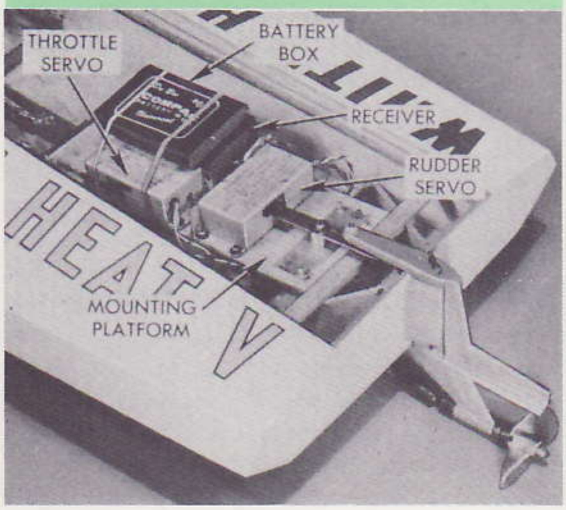
The chine and sheer logs are installed next, Figs. 4 and 5, using ¼-in.-square pine, spruce or hard balsa for both the inner aft stringers and the fore stringers. Again check for alignment of the bottom when doing the final gluing. The outer chine logs, also the upper sheer logs, are laminated of four 1/16 x ¼-in. strips of the same material. These strips must be at least 48 in. long and should be soaked (use your bathtub) before being glued in place. Use clamps or rubber bands cut from an inner tube and allow to dry in place before cementing or gluing. Again

An underside view of the hull shows the drive-shaft and stuffing box. Note stabilizer fin





The components of the controls include throttle and rudder servos, receiver and battery box



check hull alignment before allowing to dry. It is important that the outer chine logs are unbroken from stem to stern as any break will show up in the finished hull. Now, using a small hand plane, remove the excess chine and sheer-log material to conform to the corresponding hull section.

Make a sanding block about 1 x 4 x 12 in. and cover it with a medium-grade sandpaper. Proceed to sand the chines and sheer members as if the hull were a solid block, taking care not to catch the block on the formers and possibly break a glued joint. Sight down the area being sanded to be certain you are not sanding any hollows or flattening any lines in the framework. When all exterior edges have been sanded and blended, the hull is ready for planking.

With the exception of the bottom planking which is 3/32 in. thick, all planking is 1/16-in. aircraft grade (waterproof) plywood. The wedge-shaped nontrips on the after plane are installed first (see Fig. 5). Cut the plywood roughly to shape and glue in place, using clamps, clothespins and rubber bands to hold it. Sight from the bottom edge of former 12 to the bottom edge of former 6 to determine alignment. Also check squareness of formers to engine bearers before allowing to dry.

The after-plane bottom planking is installed next. As maximum width of plywood is 12 in., the planking is applied in two pieces and the joint is centered on one of the engine bearers. Here glue blocks are added along the outer face of the bearer and Du-Bro model fillets installed along the inside face for reinforcement. Again double check alignment of hull before allowing the glue to dry. Use clamps, clothespins, rubber bands to hold the bottom planking in place. Follow by gluing the nontrips on the bow section, using the same technique as before and then with a block plane and sanding block, trim the excess material flush on the nontrips. Leave the edges square on the bottom planking.

You are now ready to glue on the side planking which is a critical part of the hull construction. Using a 48-in. length of 1/16-in. plywood, cut it roughly to size. Make certain the aft-plane bottom is flat, either by clamping the hull to the saw table as before or by sight aligning. Make register marks on the frame and the side planking and clamp the latter temporarily in position. The planking is glued in place in stages, first the rear half, then the front. This is done by removing the clamps from the aft portion first, applying glue to contacting surfaces of the hull framework and reclamping. With this done, proceed to release the clamps holding the forward portion of the planking and repeat. Plank the opposite side of the hull in the same manner, making certain no twist develops in the hull while clamping. Use a sharp block plane and sandpaper to trim the side planking fair with the sheer logs and flush with the nontrips.

plank bow bottom next

This brings you to the bow bottom planking. This is applied in two pieces also, centering the joint in this on the longitudinal bow member. Fit, glue and clamp one half. Check alignment and let dry. Then add the other half. Trim off the excess, leaving the edges of the planking square, port and starboard, and overhanging at the step about 1/4-in. A 1/4-in.-model fillet is glued along the underside of the overhang. Finally, glue the transom braces in place at the stern and add 3/16-in-sq. strips of pine, spruce or hard balsa along the inside of the engine bearers, see Fig. 4, to serve as ledge strips to support the removable cowling, or engine cover.

The machine screws which are used to fasten the engine-mounting casting to the engine bearers are turned into anchor plates attached to the outside of the bearers. The plates, which are cemented in place with epoxy, are detailed in Fig. 8 and are made to suit the hole spacings in the casting. Next, spot the location of the slot for the stuffing box which is on a centerline roughly 14 in. from the transom, and cut the opening. Then mount the engine in the hull, bolting it to the mount with four 8-32 screws, and install the strut bracket and strut at the stern. Now, to determine the proper angle of the strut, remove the prop shaft from it and replace with the driveshaft, passing it through both bearings and letting the end project toward the front of the boat. When at the proper angle, the end of the drive shaft should be about 1 3/4 in. below the step. If it isn't, shim the strut bracket as necessary. Now remove the driveshaft from the strut and reassemble.

Remove the strut and slip the driveshaft through the stuffing box. Place the upper universal ball joint in the engine coupling and insert the driveshaft. Remount the strut on the bracket and adjust the driveshaft so it has about 1/64 in. end play between the upper and lower universal joints. Tighten the setscrew on the shaft just enough to mark it. Then loosen the screw and remove the strut and driveshaft. File a 1/32 in. flat 3/16 in. long on the shaft at the mark and reassemble and tighten the setscrew. Bed the stuffing box in place with epoxy cement to assure a watertight seal. The sheet-metal stabilizing fin, Fig. 7, is located 3 1/2 in. aft of the step and is attached with two short machine screws passing through holes in the bottom planking. At this point, give the inside of the hull a light, single coat of Evercoat marine plastic.

decking completes hull

Now to plank the deck. This is done with four separate pieces of 1/16-in. plywood. Two of these are long strips which are applied flush with the inside of the engine bearers and run the full length of the hull. Cut them oversize and glue in place, using rubber bands or brads to hold them. The remaining area at the center of the bow is filled in with two separate pieces, fitted carefully and with the joint centered on the bow piece. Thickness of the engine bearers here is increased by addition of glue blocks to the inside to support the fill-in planking. When completed, carefully trim excess flush with the side planking.

Now to build the cowling, or removable engine-and-controls cover. This fits down inside the engine bearers and rests on the ledge strips provided. The pattern for the outside stringers is given in the profile view of the cowling, Fig. 2. The stringers are cut from 1/8-in. plywood and notched at the points shown for nine formers. Patterns for the latter are given in Fig. 3 which must be enlarged full-size for cutting from 1/8-in. plywood. Note that these are notched to fit the stringer notches and also notched for four 1/4-in.-sq. longitudinal stringers. As you will see in studying the cutaway view in Fig. 4, the lower stringers run full length, while the upper ones stop at former 6. Glue the assembly together right in the hull, being careful that the parts don't adhere to the hull. Then apply the deck planking first, Fig. 6, followed by the side planking. Openings in the latter for the manifold exhaust ports are made afterwards and covered with sheet-metal plates. The latter are held by tabs which pass through slots in the planking and are clinched on the back. Fillets are added where the deck and side planking meet, port and starboard. Finally, fit and glue the cap piece; trim flush when dry and round the edges.

add the air scoop

One thing still to be added on the port side of the cowling is the carburetor air scoop. This covers an opening in the cowling, and Fig. 11 shows how it is fashioned from a plastic sugar scoop. Cement it in place with epoxy and use fillets to blend in with the rest. When dry, carefully cut an opening in the plywood behind it, leaving formers 6 and 6A intact. Finally, coat the inside of the cowling with a thin coat of marine plastic. This completes the hull. The original was sprayed with several coats of lacquer over a primer. A two-tone color scheme of white and red was used. Fig. 9 details a display stand for your model, and Fig. 12 shows how to make a cradle for the fuel tank. Note the ¼-in. slot which fits over the center bow piece.

Install the servo mounting board as shown, Fig. 13, making sure the tiller pin is engaged in the servo arm. Connect the throttle control wire to the carburetor throttle arm.

The engine can now be tested. Mix white gas and outboard-motor oil in the ratio of 1 gallon to ¾ pint. Fill tank ¾ full, making sure the gasoline line is connected to the carburetor. Open the needle valve ½ turn and hold a finger over the carburetor-throat opening. Pull engine over slowly; carburetor should be ½ open now.

When the engine starts, control the speed with the throttle. If the engine appears to run rich, close the needle valve to the proper setting. Close the throttle until the engine just ticks over, not slow enough that the starter pawls begin to drop in the ratchet. Note the throttle opening at this point. Open up the throttle full for a second to clear it out and then close it to the same opening as before. If it continues to run, stop the engine and connect the throttle control cable from the servo to the low-speed setting, giving the previously determined throttle opening.

install the propeller

Connect R/C equipment to servos and install the propeller, making certain the prop is locked on the shaft.

Start the engine with the servo set for low speed. Lower propeller in water and open throttle part way. If the engine dies, open the needle valve slightly and restart. If the engine takes the load, open throttle to full opening. *Caution:* Be sure you have a good hold on your boat and brace yourself during this first test.

With the propeller fully submerged and with full throttle opening, adjust the needle valve to get maximum r.p.m. Allow the throttle to return to the idle position and see if the engine will turn the prop at this setting. If the engine stops, increase the throttle opening until the engine turns the prop at idle or slow-speed setting. This is the starting point for runs under R/C.

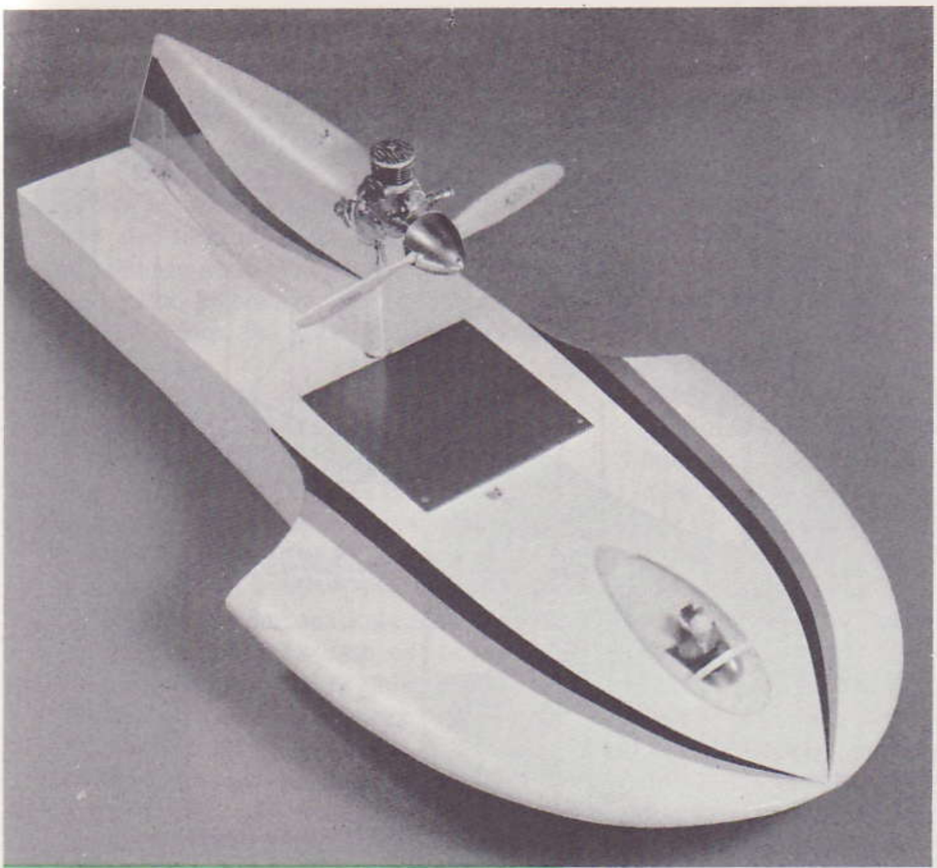
Make sure you have at least ¾ to ½ tank of fuel. Make certain the shorting wire is connected to the engine ignition system and working. Make sure the throttle control wire is connected and the tiller pin is engaged. Lastly make sure your R/C equipment is functioning as it should.

ready for first run

Start the engine and double check all functions, rudder, throttle and engine shutoff. Release the boat with the throttle at idle position. It should move along with the bow riding low on the water. Check steering at this stage. Increase throttle opening slightly and bow should rise slightly. Again check steering, both right and left. Maneuver the boat so there is several hundred feet of water ahead of it. Open the throttle gradually with the rudder in neutral or straight ahead position. The bow should rise up now and the boat should start planing. Leave the throttle setting and with boat planing, make a turn to the right or left, making sure enough space exists between the boat and the shore for such a turn. If space is not enough, either cut the throttle or stop the engine. If the turn is successful, straighten out the rudder and if there is enough stretch of water available, increase throttle opening. After you get the hang of running and controlling your boat, then try some full-throttle straightaway runs. If the engine appears to be running rich at full throttle, bring the boat in and lean out the carburetor setting slightly. Check the idle position before releasing for another run.

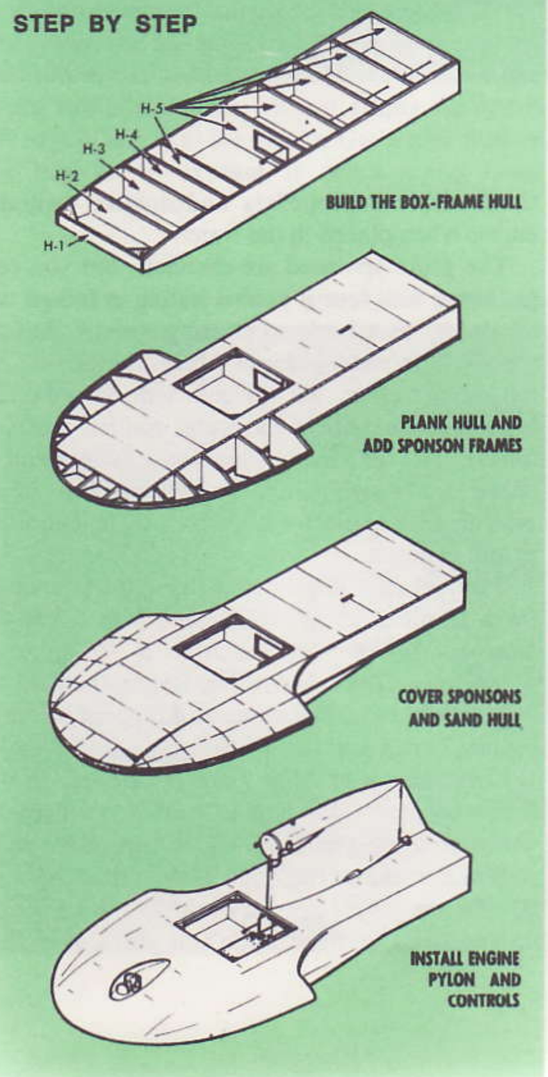
You will find in some cases, such as in dead-calm water, that in opening the throttle full with the boat down in the water, the prop will cavitate or tear a hole in the water. Slow down the engine until the rooster tail drops down and the bow starts to come up. Open the throttle gradually and the boat will climb up into a planing position. Now open the throttle full.

See also: boat model; rotor ship model; sailboat model; steamboat model; submarine model.



From prop to servos, all the gear in this sleek air-driven hydroplane comes directly from the world of the radio-controlled airplane, reducing the maintenance and control problems

STEP BY STEP



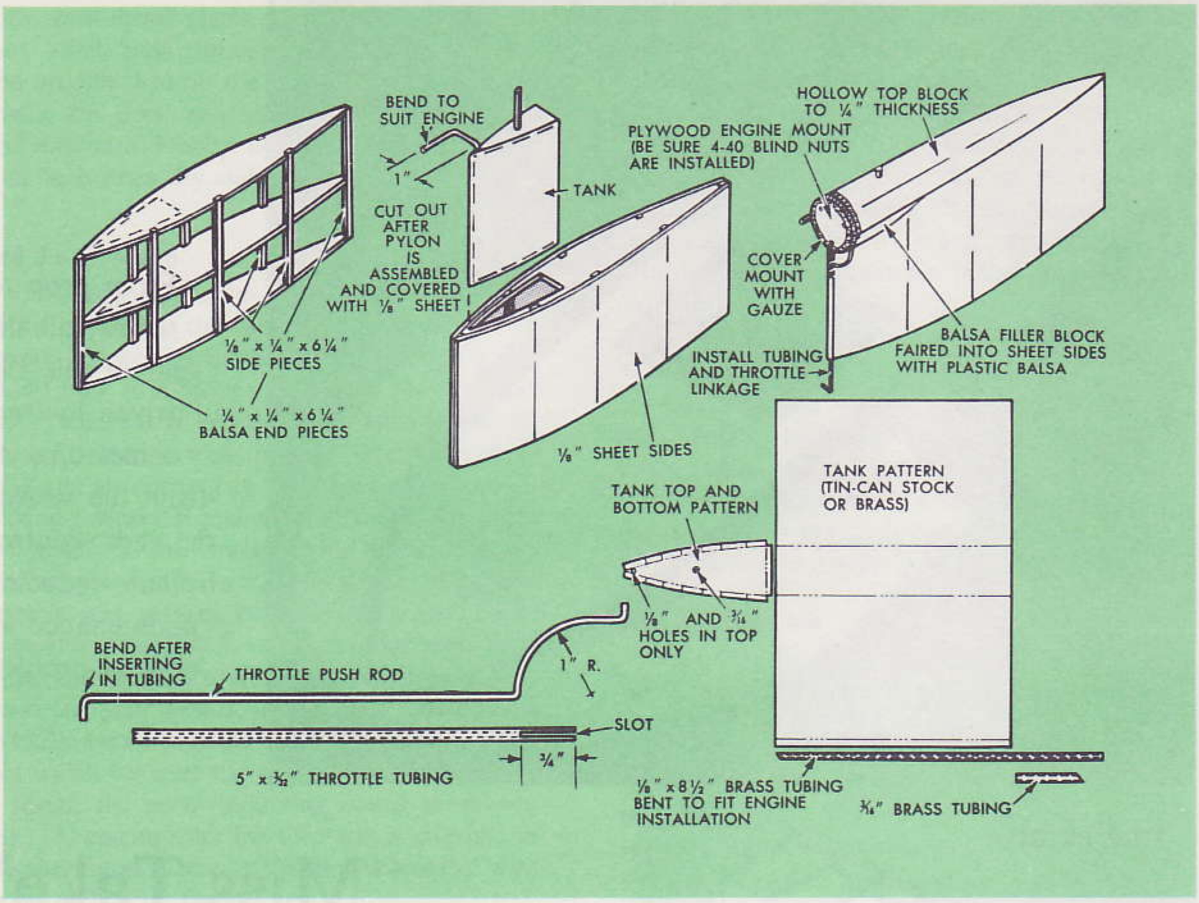
"Miss Take"— an air-driven model hydroplane

BY GERALD C. LEAKE

IT STARTED WITH a plane crash. There comes a time in every radio-control flyer's life when he has the urge to say the heck with planes and try something that won't turn into a pile of broken balsa chips at the first minor malfunction. It was at just such a time that *Miss Take* was born.

You'll find numerous advantages in an air-driven boat. It's easy to start, requires no complicated system of water cooling, uses conven-

hydrostatic pressure: see basements
hygrometer: see psychrometer
ice dams: see gutters



air-driven model hydroplane, continued

The double rudder system is shown in this view of *Miss Take*. The air rudder serves as a low-speed backup to the water rudder, is effective at high speed

tional airplane propellers and doesn't load the engine when placed in the water.

The prototype used six channels, but you can get along with four if you're willing to forego the air rudder as a back-up steering system. At low speeds, this rudder doesn't function as well as the water rudder, but it's sufficient to bring the boat back to shore if the water rudder becomes fouled. At full bore, however, it's extremely effective—enough to flip the boat if you aren't careful, so be sure to drop back to half-throttle before trying it.

The fuel tank holds better than 10 oz., enough for a 10-min. run at low throttle with a KB-45. You can use any engine from a 19 up to a 45 in *Miss Take*. Anything larger than 45 is impractical, since the chances of flipping increase rapidly at this point.

Construction of *Miss Take* is detailed on the following pages. Be sure to install the planking sheets with the grain running abeam of the hull.

When making the fuel tank, cut crosswise slits for the tubing instead of drilling holes. Bend up the sides of these slits, and you'll find that you have a much larger soldering and bonding area between the tank and tubing.

After you have completed the tank, connect a length of neoprene tubing to the fuel pickup, immerse the tank in water and blow into it through the neoprene tubing while holding your finger over the breathing tube. If you see any air bubbles, note the location and resolder that area.

Should you discover a leak after installing the tank in the pylon, just drill a small hole in the top of the pylon and pour in a little waterproof glue every day for a week. Then the tank will be completely encased in glue so it *can't* leak.

After sanding the hull, glue the pylon in place on the centerline of the hull. To be sure of locating it exactly on this line, mark the location with a pencil and measure from each side of the hull to the ends of the pylon before gluing in position. Exercise the same care when mounting the ¼-in.-sheet keel rudder on the centerline of the boat.

Make the water-rudder hinge by running a short piece of ⅛-in. wire through 5/32-in. landing-gear mounting straps. Solder a washer on each end of the wire after the straps are installed.

Only one screw is used to hold the crank for the water rudder in place. Thus, by loosening this screw and shifting the rudder you can make small trip adjustments without taking the hatch off to gain access to the servos. Use a lock washer on this screw so that it won't come loose during a rough run.

After you have assembled *Miss Take,* remove the water rudder and hinge assembly, and give the boat at least three coats of clear butyrate dope. Then sand this smooth and cover the entire hull with silk or nylon. Follow this up with 10 coats of sealer.

Once the last coat has dried, wet-sand with fine sandpaper until all the wood grain disappears and you achieve a high gloss. Finally, spray with two coats of color and apply the trim. After hand-rubbing with rubbing compound, wash the boat with warm water and spray four coats of clear dope to protect the color. A last rubbing, and the job is done.

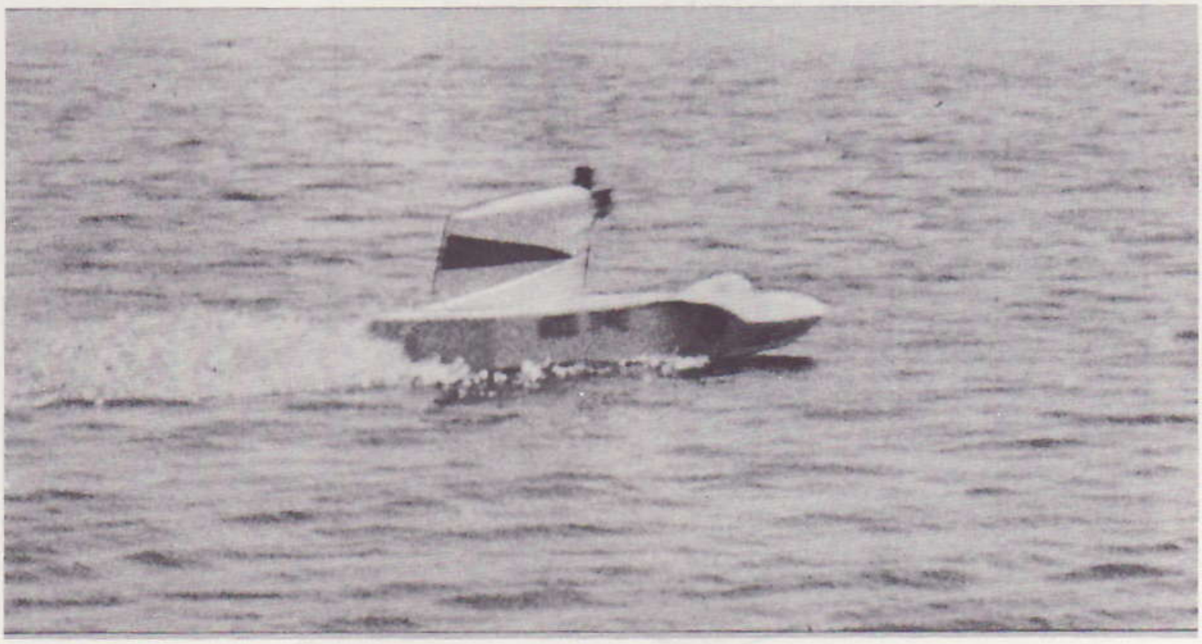
Fasten the air rudder in position with heavy nylon thread, using a figure-eight stitch. Complete the boat by installing the engine mount, engine, servos and water-rudder assembly.

It's a good idea to seal the hatch with masking tape to keep water out of the radio compartment. Pack the receiver in foam rubber and protect it with a heavy plastic bag, sealing the end where the wires come out with a rubber band. Once this is installed, pack foam rubber around all the radio gear to absorb any moisture.

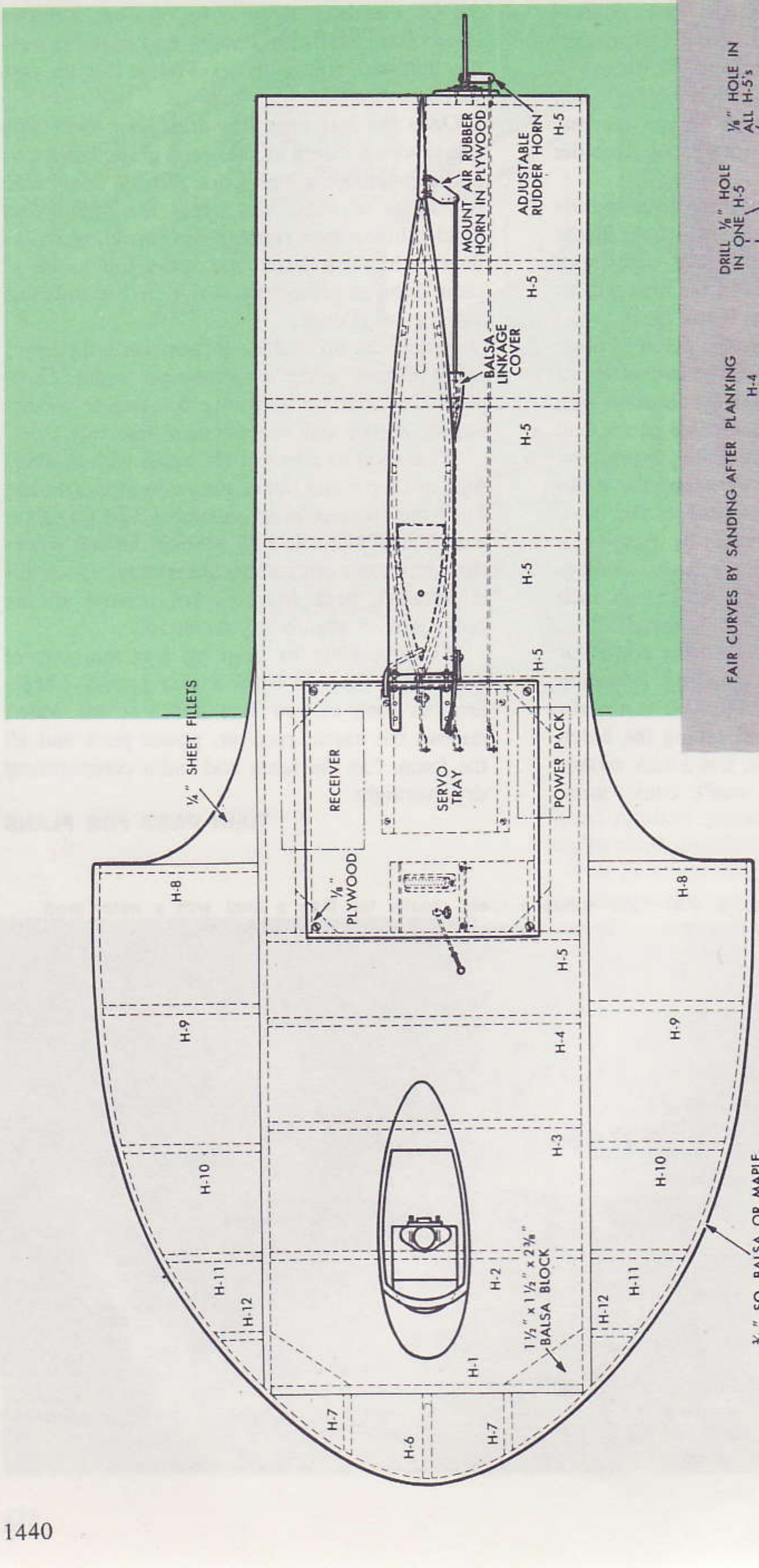
It's impossible to keep all moisture out of the boat if you run it for a long period. Therefore, as soon as you take it out of the water, remove the hatch, receiver, power pack and all the foam. Let the foam and radio compartment dry overnight.

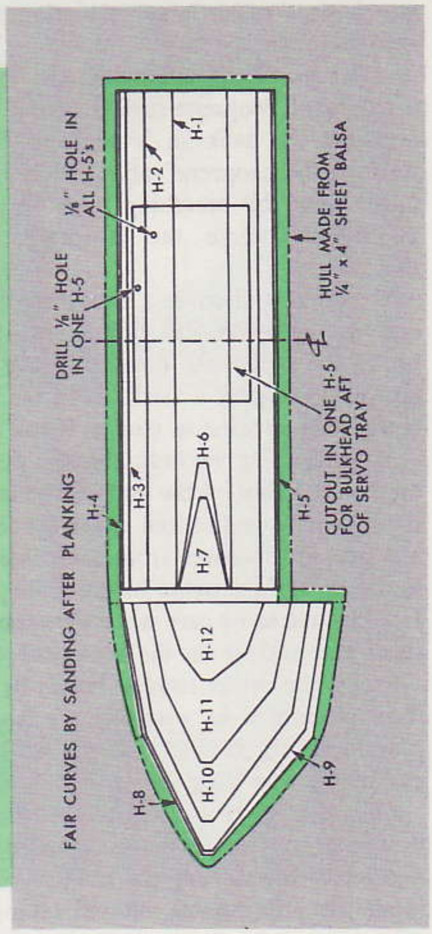
TURN PAGE FOR PLANS

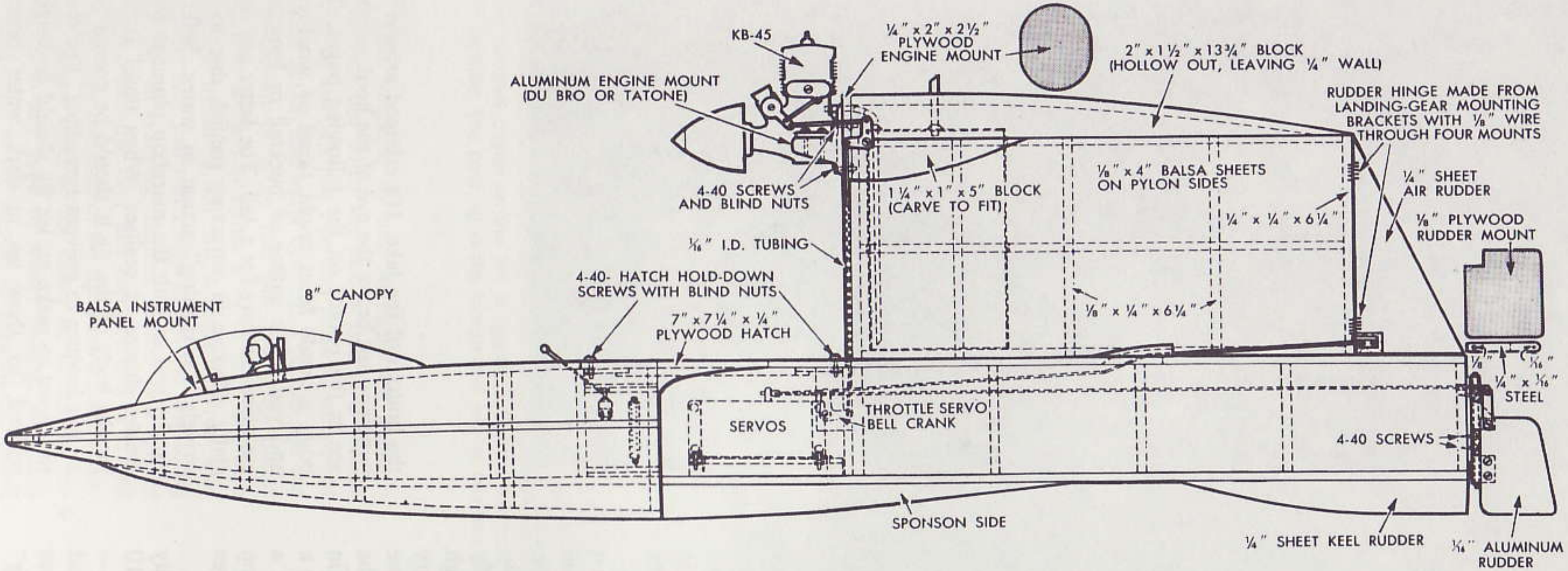
Streaking across a small pond, *Miss Take* leaves a lower rooster tail than a boat with a water prop

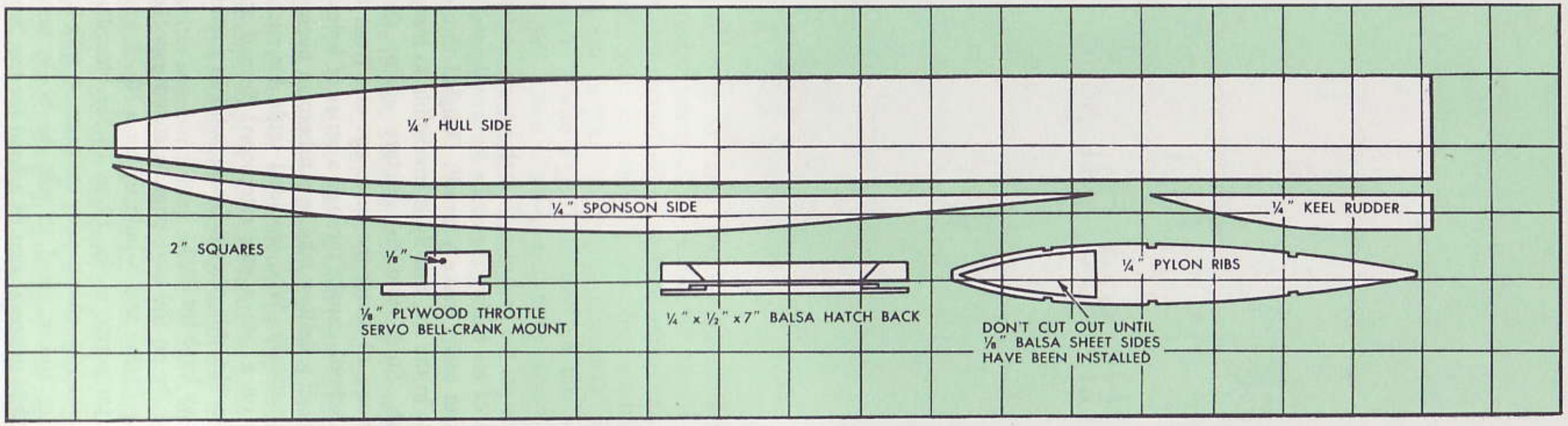


air-driven model hydroplane, continued






KB-45
¼" x 2" x 2½" PLYWOOD ENGINE MOUNT
2" x 1½" x 13¾" BLOCK (HOLLOW OUT, LEAVING ¼" WALL)
ALUMINUM ENGINE MOUNT (DU BRO OR TATONE)
RUDDER HINGE MADE FROM LANDING-GEAR MOUNTING BRACKETS WITH ⅛" WIRE THROUGH FOUR MOUNTS
⅛" x 4" BALSA SHEETS ON PYLON SIDES
4-40 SCREWS AND BLIND NUTS
1¼" x 1" x 5" BLOCK (CARVE TO FIT)
¼" SHEET AIR RUDDER
¼" x ¼" x 6¼"
⅛" PLYWOOD RUDDER MOUNT
1/16" I.D. TUBING
4-40- HATCH HOLD-DOWN SCREWS WITH BLIND NUTS
⅛" x ¼" x 6¼"
BALSA INSTRUMENT PANEL MOUNT
8" CANOPY
7" x 7¼" x ¼" PLYWOOD HATCH
⅛"
1/16"
¼" x 1/16" STEEL
THROTTLE SERVO BELL CRANK
SERVOS
4-40 SCREWS
SPONSON SIDE
¼" SHEET KEEL RUDDER
1/16" ALUMINUM RUDDER


¼" HULL SIDE
¼" SPONSON SIDE
¼" KEEL RUDDER
2" SQUARES
⅛"
⅛" PLYWOOD THROTTLE SERVO BELL-CRANK MOUNT
¼" x ½" x 7" BALSA HATCH BACK
¼" PYLON RIBS
DON'T CUT OUT UNTIL ⅛" BALSA SHEET SIDES HAVE BEEN INSTALLED

Jet performance with this delta-wing model

By ROY CLOUGH, JR.

There's nothing mild about the action you'll get from this balsa wood speedster

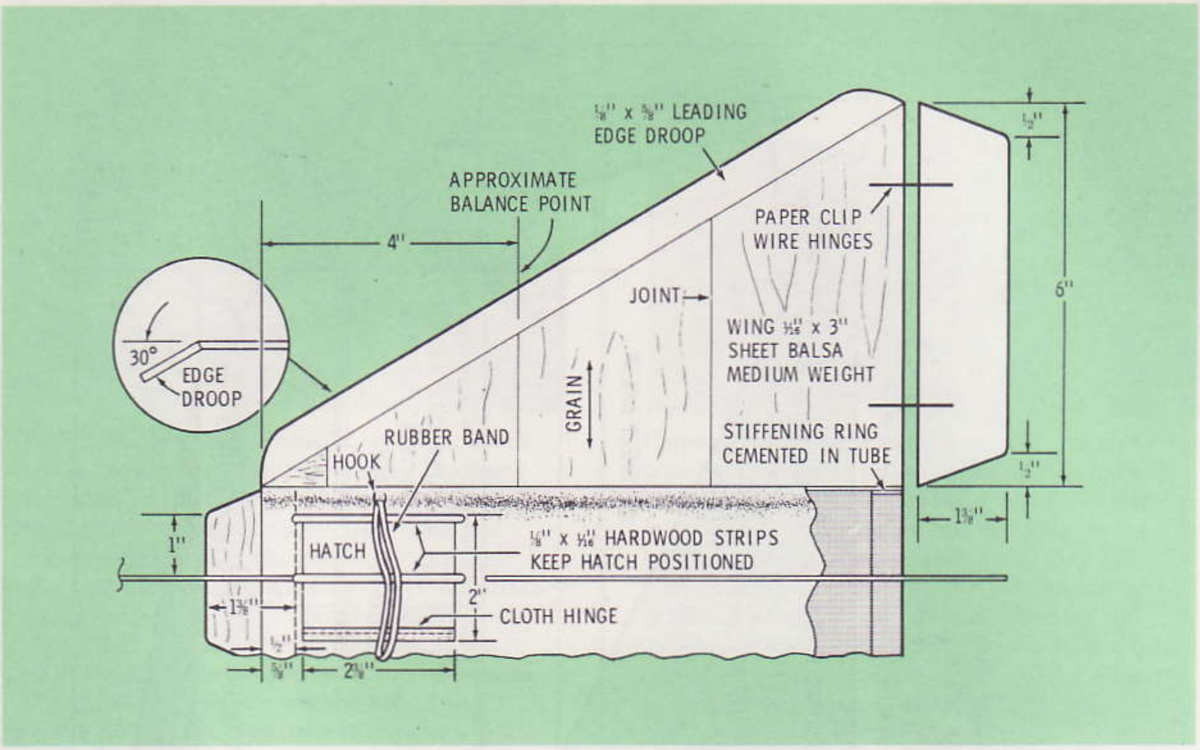
LAUNCH THE DELTA ROCKET from your hands and it glides straight out for a short distance. Then the nose tilts up and, gathering speed, the plane shoots skyward, trailing a cloud of blue smoke like a jet with the afterburner cooking. When provided with a 15-second fuel supply, the pilot model soared about 1500 ft. at an altitude of approximately 30 ft., then gently glided to earth.

The sharply swept-back delta wing, needle nose and rakish fin suggest its speed and power. The performance is equal to the promise. Construction is not difficult and the simple jet propulsion system is practically foolproof. Any one of a number of different size jet motors can be used. You might even try a multi-motor array; there's plenty of room.

The original model flew well on a veteran Jetex 100 motor. Larger motors will provide even more spectacular performance. The model can be flown on a pair of 50's.

Although many model jet planes using this type of propulsion give a mild glider-type performance, this model behaves like a real plane and moves along at scale speeds—with scale sound effects, as well!

The duct-mounted model rocket motor operates on the aspirator principle to gulp in large



TURN PAGE FOR PLANS

quantities of air for mixture with the hot exhaust gases, thus increasing the effective reaction mass of the ship. This arrangement can increase the thrust of the basic unit by up to a fourth.

Begin construction by finding a mailing tube about 1 ft. long and 2¾ in. in diameter. The diameter is not critical; a variation of ¼ in. or so won't affect performance. Wrap a turn of wax paper around the tube and build up the fuselage out of 3/32 x 3/8-in. strips edge-cemented around the tube. When the cement has dried, sand the strips down to curvature, then slide the shell off the mailing-tube building form, cut out the hatch and hinge it as shown. The wings are built with a specially-drooped leading edge to provide better lift, greater stability and strength. A strip of 1/16-in. balsa is cemented down the sides of the fuselage to serve as a guide in positioning the wings. The fin is cemented directly to the top of the fuselage tube. The nose section is a silhouette connected to the underside skid by a strip of ¼-in.-sq. hardwood. It's important that the fins, wings and other projections be in accurate alignment. The model should be blocked up during assembly and plenty of time allowed for cements to dry.

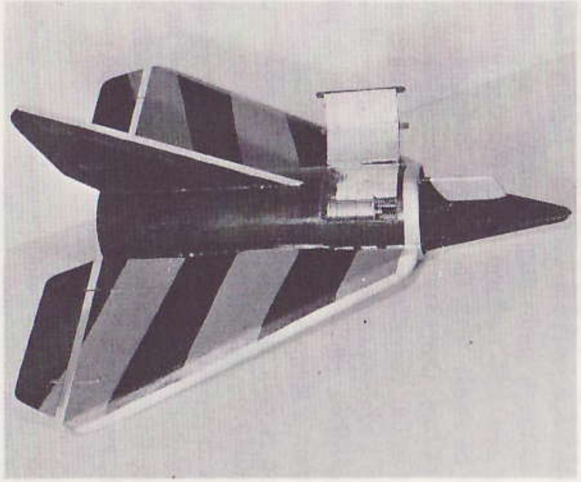
The inside of the fuselage tube is lined with household aluminum foil stuck in place with sodium-silicate solution (water glass). This fireproofs the model, though there is actually little danger from these motors.

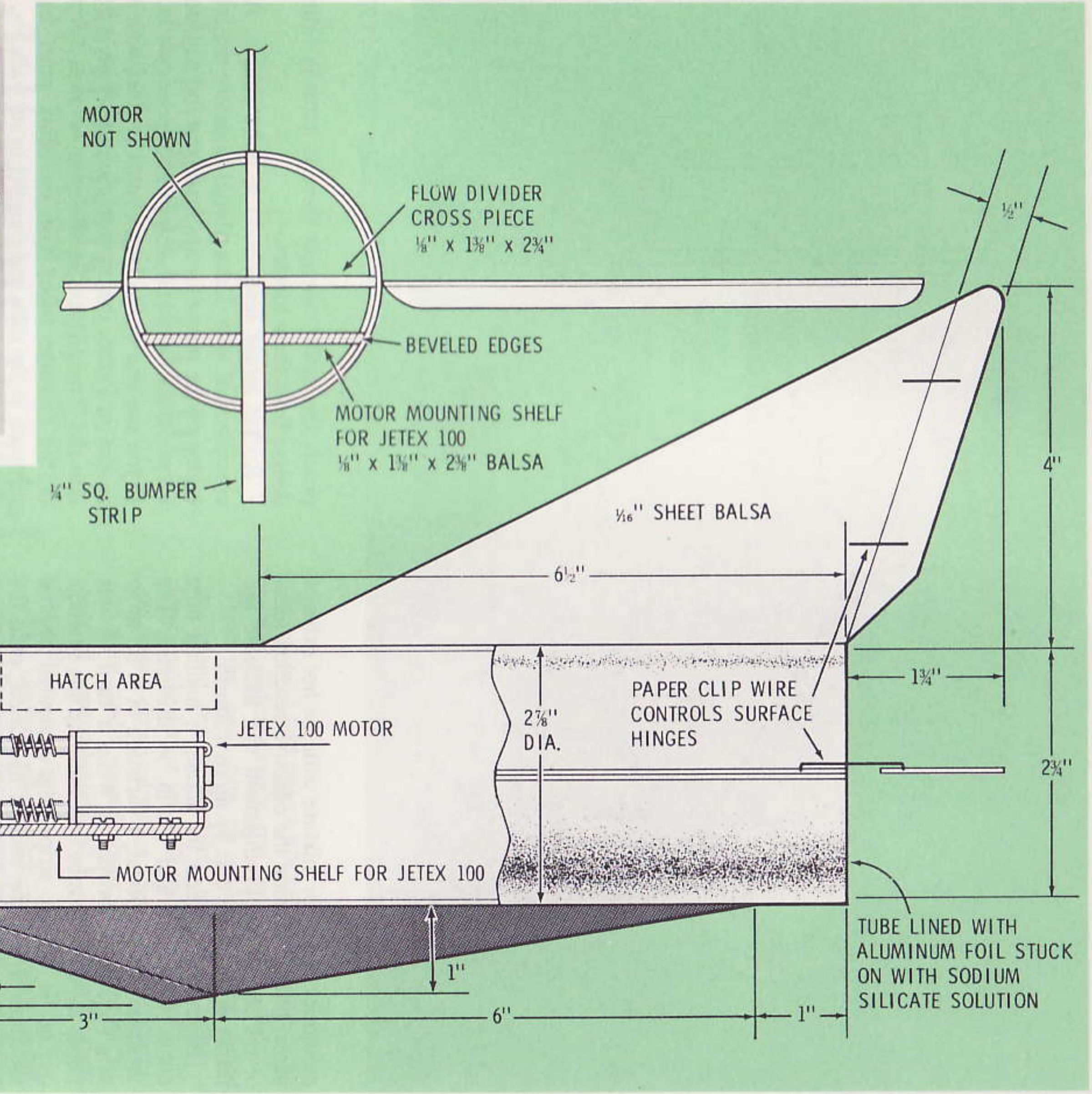
Rocket motor installation is quite simple. A crosspiece of 1/8-in. balsa placed to center the jet orifice of the motor in the fuselage tube will do very well for Jetex 100, 150 or 200 series motors. If you use one of the larger Jetex engines which mount on a stud, the mounting stud may be built into the flow dividers in the nose or intake end of the fuselage tube. The jet efflux must be centered in the tube and parallel to its walls.

The balance point shown on the plan is about right, although individual models may vary slightly and still perform well. Practice glides should be made with the engine installed, but empty of fuel. Don't try to get a maximum-float sort of glide, because you want the model to climb at a shallow angle at a high rate of speed—a much more efficient configuration for a jet plane than a steep angle at low speed.

There is only one precaution to be observed when flying the model under power: Be sure to hang onto it until the rocket motor has built up to full thrust. This may take as long as five seconds after igniting the wick. Then launch with a smooth, even thrust. The model will do the rest.

See also: air-car model; airplane model; glider model; gyroplane model; stick-model planes.




MOTOR NOT SHOWN
FLOW DIVIDER CROSS PIECE
⅛" x 1⅜" x 2¾"
BEVELED EDGES
MOTOR MOUNTING SHELF FOR JETEX 100
⅛" x 1⅜" x 2⅜" BALSA
¼" SQ. BUMPER STRIP
½"
1⁄16" SHEET BALSA
4"
CANOPY DETAIL PAINTED ON
½"
2¾"
6½"
⅛" MED. BALSA
¾"
HATCH AREA
JETEX 100 MOTOR
2⅞" DIA.
PAPER CLIP WIRE CONTROLS SURFACE HINGES
1¾"
2¾"
℄
3¾"
MOTOR MOUNTING SHELF FOR JETEX 100
¼" SQ. HARD BALSA BUMPER STRIP
½"
1"
TUBE LINED WITH ALUMINUM FOIL STUCK ON WITH SODIUM SILICATE SOLUTION
4½"
3"
6"
1"