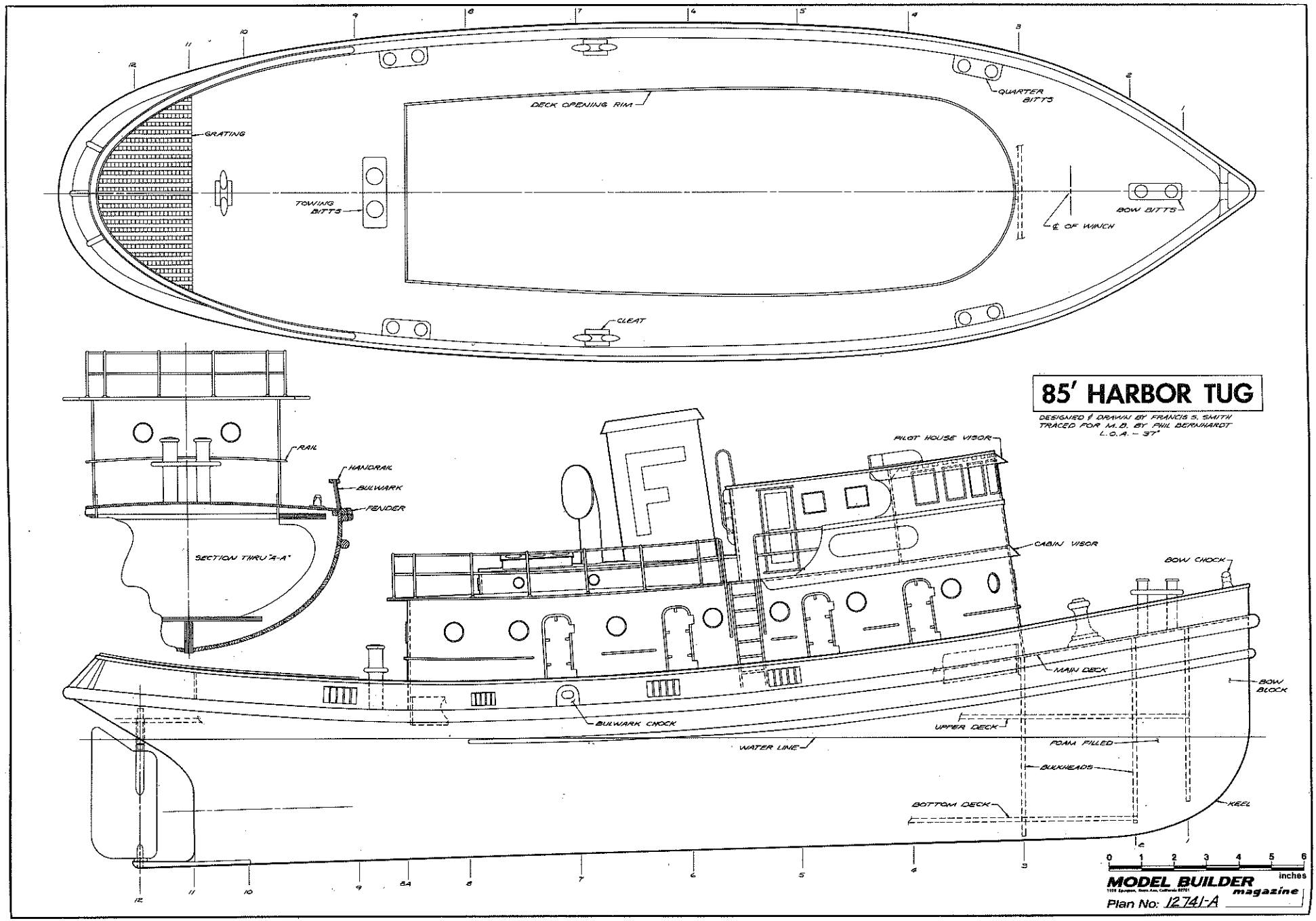
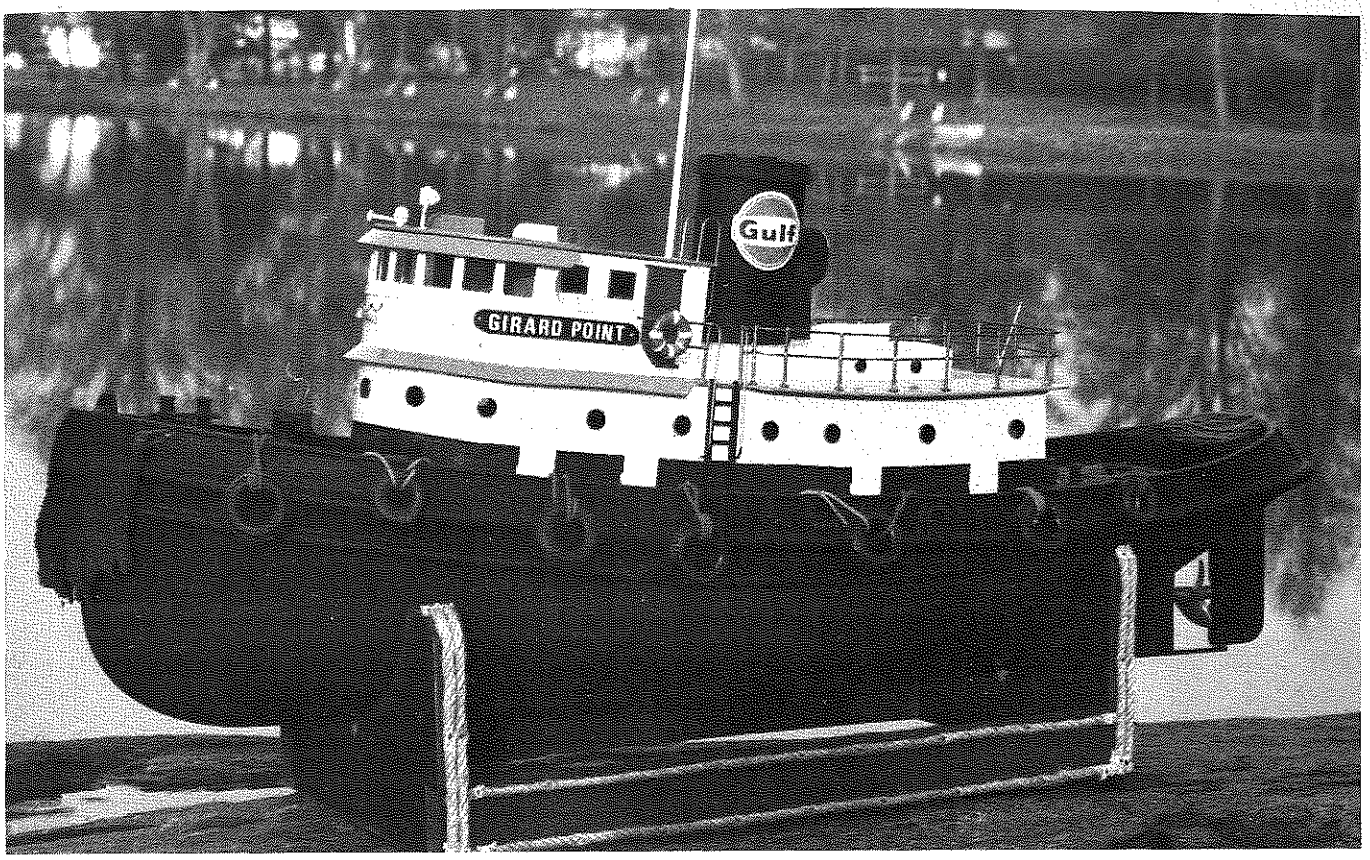


FULL SIZE PLANS AVAILABLE — SEE PAGE 80

PHOTOS BY AUTHOR



PHOTOS BY AUTHOR

85 FT. HARBOR TUG (PART ONE)

By FRANCIS SMITH

First of a two-part article for the construction of a classic boat style. Built entirely of wood, it's an excellent workbench project. Unusual method simplifies planking. Superstructure and details next month.

● I've been a modeler since boyhood and my interests have been many. In recent years my pleasure has been to build electric and glow engine powered boats.

The 85 foot Harbor Tug appealed to me and the desire was to make it so others could duplicate it. This tug was originally designed by the Army for World War II and later sold to private concerns for use in harbors and rivers throughout the country.

I decided to make the model 3 feet long to allow enough room for any operating features I would want to install, and yet not make it cumbersome and difficult to transport.

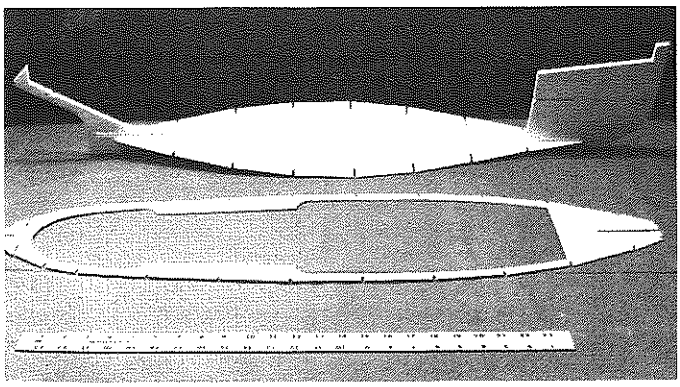
Wood was chosen as the construction material, because to me it is easy to work with, and is clean and familiar to most modelers.

Before construction began, I purchased a set of line drawings, and developed a complete set of plans, including assembly details and templates. The templates were attached to the appropriate pieces of wood with rubber cement and the pieces were cut out on a jig saw. This resulted in what was basically a tug boat kit (very few available today).

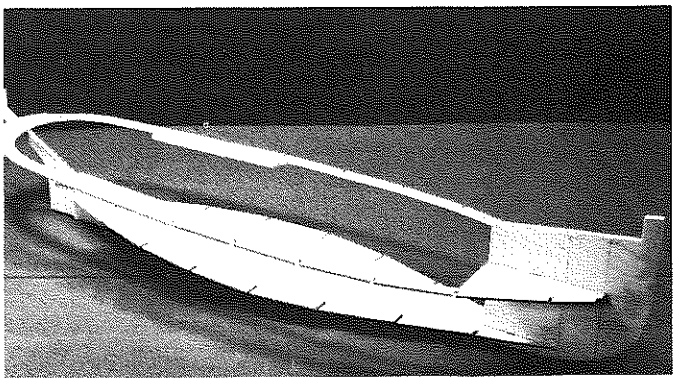
After cutting out the hull parts (keel, main deck, upper deck, bottom deck, bulkheads and bulwarks), I dry-fitted all the pieces to be sure all was well before gluing. Being satisfied, I tack cemented the entire hull, with the exception of the main deck, with 5-minute epoxy and then completed the gluing with regular epoxy.

I then attached the hull to a planking jig (see sketch) with small brads and planked the hull as far as the jig would permit with 1/8 x 3/8 x 36 balsa strips, gluing *only to the bulkheads* with 5-minute epoxy.

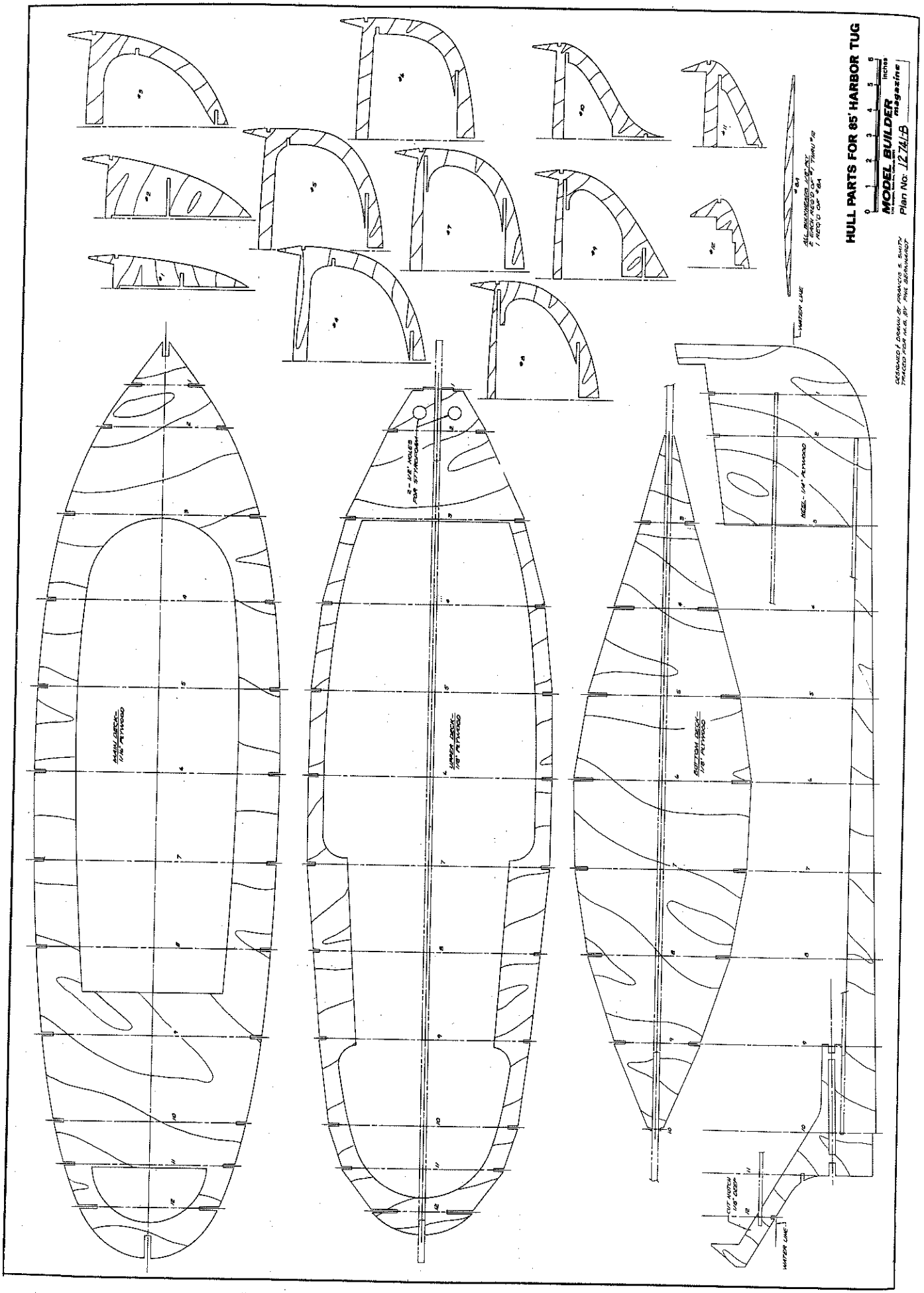
After removal from the jig, the planking was continued to the top of the



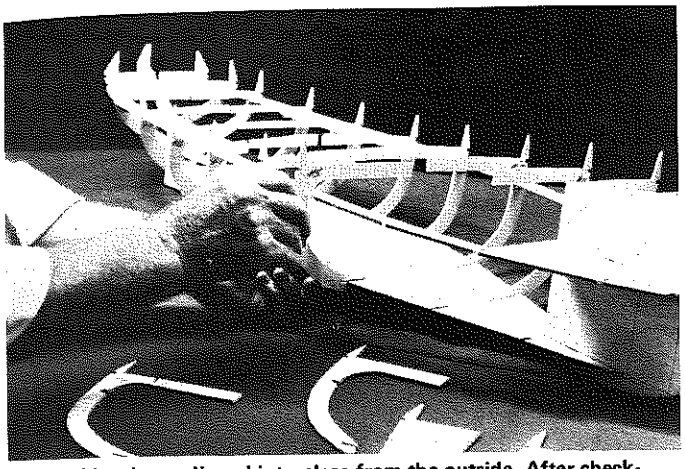
Keel with lower deck in place, and upper deck ready to slip into notches. No gluing until dry fitted.



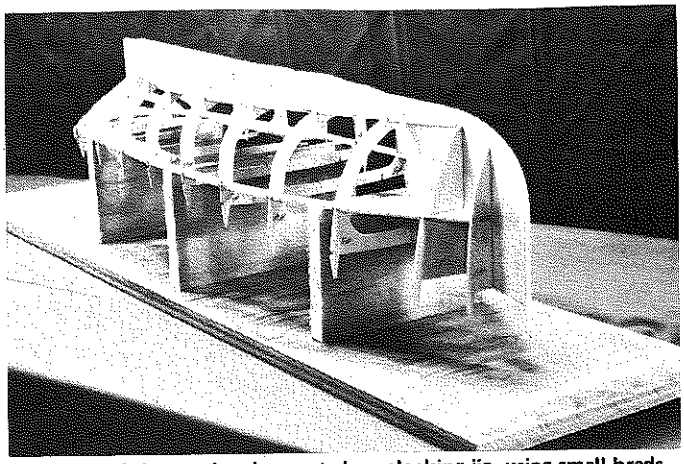
Extra-long notches at bow permit slipping upper deck in place without spring parts. Half-bulkheads can now be added.



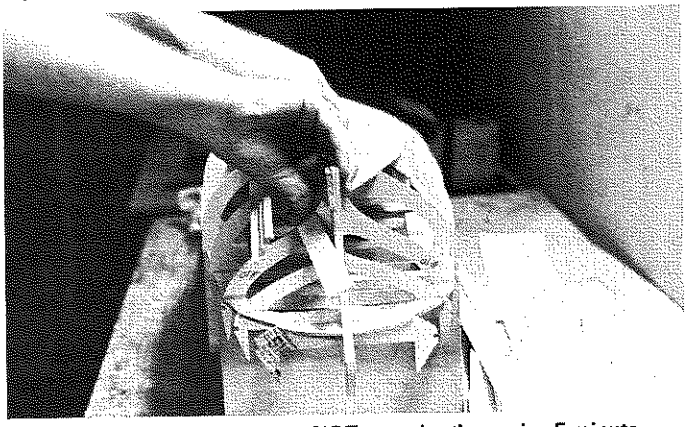
FULL SIZE PLANS AVAILABLE — SEE PAGE 80



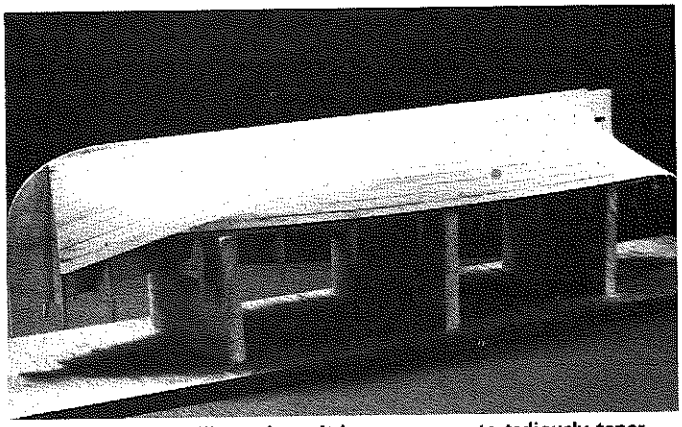
Half-bulkheads are slipped into place from the outside. After checking alignment, everything is tack-glued.



Framing is inverted and mounted on planking jig, using small brads. This prevents distortion of frame during planking operation.



Planks are glued to frames only, NOT to each other, using 5-minute epoxy.



Since planking will not show, it is unnecessary to tediously taper each plank before gluing in place.

sheer strip, which is 1/8 x 1/8 x 36 spruce. I then glued on the bow blocks and stern blocks and sanded to shape while sanding the hull lightly.

The complete exterior of the hull was covered with 1 inch strips of masking tape, after which I coated the entire interior of the hull with Hobbypoxy Formula II epoxy, giving it a generous filling and working in the medium with a stiff brush.

When this interior coat of epoxy cured, I removed the masking tape and sanded the hull to its final shape. The hull was then completely coated with Sig's Epoxolite (exterior only), which filled the dents, cracks, seams and grain, and then it was sanded smooth.

I poured in some Sig two-part expanding foam between bulkheads 1 and 2 and then attached the deck in place.

Next I put on the bulwark sections, fenders, spray rail and handrail. I then laid out the freeing ports and cut them out with a coping saw. The bars were made from 1/16 inch dowels.

After cementing the cabin rims to the main deck, the hull was set aside and construction started on the Main Cabin.

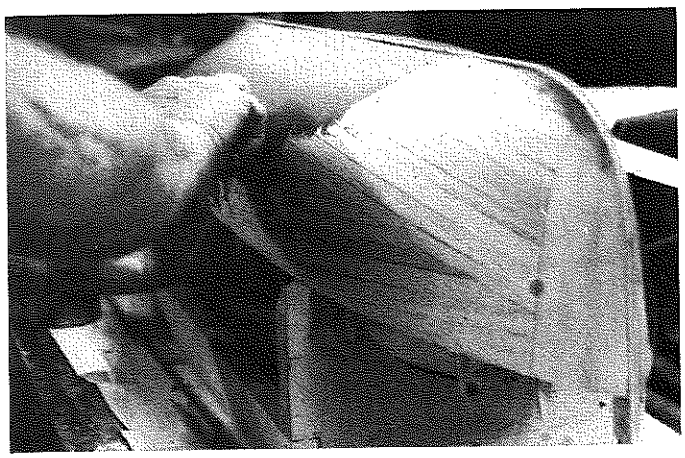
STEP-BY-STEP CONSTRUCTION

1. Make Keel from 1/4 inch plywood. Be sure to notch Bow to identify water line and cut slot for Stuffing Box Tube.

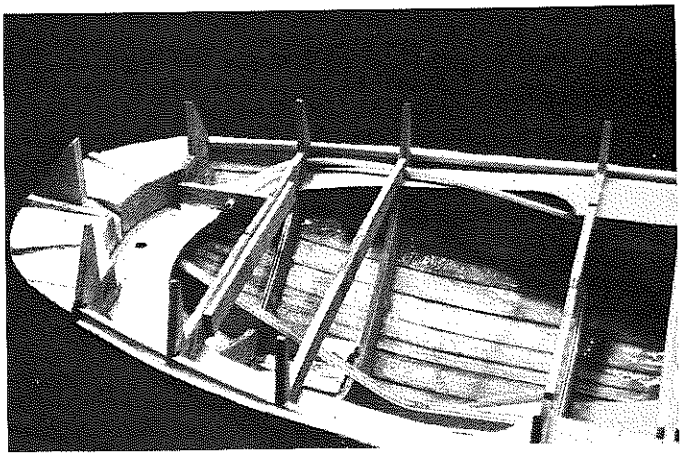
2. The Bottom Deck is made from 1/8 inch plywood. Draw a center line on top of the Bottom Deck and two parallel lines on the bottom of the Bottom Deck in line with the edges of end slots.

3. Assemble Bottom Deck to Keel by inserting Bow End into Keel all the way. This will allow the Stern section to engage in the rear slot. Slide the Bottom Deck fully rearward. Nail with 1/4 or 3/8 brads, using the lines drawn in step 2 as guides.

4. Cut Upper Deck from 1/8 inch plywood and install in Keel in the same manner as the Bottom Deck. Epoxy in



After saturating interior of planking with epoxy, the exterior is rough sanded and then a coat of Sig Epoxilite is added.



Flex-cable lead to rudder tiller is added before main deck is installed. Bulwark will be epoxied to extension of bulkheads.

Completed tug is large, but not so much that it becomes awkward to handle. Great model to have around for scale-like retrieval of becalmed sailboats and stalled or out-of-gas power boats.

place.

5. All Bulkheads are made of 1/8 plywood. After test fitting, tack in place with 5-minute epoxy. Join Bulkheads Nos. 4 through 11 with 1/8 x 1/4 x 2 inch long balsa at the center of the Bulkheads for reinforcement, if desired. *Do not assemble Bulkhead No. 8A at this time.* When all Bulkheads are cemented in place, use regular epoxy to reinforce all joints.

6. Make a Planking Jig as shown in sketch. Jig will keep Hull from twisting while being planked. Nail Hull to jig, using short brads.

7. Plank Hull with 1/8 inch thick x 36 inch balsa, using assorted widths of 3/16, 1/4 and 3/8 inches. Approximately 540 square inches of planking will be required, or 15 x 36. It is only necessary to glue the planking to the Bulkheads instead of gluing along the entire length of each strip. Bulkheads No. 1 and No. 2 at the bottom will require slight beveling to remove sharp corner, as will Nos. 11 and 12. Plank Hull as far as possible while on jig, then remove Hull from jig.

8. Install 1/8 x 1/8 x 36 spruce shear strip in slots near top of Hull and complete planking to this strip. *Light* sandings of Hull can be done at this time.

9. Epoxy a piece of 1/8 x 3/4 x 2 plywood on each side of the Stuffing Box slot inside the Hull. File three or four slots on the end of a 1/4" O.D. brass tube to make a cutting tool. Put the brass tube in an electric drill and drill out the wood plugs to complete the slot for the drive shaft.

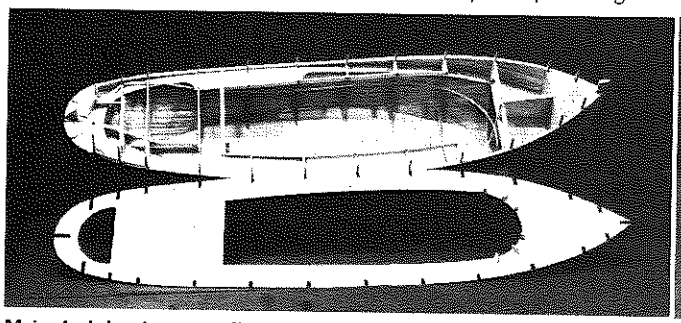
10. Cover the outside of the Hull with masking tape to prevent seepage and coat inside of Hull with Formula II epoxy, using a stiff brush to work the medium well into the wood and seams.

11. Remove masking tape from exterior of Hull. Trim planking flush with Bulkhead No. 1 and glue the Bow Blocks (made from 2 x 2 x 6 balsa) in place. Trim away interfering planking at Bulkhead No. 12 and insert Stern Blocks in place after cutting to shape from 5/8 inch thick balsa. (Laminate to make 5/8 inch by gluing five 1/8 inch thick layers of 2 inch wide balsa together.) From 1/8 scrap planking, make 4 shims 1¼ inches long, to taper 3/32 at the large end, and glue to Stern Block.

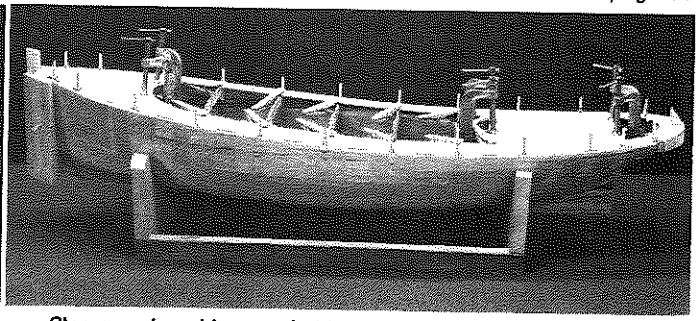
12. At this time, fill between Bulkheads 1 and 2 with two-part expanding foam, if desired, for flotation.

13. Cut Main Deck from 1/16 plywood, test fit to Hull and trim slots where necessary. Attach 6 pieces of 1/8 x 3/8 scrap planking to the underside of the Main Deck at the curve of the Cabin opening, flush with the edge. These are back-up blocks for attaching the Cabin Opening Rim. Coat the entire

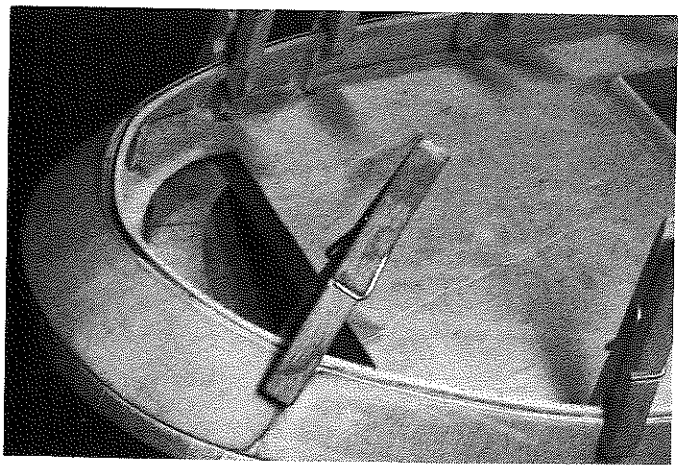
Continued on page 61



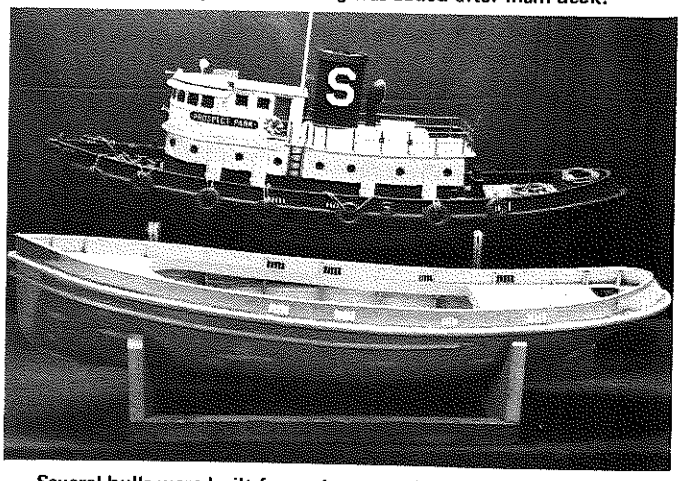
Main deck has been pre-fitted and now ready to epoxy in place. Note braces for Cabin Opening Rim on underside of main deck.



Clamps and masking tape hold main deck in place while epoxy cures. On this model, Epoxilite coating was added after main deck.



Bulwark has been added, now a strip of balsa or spruce is clamped in place to build up top for railing.



Several hulls were built from plans, assuring accuracy of parts fit. Fender strips have been added to outside of hull.

used the lines in competition and those who have not. Accurate calculations have been made on speeds and safety factors and some wire sizes were found to be too small at projected possible speeds. One noticeable, favorable comment from several "ex-speed flyers" was that they would fly speed again if line ties were allowed, because they would be very competitive against Monoline equipment. Wouldn't it be nice to see long entry lines at speed contests again?

More controlled test flying must be done before all the answers are found. So get tied up and go flying. ●

Remotely . . . *Continued from page 19*

"I believe I've finally made a decision which a lot of other R/C glider designers have also made for one reason or another. I've flown two identical (as identical as two can be) gliders for over a year now; one equipped with coupled-aileron-rudder, and the other a polyhedraled arrangement. I enjoy making gadgets, so the aileron installation and linkages did not affect my decision one way or another. Both planes have been flown in contests and under varying sets of conditions to evaluate their relative performance. Both planes, Dreamer II with the ailerons, and Dreamer I with polyhedral, are high performance aircraft that require more hands-on flying than hands-off flying. The real difference between the two is in roll response and stability . . . the polyhedral wing winning by only a small margin. But the margin is enough for me to go to the polyhedral wing for Dreamer III which is now on the boards. Also, the Dreamer III will have a three piece wing (continuous center section) which lends itself to the polyhedral approach very well."

There's nothing like experience to make believers out of us. ●

Tugboat . . . . *Continued from page 12*

underside of the Main Deck with Pettit Epoxy Formula II and install to Hull using tape, clamps, and weights to insure contact with the tops of Bulkheads. Insert Bulkhead No. 8A flush with rear of Cabin opening.

14. Cut away the exposed Bulkheads Nos. 4, 5, 6, 7 and 8 flush with the Cabin opening. Glue back-up strips made from scrap 1/8 x 3/8 planking between these bulkheads for attaching the Cabin Opening Rim. Then cut Cabin Opening Rim from 1/16 plywood and install, keeping top edge approximately 3/8 inch above top of Main Deck.

15. Coat the entire outside of Hull with Epoxolite, and sand smooth.

16. Draw the water line, using the

notch cut in the Keel at the Bow and the intersection of Bulkhead 12. (Drill a 1/16 inch diameter pilot hole down through the center of Bulkhead 12 to locate water line at the Stern. This will serve as the center line for the Rudder Post as well.)

17. Cut four Bulwark strips from 1/16 plywood. Attach one piece to each side of Hull, gluing to each Bulwark upright and using top of Main Deck for the bottom edge. When this has set, install the second Bulwark strip to the first. An optional way of applying the outer Bulwark strip is to use three pieces, one piece about 8 inches long to cover the Stern section, and two pieces to complete the sides.

18. Make the Fenders from eight strips of 3/16 x 3/16 x 36 balsa or spruce, using four strips to each side of the Hull. Glue one strip on at a time until a 3/8 x 3/8 square has been made. Use a piece of 3/8 x 3/8 x 12 balsa or spruce for the Stern portion of the Fender. Cut serrations about 3/16 apart and down to within 1/32 of the bottom, then glue in place. Fill serrations with Epoxolite or wood filler. Sand corners round to complete Fender.

19. Glue a 1/4 x 1/4 x 26 piece of balsa or spruce to each side of the Hull, 5/8 below and parallel to the Fender from the Bow to Bulkhead No. 6, continue with a smooth curve to end 1/16 below the water line at Bulkhead No. 8. Cut or sand a taper off the bottom from 3/32 inch at Bulkhead 8 parallel to the water line to Bulkhead 7. Sand all corners round.

20. Glue a 3/32 x 3/32 x 36 length of balsa or spruce to the upper outside edge of the Bulwark flush with the top. Cut with a sharp knife all Bulwark uprights to 3/32 below top of Bulwark and glue another 3/32 x 3/32 x 36 length of balsa or spruce to the inner side of the Bulwark flush with the top. This will give a 5/16 inch wide handrail 3/32 inch deep.

. . . Continued next month . . . ●

R/C Soaring . . *Continued from page 23*

But, you say, this doesn't work with model gliders because they're hollow. If a model is *true to scale*, each part, be it a wing spar or fuselage skin, must be scaled down in porportion. And each of these parts is a solid . . . though, granted, the structure is hollow. Let's check this out with the Standard Austria glider. Using the formula, the 1/5 scale model would weigh about 85 ounces and the 1/8 scale, 21 ounces . . . Sounds reasonable.

Now, let's throw the mess together and see what we come up with for wing loading. But definition wing loading is W/A. Then:

$$\frac{W_1/A_1}{W_2/A_2} = Sf$$

Substituting real numbers, we get:

$$\frac{660/145}{5.3/5.8} = \frac{4.5}{0.9} = 5$$

Thus, as we scale up or down, if the scale is true the wing loading must vary in proportion with the scale factor. How about *THAT!*

Figure 2 is a plot of representative wing loadings for various categories of free flight competition models, common birds, man carrying sailplanes, and R/C gliders. The diagonal line, *or any line parallel to it*, represents the effect of scale on wing loading.

Spend some time with the graph. It offers some interesting thought food. Does your R/C glider really have a higher effective wing loading than Joe's or is it just that your's is larger? (Incidentally, it would seem that real birds have about 2 to 2½ times the wing loading of our models. Not "Many times" as has been often stated.)

Figure 3 is an enlargement of the R/C glider portion of Figure 2. A dozen or so models are plotted, using wing areas and loadings as reported in various magazines. The dots kind of spread out on the graph. Part of this is because each designer had a specific objective in mind when designing his model. The balance of the "spread" is due to two items in the real world of model building that distort this scale relationship between size and wing loaidng:

1. All R/C gliders have to carry radio gear which doesn't vary proportionately in weight with the size of the model. Thus, a small model would tend to have a higher scale wing loading than its larger counterpart. It has to carry the same radio.

2. Though to a lesser degree, the finishing method tends to be the same weight per square inch of surface covered regardless of the model size. This tends to make the smaller model heavier in proportion to scale.

SPEED, SINK RATE, AND GLIDE SLOPE

Back to the two models of the Standard Austria: the 1/5 scale model would have a wing loading of 14.5 oz./sq. ft.