MODEL YOUR OWN

Dream Boat

By WESTON FARMER

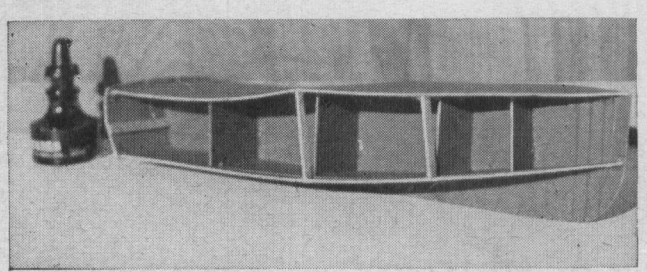
Dreaming of that boat that you hope to build some day? Then you can't afford to pass this up. It shows you how to make certain that you'll get the boat you want

BOAT-MINDED sportsmen usually have a "feel" for sweet curves and flowing lines. But they find it difficult to get these down on paper so that the boatbuilder may interpret what is wanted. Few laymen have the necessary professional skill to draw out a boat, calculate the weight, peg the proper waterline, and predetermine the performance. How, then, to get the boat you want out of dream stuff? How do you know how it will actually look and how it will perform? The method is easy.

You model it. Anyone who can handle scissors and a tube of model-airplane cement can get, with the method I show here, a miniature of his boat which will show him how his dream ship is going to look and how it is going to perform.

First, you need a few simple materials. You need photo mounting board, a few sheets of 1/32" balsa, scissors, a couple tubes of Testor's fast-drying model airplane cement, some pins, some stiff-backed razor blades, a sheet of fine sandpaper and a small can of varnish. Two dollars will buy the works. A stationery store will supply the sheet of photo mounting board and a model-airplane supply store will provide the cement or "glue," pins, balsa and razor blades. Get the cardboard in the usual gray and blue-backed sheet. The balsa should be of the hard variety. Standard sheets are 1/32"x3" x24" and cost about 14 cents each.

Now you have your materials. The first two things you do are: cut out of the photo mounting board the outline of the deck (sheer) plan, and the outline of the boat in elevation, which is termed the outboard pro-



In this picture you see that the model has been glued up with airplane glue. The cardboard profile is glued to cardboard deck plan and sheer to chine spacers and the chine-line plane put in. The framing topside is begun. Study this photo.

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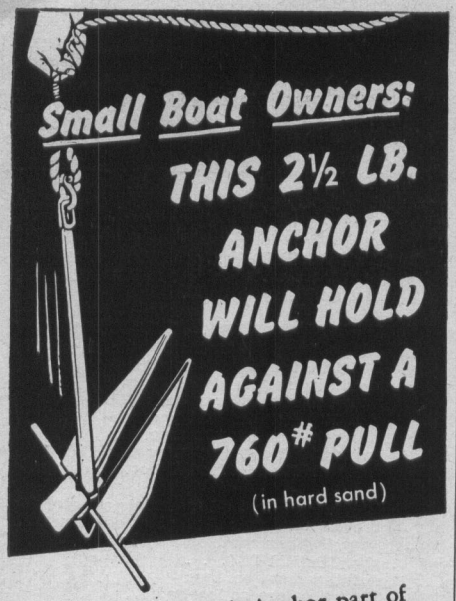
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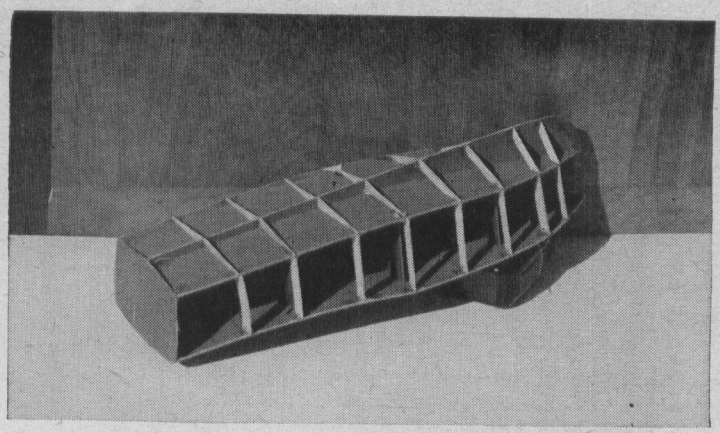
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Bottom and the topside framed in ready for the planking. All you need for the making of model is ability to handle a scissors and model cement.

file. See Fig. 1 in the accompanying drawing. This illustration shows what you are shooting for.

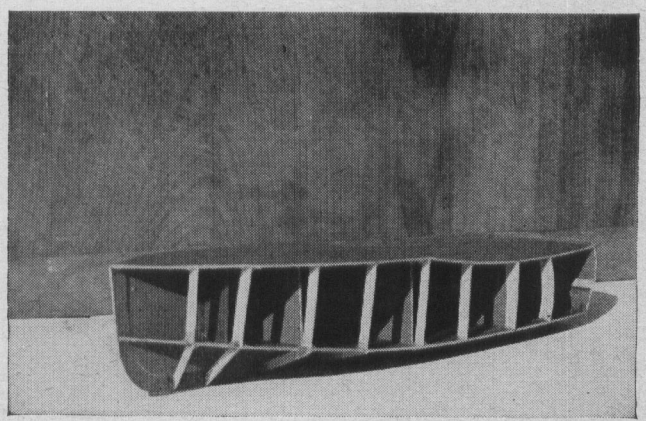
The profile will give you no trouble, but if you find it hard to sketch both sides of the boat symmetrically about the centerline in plan view, cut a separate template to one half the boat's shape, draw one side, then flop the pattern over about the center and draw the other side. This assures symmetry. Any small jogs in any curve usually are smoothed up by cutting when you use the scissors.

With a razor blade, cut partially through each face of these two pieces —the profile and the deck plan— about ¼ inch from the edge. The idea is to go part way through, but not quite; what we want is a piece of cardboard stiff enough to hold shape while cementing, but which will part company at the right place when we gut the falsework out of the model.

Next, as at Fig. 3, cut out some spacers for the chine-to-sheer height, assuming your boat is of V-bottom form. If of round-bilge form, forget this step. These spacers go between frame stations and are merely for temporary support of the chine plane.

In gluing the profile and the deck plan together, and in setting in the chine-to-sheer spacers, the technique to use is to hold the piece to be glued in the left hand, and with the tube of cement held in the right, pay a bead of cement out on the edge to be glued. It is like putting a ribbon of toothpaste on a brush.

The next step is to get out the chine planes. In a V-bottom boat the chine line is the hard knuckle where



In the picture above it is seen that the topside frames are all in and the bottom frames have been tacked on. This is a V-bottom model. This article will give you full details on the making of this model and all of the materials needed.

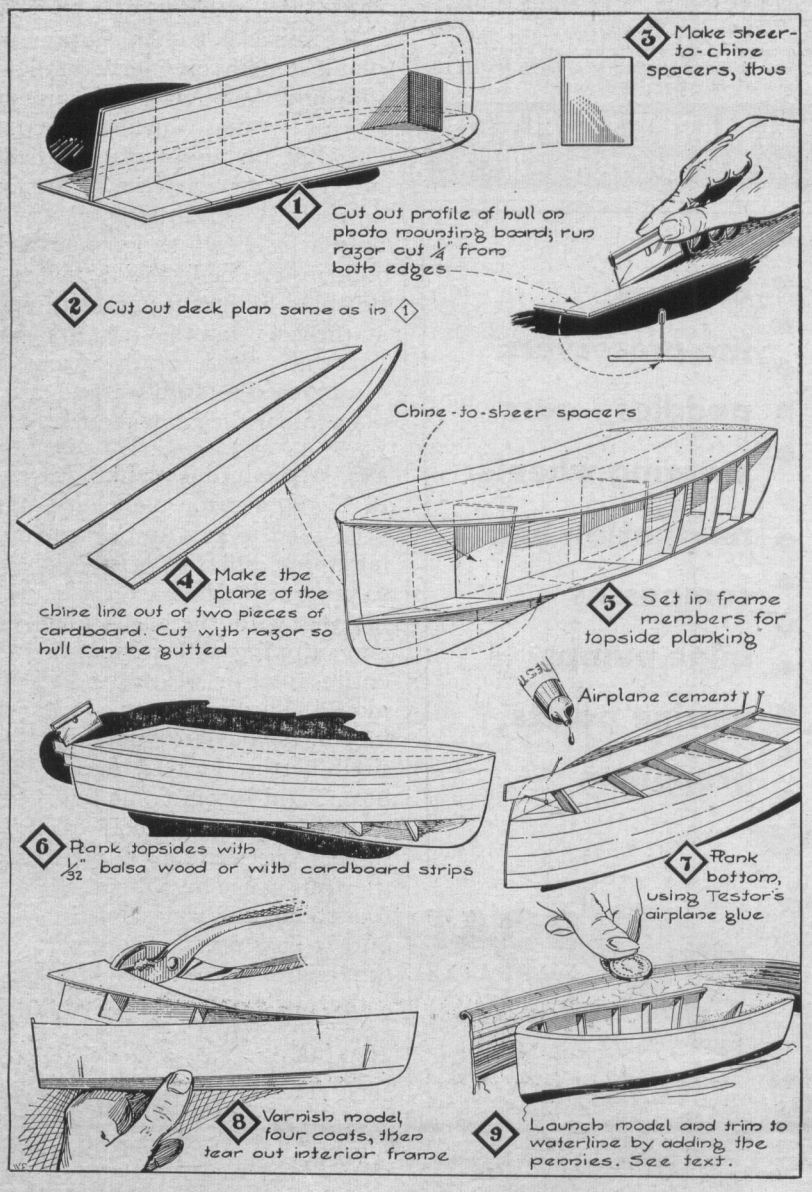
the topsides and knuckle meet. In most modeling, notches are cut in the frames and a small chine stringer is inserted. This method is not as satisfactory as is the method of containing the chine line in a plane of cardboard and bending it into place over the sheer-to-chine spacers. The chine-plane method assures symmetry and accurate flow to the line, something otherwise hard to get. Fig. 4 shows how these chine planes look, including the razor cut, and Fig 5 shows how they are installed.

Cut out the transom from cardboard and glue it in place. If you work in a dry room at about 70 degrees, the airplane cement will dry so it will hold in about one minute. It later sets up glass-hard, holding beautifully.

As shown in Fig 5, you proceed to frame up the topsides. Cut curved frames from cardboard, and use balsa for straight frames. The topsides are best framed first to avoid any propensity to warpage caused by the dope cement "pulling." The heads and heels of the frames are tacked with glue at the 1/4" strip which will stay in the boat. Avoid getting glue spread over the razor cut as this will make it hard to rip out the inboard falsework.

The next step is to plank the topsides as shown in Fig. 6, and the bot-

These steps given in the drawing below will explain themselves. If you follow them carefully, you will not have any trouble in obtaining a model that gives you an idea of your desired boat.



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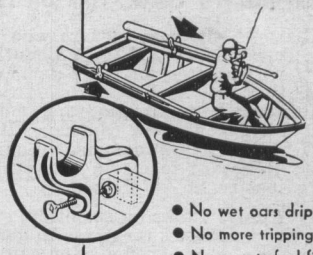
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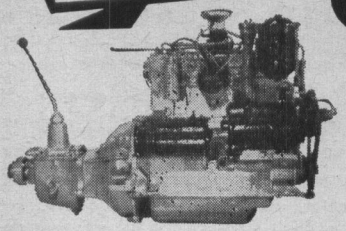
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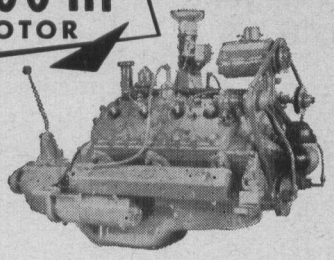
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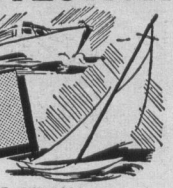
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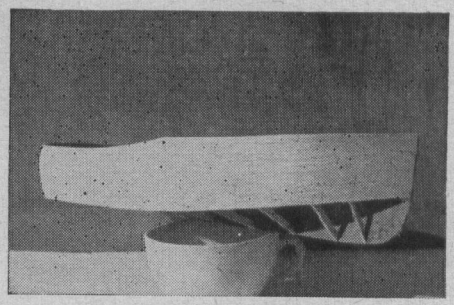
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Here we see that the topside of the model is planked and trimmed. The bottom is planked in the same manner. It should be varnished before launching.



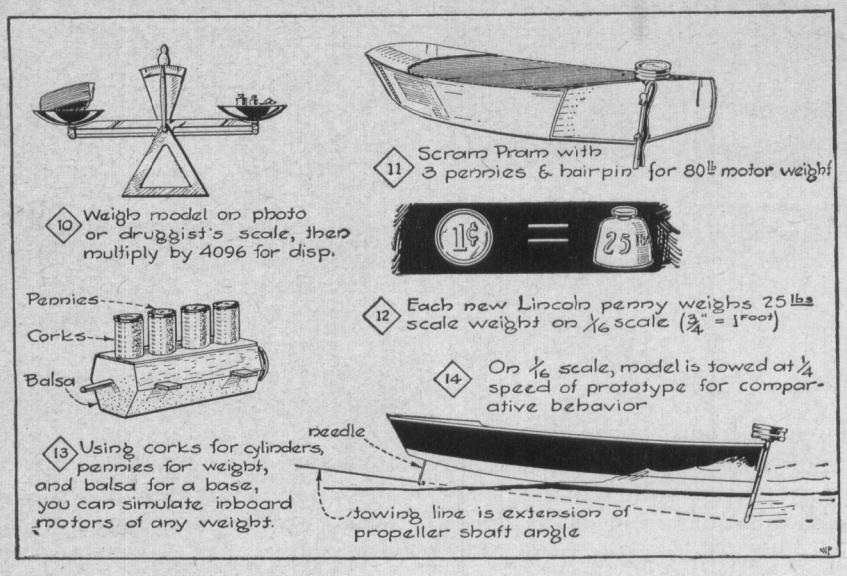
tom, as in Fig. 7. The ends of the balsa are shaved off as they pass the transom. Use a razor blade for this. It is a good plan, after the plank ends have been thus trimmed, to run a bead of cement over the raw end grain of the wood, and smear it flat with your finger tip, the better to provide a glue wrapping about the end of the plank.

Reasonably flat topsides may be planked with one sheet of balsa as shown in the photos. The same holds true of bottoms which are reasonably flat. But on any surface which has much sny, or warpage, strips should be used. The planking of a typical bottom is shown progressing in Fig. 7. Strips can be 1/4" wide, and should be glued both at frame landings and at the edges as they come together. In other words, at the seams. Pins can be used to hold warped strips in place until the cement dries.

NOW the hull is planked. As shown in Fig 8, a razor blade first having been used to pry up one end of the falsework, pliers or scissors are used to pry out the inboard falsework. By nicking with the razor blade here, and snipping with scissors there, the entire interior of the model is removed. This leaves you a hollow hull in which you later can build scale-sized berths, lockers, floors, engine boxes, and so on. Some naval architects who are extremely careful designers use scale-sized manikins so they can gauge headroom, elbow and foot room, and general utility of layout. It pays off. Very often it makes the difference between a klunker and a thoroughbred. The latter kind of boat, one with no bad traits, comes about rarely and is a result only of such close attention to little details.

Now the hull is lightly sanded and finished off. This is one of the main

Below is given the method for weighting your model properly so that you'll be able to judge her condition when boat's equipped with an engine. You may get some surprises now.



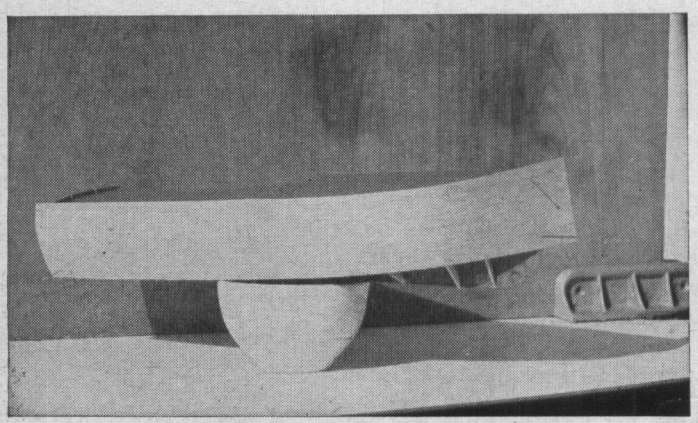
reasons balsa is used for planking. It sands and finishes easily. I have used cardboard, and it is perfectly all right, but finishing must be done by waterproofing with hot paraffin, and then scraping with a blunt table knife. Paraffin is not as satisfactory or as long-lived as varnish.

Four coats of varnish is the minimum necessary to really waterproof a model built on this system. Let each coat set up overnight. Do not sand the last two coats, but flow them generously.

Now comes the launching! This and the testing for trim and wake pattern, are the pay-off where the real fun comes. And here I must get in a word or two about the simple mathematics of similitude.

There is a law in naval architecture which states that (within broad limits) the model of any vessel varies to the prototype as the square root of their linear ratios in the matter of speed, and as the cube of the linear ratios as to weight. Let us take an example to show you what is meant.

Suppose you have worked in the scale of 3/4" equals 1 foot. This is the scale most used by naval architects who use models, because it is one sixteenth full size, and the linear ratio, 16, is easy to cube and to extract



The step pictured here is the one where you are beginning to plank the topside. For the man who is planning to build a boat, the steps in the making of this model will be of great help. He will avoid serious errors in his boat.

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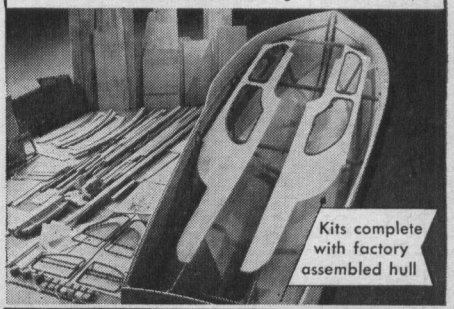
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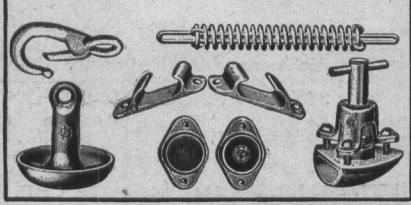
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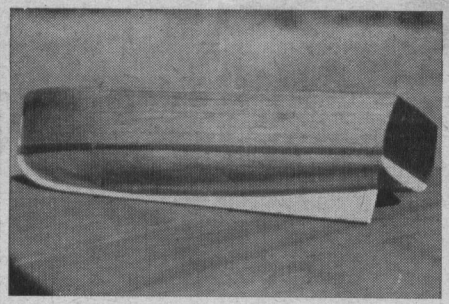
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In the photograph above you find the fully finished model of the round-bilge form ready for the launching. You will now be ready for testing of the model.

square root from. Your model is then one sixteenth full size. Its speed in scale proportion will be to the prototype as the square root of the linear ratio. The linear ratio is 16. The square root of 16 is 4. Therefore the model when towed will exhibit the wake and behavior of the prototype at one fourth the speed of the bigger vessel. If your prototype is to be powered for a speed of 16 miles an hour, tow the model at four miles an hour (a nice brisk walk at lake edge) and the behaviors will be similar. For a 40-mile prototype speed, one fourth of 40 being 10, a moderate running gait will give you 10 miles an hour and similarity.

Because these towing speeds so readily lend themselves to a gait a man can achieve on his own legs, the scale $\frac{3}{4}$" to 1 foot is most useful.

As to displacement, or weight, the scale varies as the cube of the linear ratio, or, on $\frac{3}{4}$" scale, as 16 times 16 times 16. This is 4,096. Therefore, if your model, after trimming to waterline, weighs one pound, the finished prototype will weigh 4,096 times 1 or 4,096 pounds.

After launching your model, a most convenient form of ballast is multiples of the Lincoln penny, which scales out very close to 25 pounds scale weight in $\frac{3}{4}$" scale. By adding pennies until you reach the waterline trim, and gunking these pennies into permanent place by flowing a bead of cement over them, the model, after being removed from the water and dried, can be both weighed and balanced. Where the model balances will be the fore-and-aft position of the center of buoyancy, much more accurately arrived at this way than by Simpson's rules of calculation. The center of buoyancy and center of gravity always coincide in a fore-and-aft relationship.

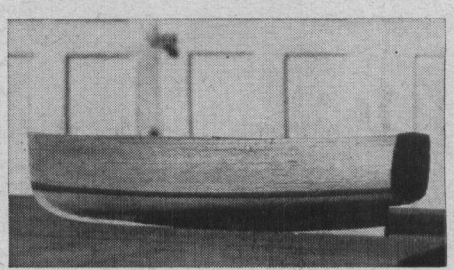
After ballasting, weigh your model on a photo scale or on a druggist's balance. There are 16 ounces in a pound, and 480 grains in an ounce, troy weight. Thus, the total weight of the model in pounds, ounces and grains can be converted to pounds and decimals of a pound, multiplied by 4,096 and presto! you have the weight of the prototype. The method is quite accurate.

Thus both the wake pattern and the total displacement of the prototype as well as the location of the buoyancy center and gravity center are made known by modeling.

Figs. 9, 10 and so on show the launching and weighing, and give suggestions whereby engines of different weights may be simulated with pennies, balsa, corks and pins.

As to towing methods: it is important, in order to simulate the proper thrust components, to extend the towing cord in the same angle as the propeller shaft. A needle is shown in the last drawing of the series, through the eye of which a silk thread is knotted. The towing operator then keeps the towing line at an extension of the shaft angle. In tank work the towing thrust is usually applied at the thrust block, but this is not practicable for our simple experiments.

A self-integrating model shows up errors in basic premises if there are any. To the skilled, the best method of arriving at the ultimate dream boat is to carry both calculations and model along together. To the sportsman not concerned with theory, the model will show him more in a few days' time than a whole library possibly could. He is taking his answers from the boat and the water itself. Together they are infallible.



Another view of round-bilged model—fully planked with the balsa strips and varnished—and ready for its launching. Compare the text with these photos.

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