

*Left—The completed Cartopper construction model, fitted for her sailing rig. The instructions in this series are for the rowing version of this boat. Right—The full-sized Cartopper on her way to the launching ramp. Once there, she can be rigged for oar, sail, or outboard power.*

# Build a Construction Model,

## The 11 1/2' Bolger Cartopper, Part I

### Getting Started on the Model

Even though I build full-sized boats for a living, for years I always wanted to build model boats—not full-rigged ships or anything like that, but down-to-earth models that matched my levels of skill and patience. I watched others try their hand at modelmaking and learned a lot from their successes and failures. I saw the remains of a good friend's botched kit model go up in flames, for example, and decided then and there that, for me, stamped-out kits and working with balsa were out.

The type of modelmaking that appealed to me the most was that described by the late Weston Farmer in an article in the *National Fisherman*. His commonsense approach was to work with the plans of a full-sized boat—either a design in progress, to test it out, or a finished design—and to use materials for the model that

you could find around the boatshop. So I started making construction models of my full-scale boats, put together from scratch in exactly the same manner as shown on the plans. Some models were built entirely for pleasure and are now on display on a shelf in my living room. Others were built to see how the lines of the boat checked out in three dimensions; I wanted to be able to hold the hull in my hand and eyeball the exterior (I usually skipped the interior on these models). Still others were built to test a set of plans; I wanted to check out the building procedure and discover where the difficult areas might lie before I started on the real boat.

No matter how experienced you are as a boatbuilder, building a construction model before tackling the full-scale boat is one of the best learning techniques around. The cost of materials is next to nothing, and cutting and shaping those small, flat

pieces and transforming them into a model is bound to add to your abilities. The techniques for this type of modelmaking are virtually the same as for full-sized boatbuilding, and the satisfactions are every bit as high. If you make a mistake...so what? Better to make your mistakes on the model while you improve your skills for the real thing.

So come along with me on a minimum-risk adventure in boatbuilding. We'll build a model as if we were building a boat; then when we're done, we'll set the model on the shop bench and use it as inspiration to build a full-sized boat.

### The Boat

Looks, lightness, and performance are built into this boat, the 11'6" x 4'0" Cartopper, designed by Phil Bolger. Her centerboard and kickup rudder permit shallow-water sailing, and should the wind fall she





Jonathan Wilson and Sherry Streeter

# Build a Boat

by Harold H. "Dynamite" Payson

will take you home under oar or power. This isn't the first boat Phil Bolger designed for me this way. The 15' Gypsy is another, and as her owner John Garber put it, "Her spare plywood frame has all the structural elegance of a bird bone, or the inside of a green pepper." But not their lightness. The Cartopper is a vast improvement in that regard.

Since the purpose of this series is to cover how to build a simple construction model, followed by advice on how to build the full-sized boat with the tack-and-tape method, I will confine the discussion to the rowing version of the Cartopper. For ambitious builders, the sail rig, including the daggerboard trunk, the rudder, and other accessories, are shown on the plans.

## Tack-and-Tape Construction

The full-sized Cartopper uses the tack-and-tape building method. Basi-

cally, this involves cutting out plywood panels to a predetermined pattern shown on the plans and shaping them to fit together edge to edge. No lofting or complicated jigs are required. The panels are temporarily fastened together on the boat's own frames with tacks, light-gauge nails, mechanic's wire, or hot glue, and the outside seams are filled with fiberglass putty. The temporary fastenings are then removed and replaced by long strips of fiberglass tape. The inside of the seams are then filled with putty and covered with fiberglass tape. The result is a smoothly curved hull with a multichine form that requires a minimum of framing and no chine logs for structural strength.

Your first question is probably the same as mine was when I first tried this out: How strong is such a put-tied-and-taped joint? I gave one such joint—two pieces of plywood butt-joined at an angle—the ultimate de-

struction test by driving my pickup truck over it. The 'glass joint came through intact; it was still clinging to a strip of plywood veneer that had ripped off neatly across the joint itself.

Your second question is: How accurately fitted do the joints have to be? My test proved that gaps up to 1/4" are perfectly acceptable and even desirable. In fact, it's best to avoid wood-to-wood joints except at the inside edges. It's the 'glass putty filler that provides the strength and locks the joint together.

Of course, that's for the full-sized Cartopper. Tacking and taping the seams in the model is unnecessary. Glue will do for that.

## The Plans

There are several ways to build a model of the Cartopper from plans. The easiest and most accurate way is to use a set of builder's plans at the



# Phil Bolger Cartopper

## Tack-and-Tape Construction and Three Power Options

Even the smallest designs from Phil Bolger's board deserve close study. Cartopper's drawings reveal a structure, elegant in its simplicity, that virtually guarantees success for novice builders and permits rapid assembly by experienced hands. From a designer's perspective, the sparse skeleton allows for some well-conceived liberties in this dinghy's layout.

Interiors for 11'6" skiffs sometimes don't receive much thought—a few thwarts, and forget it. Cartopper represents an exception. By moving the centerboard trunk forward and eliminating thwarts, Bolger gives the best part of this boat to the crew. A raised "floor platform" amidships keeps everyone out of the bilge, provides adequate sprawling space (the platform is about 8" wider than the boat's bottom), and allows the sides to function as backrests that rival your best chair for comfort.

Because the platform must support considerable weight, it is stoutly framed. Carrying this structure's mass into the ends of the boat makes little sense in terms of sailing performance or overall weight, and Bolger leaves the bottom bare ahead and abaft the crew area. Stiffened by a skeg, a centerboard trunk, and its considerable rocker—and gently supported by the water—the 1/4" plywood bottom is well able to handle the heaviest crew.

Befitting its far forward location, the centerboard is smaller than you might expect. Bolger has increased the rudder's size appropriately, and its huge blade carries a substantial portion of the lateral plane load. This heavy loading dictates the use of a long (44") tiller that reaches to the "floor platform"

and will help keep the crew weight where it belongs most of the time. The large rudder—well separated from the centerboard—and adequate rocker to this skiff's bottom contribute to positive control. Catching her in irons will require a combination of bad luck and almost monumental ineptitude.

Cartopper's strongly flared bilge panels and fairly substantial overhangs (substantial at least for a skiff) help her gain buoyancy quickly as she's pressed into the water. She carries a load well and will handle a surprisingly heavy sea—if that load is kept low and out of her ends.

Most boats built to these plans no doubt will serve as daysailers and beach skiffs, but the design shouldn't be overlooked as a tender for medium-sized cruisers. She's not as compact for her capacity as many prams, but perhaps her performance and good looks will help her find room on deck. At any rate, she'll tow well—though you might want to secure her painter lower on the stem and devise a cap for the centerboard trunk.

The choice of sprit rig or leg-o'-mutton is left to the builder. In its favor, the spritsail is more powerful, and the short mast and sprit will stow inside the boat. Efficiency and convenience might offset the sweeping foot of the sail that (the window notwithstanding) obscures much of the view to leeward. The leg-o'-mutton's high-cut clew assures good visibility and combines with a sprit boom to form the world's least expensive automatic boom vang. Perhaps more important, if you've built the Elegant Punt, Teal, Surf, etc., from Bolger's Instant Boat series, you already have this rig. —Mike O'Brien

scale drawn by the designer, 1 1/2" = 1'. (See ordering information at the end of this article, page 43.) You can cut up the plans and use them as patterns, which will produce a fine model that is one-eighth the size of the real boat, or 17 1/4" long. There is no transferring of measurements, no lofting, no bending of battens—virtually no way to mismeasure and ruin the project. Everything is done one to one.

If you want to keep your plans intact, you can measure all the parts of the plans and transfer their shapes to wood, but this means using rules, battens, pins, and a lot more time. But if you are looking at 10' of snow out your shop window, you might want to consider this option.

The above two methods are viable if you have a set of builder's plans. The plans accompanying this article are exactly the same as the builder's plans, but they have been reduced to fit on the magazine page and are therefore of no true scale. That's no problem if you don't mind redrawing them to the scale you want, especially if you are looking at 10' of snow out your window....

But at the risk of sounding like a promoter, I'd recommend ordering a set of 1 1/2" to 1' builder's plans and being done with it.

I might mention that building models this way—cutting up scale plans to produce patterns—will work for all of the boats in my Instant Boats series designed by Phil Bolger, and the instructions for the Cartopper apply to them as well. If you already have a set of plans for any other Instant Boat and you would like to make a model of it, then you have no need to buy more plans and therefore have a free run on me. Cut up the plans and have a go.

### Hand Tools for Modelmaking

The hand tools required for making the full-sized Cartopper are the usual ones for typical plywood boatbuilding projects. Most of these are useful for modelmaking, too, but should be supplemented with a few specialized tools. Here's a list of the modeler's hand tools I have been using:

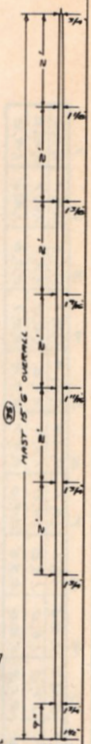
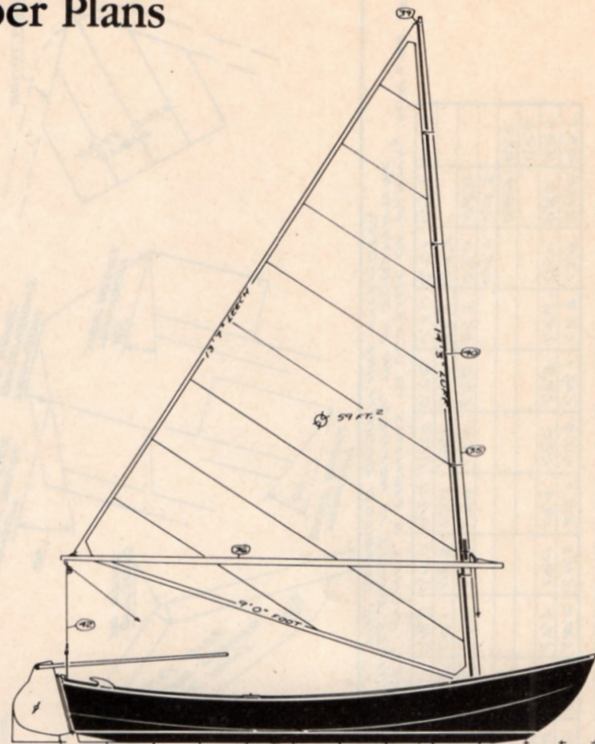
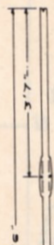
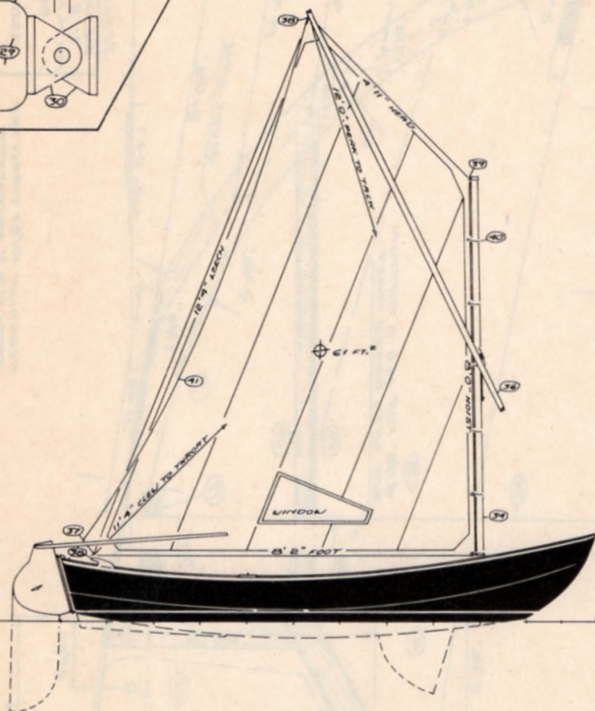
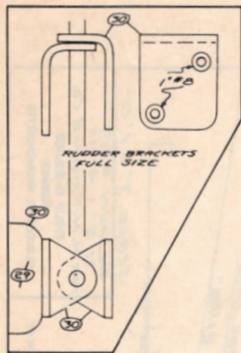
### Architect's scale rule

I consider this indispensable for modelmaking. Like a damned good compass you can trust, it lets

*Text continues on page 42*



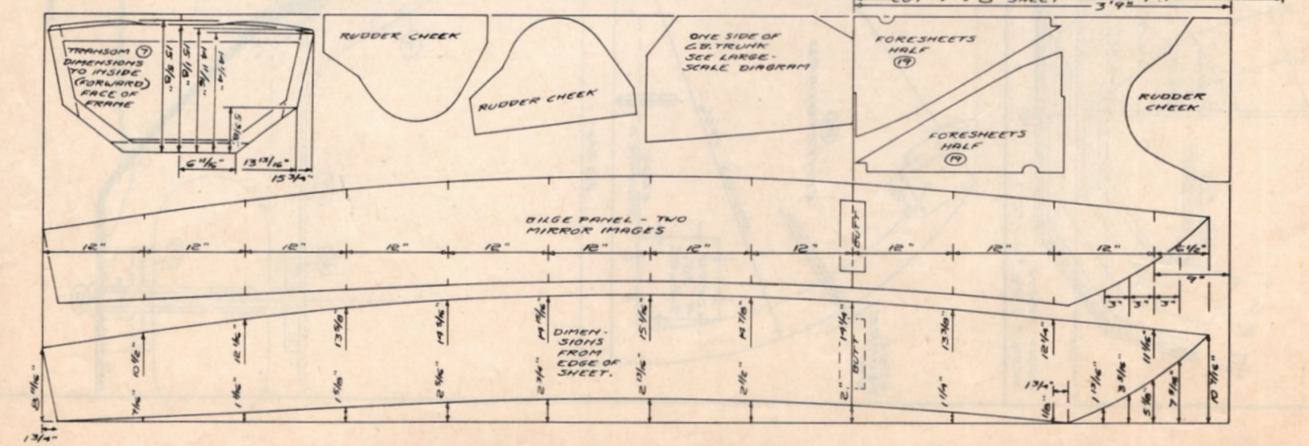
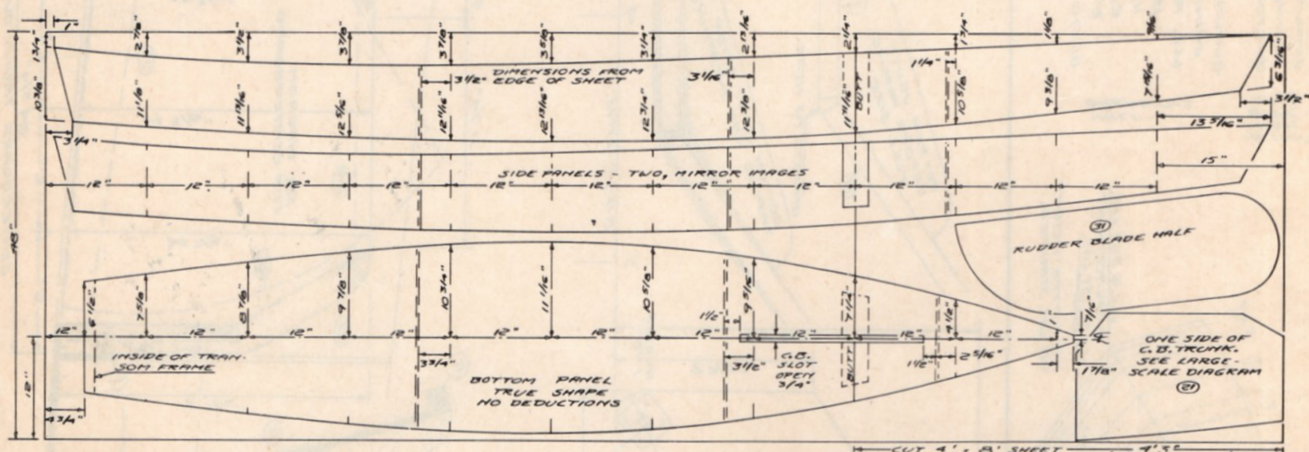
# Cartopper Plans



LEE O'HUTTON RIG FROM ELEGANT  
HUNT, YAK, SURF, ETC.

REDRAWN 10/87 BY CORRECTED  
FROM H.M.P. PROTOTYPE

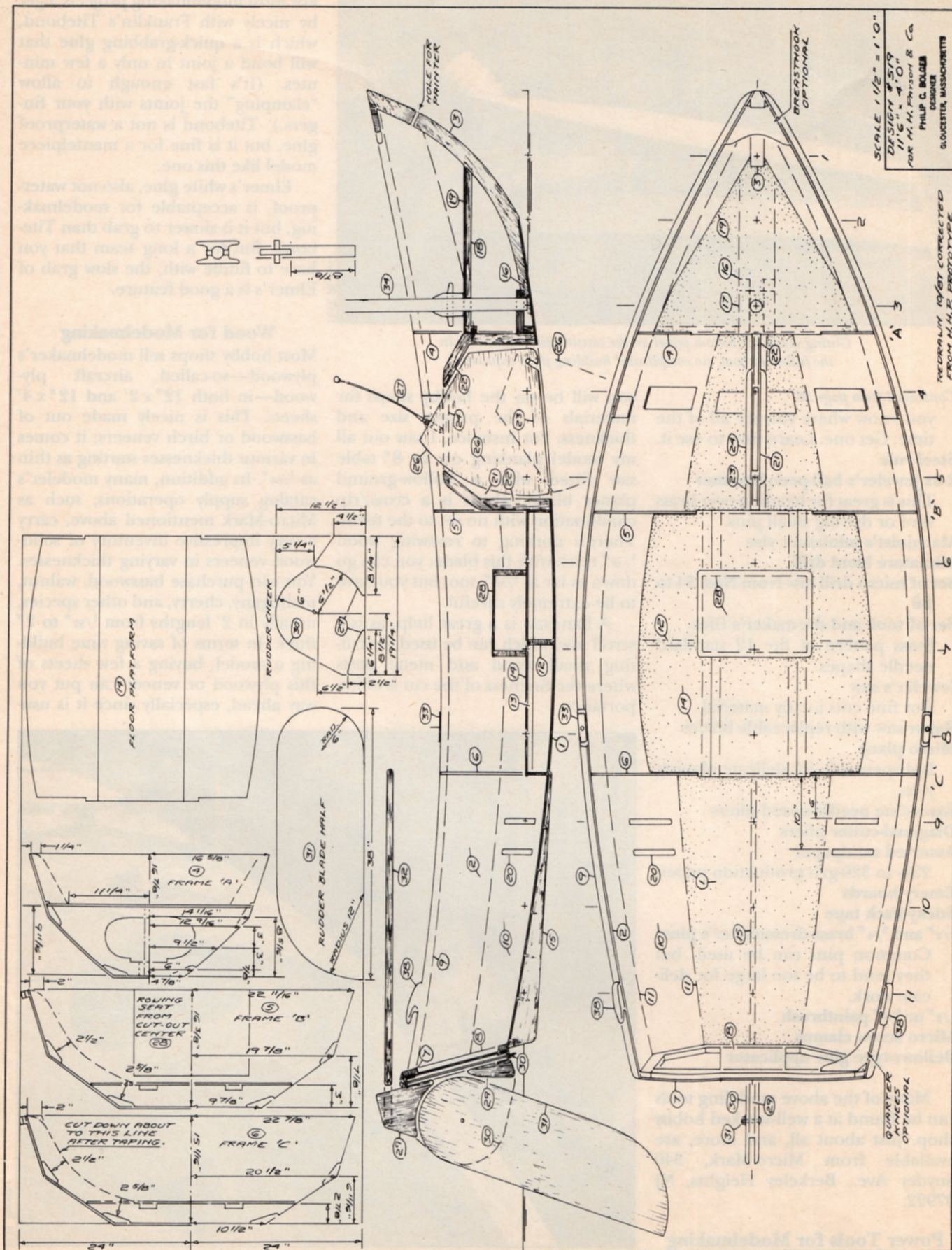
SCALE 3/4" = 1' 0"  
DESIGN #219  
11' 6" x 4' 0"  
FOR H.M. PAYSON & CO.  
PHILIP C. BOLGER  
DESIGNER  
DUXSBURY, MASSACHUSETTS



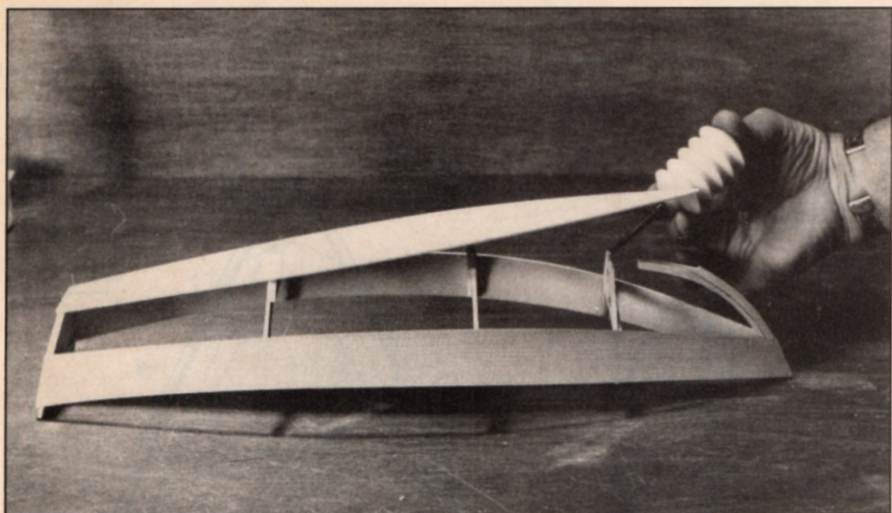












H.H. Payson

*Gluing down the bottom panel on the construction model. As in the full-sized boat, no complicated building jig is required.*

*Continued from page 38*

you know where you are all of the time. Get one. Learn how to use it.

#### **Steel rule**

#### **2-oz jeweler's ball-peen hammer**

This is great for heading over brass wire or driving small pins.

#### **Machinist's miniature vise**

#### **Miniature hand drill**

#### **Set of micro drill bits from Nos. 54 to 80**

#### **Set of tool- and die-maker's files**

Swiss pattern in the 12 standard needle shapes.

#### **Jeweler's saw**

For fine cuts in any material.

#### **Razor saw with replaceable blades**

#### **Micro plane**

Indispensable for delicate planing jobs.

#### **Extra-fine needle-nosed pliers**

#### **Diagonal-cutter pliers**

#### **Assorted sandpaper**

220- to 320-grit production paper.

#### **Emery boards**

#### **Sticky-back tape**

#### **1/2" and 3/4" brass dressmaker's pins**

Common pins can be used, but they tend to be too large for delicate work.

#### **1/2" or 5/8" paintbrush**

#### **Micro screw clamps**

#### **Bellows-type glue applicator**

Many of the above modeling tools can be found at a well-stocked hobby shop. Just about all, and more, are available from Micro-Mark, 340 Snyder Ave., Berkeley Heights, NJ 07922.

### **Power Tools for Modelmaking**

The more power tools you have, the easier the job and the less dependent

you will be on the hobby shops for materials of the proper size and thickness. For instance, I saw out all my model planking on an 8" table saw fitted with a hollow-ground planer blade, which is a cross/rip combination with no set to the teeth. There's nothing to resawing wood 1/16" thick with this blade; you can go down as far as 1/32", too, but you have to be extremely careful.

A bandsaw is a great help, as is a scroll saw, which can be used for cutting small wood and metal parts where the fineness of the cut is of importance.



H.H. Payson

*Gluing down the bottom panel on the full-sized Cartopper. The procedure is the same as for the model; only the scale is different.*

### **Glues for Modelmaking**

For most modelmaking projects, I get by nicely with Franklin's Titebond, which is a quick-grabbing glue that will bond a joint in only a few minutes. (It's fast enough to allow "clamping" the joints with your fingers.) Titebond is not a waterproof glue, but it is fine for a mantelpiece model like this one.

Elmer's white glue, also not waterproof, is acceptable for modelmaking, but it is slower to grab than Titebond. But for a long seam that you have to fiddle with, the slow grab of Elmer's is a good feature.

### **Wood for Modelmaking**

Most hobby shops sell modelmaker's plywood—so-called aircraft plywood—in both 12" x 2' and 12" x 4' sheets. This is nicely made out of basswood or birch veneers; it comes in various thicknesses starting as thin as 1/64". In addition, many modeler's catalog supply operations, such as Micro-Mark mentioned above, carry a very impressive inventory of solid-wood veneers in varying thicknesses. You can purchase basswood, walnut, mahogany, cherry, and other species, usually in 2' lengths from 1/32" to 2" thick. In terms of saving time building a model, buying a few sheets of this plywood or veneer can put you way ahead, especially since it is usu-