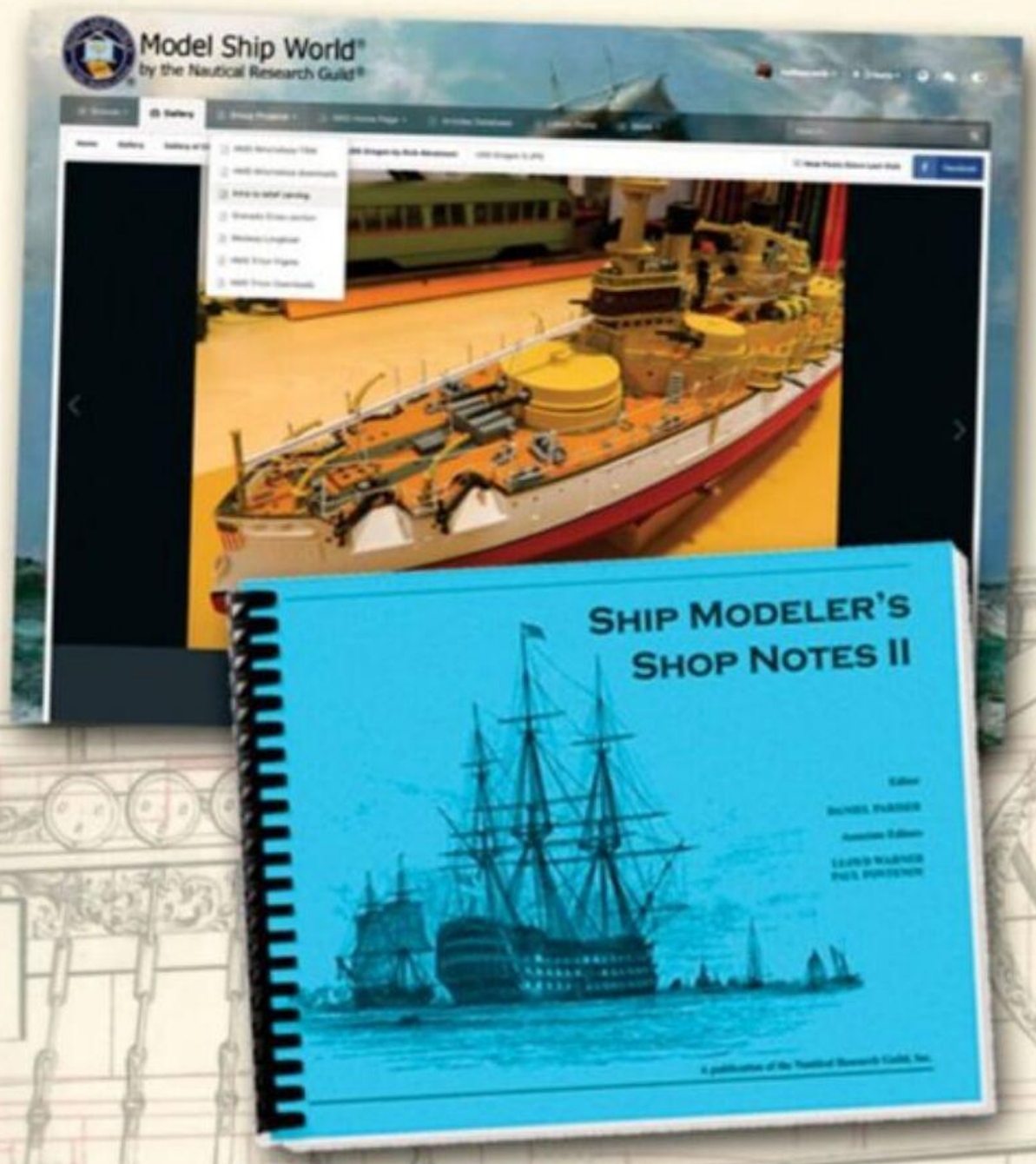
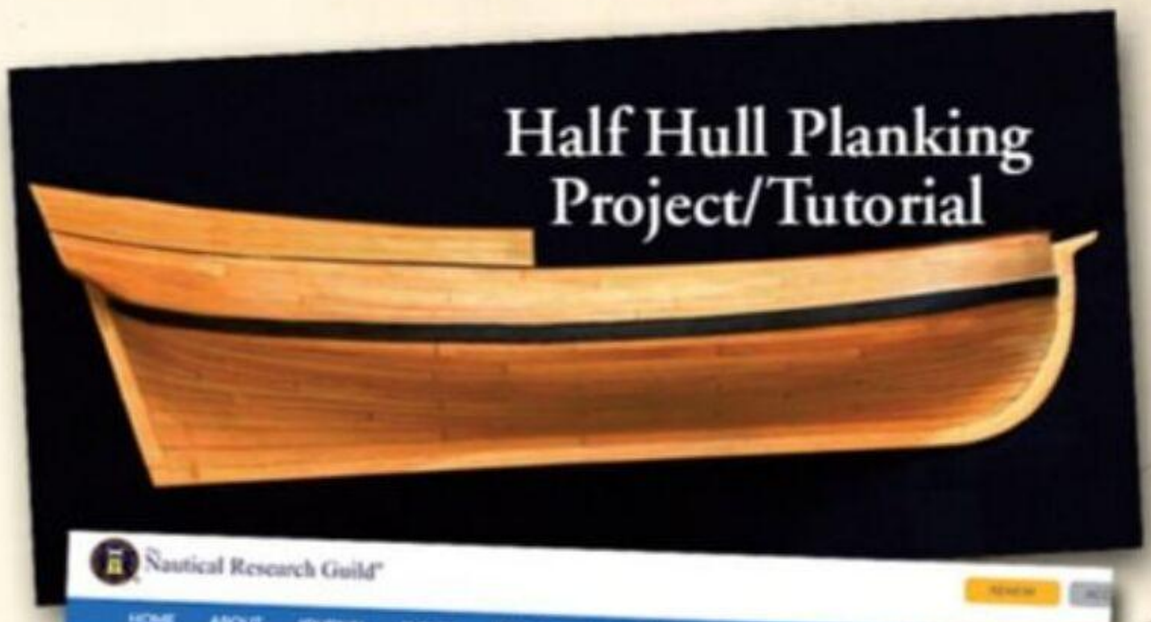
FineScale Modeler
SPECIAL ISSUE

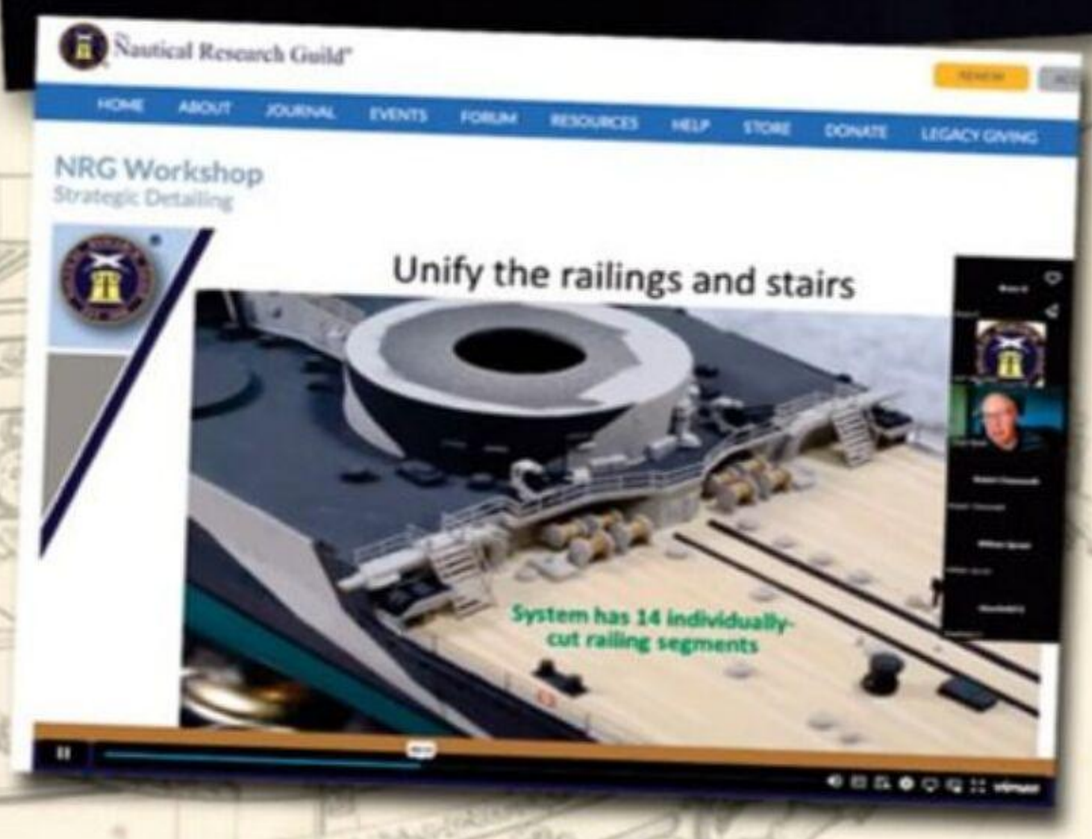
Ship Modeler's HANDBOOK

IN CONJUNCTION WITH NAUTICAL RESEARCH GUILD EST. 1948

MASTER THE SECRETS OF BUILDING MODEL SHIPS







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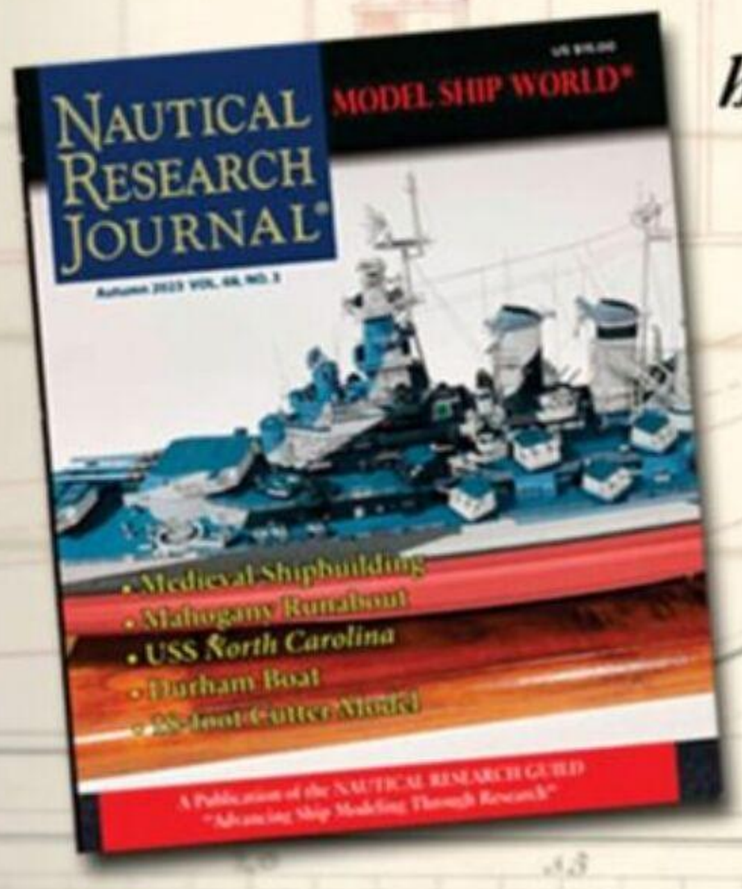

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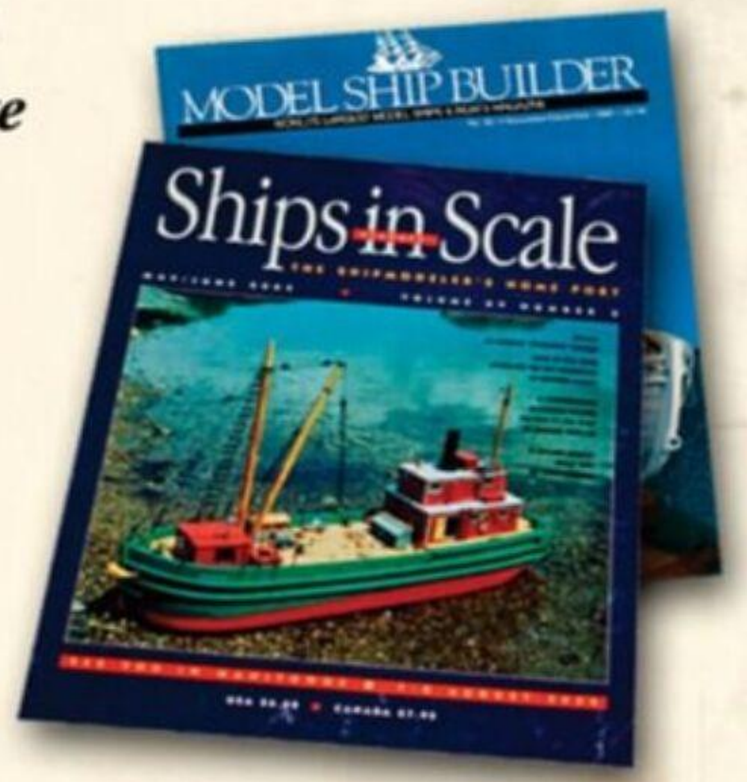

Complete Collections of
Ships In Scale &
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CONTENTS

Ship Modeler's HANDBOOK

EDITOR'S PAGE

By Tim Kidwell

Photo by Steve Wheeler

WELCOME ABOARD!

You now hold the *Ship Modeler's Handbook*! Devised via partnership between *FineScale Modeler* and the Nautical Research Guild, inside you'll find advice and step-by-step how-to articles on everything from choosing the proper tools to do a particular job to strategies for building model ships from wood, plastic, and even paper.

Over the years, a mythology has risen up around building scale model ships. You can chalk this up to ships dating back to the first glimmerings of human history and beyond. The vast, eclectic, and often mystifying vocabulary also lends to ship modeling's otherworldliness. And do not discount the very arcana of shipbuilding itself — the whys and wherefores of naval architecture, from stem to deadwood, and the daunting web of rope that completes a fully rigged ship.

No single publication can hope to answer all the questions you will have about building scale model ships, but the idea is to provide the resources and insight for you to successfully chart your ship-modeling voyages.

Wait no more! Go! Avail yourself of the experience of the Nautical Research Guild's model shipwrights and their collective years of experience to set sail and discover the joys and wonders of ship modeling.

Photo by Gus Augustin

You'll learn skills and techniques for planking hulls, painting waterlines, detailing with photo-etched metal parts, making realistic flags, and so much more. Keep the *Ship Modeler's Handbook* within reach as a reference whenever you need a ship-modeling question answered.

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Ship Modeler's HANDBOOK

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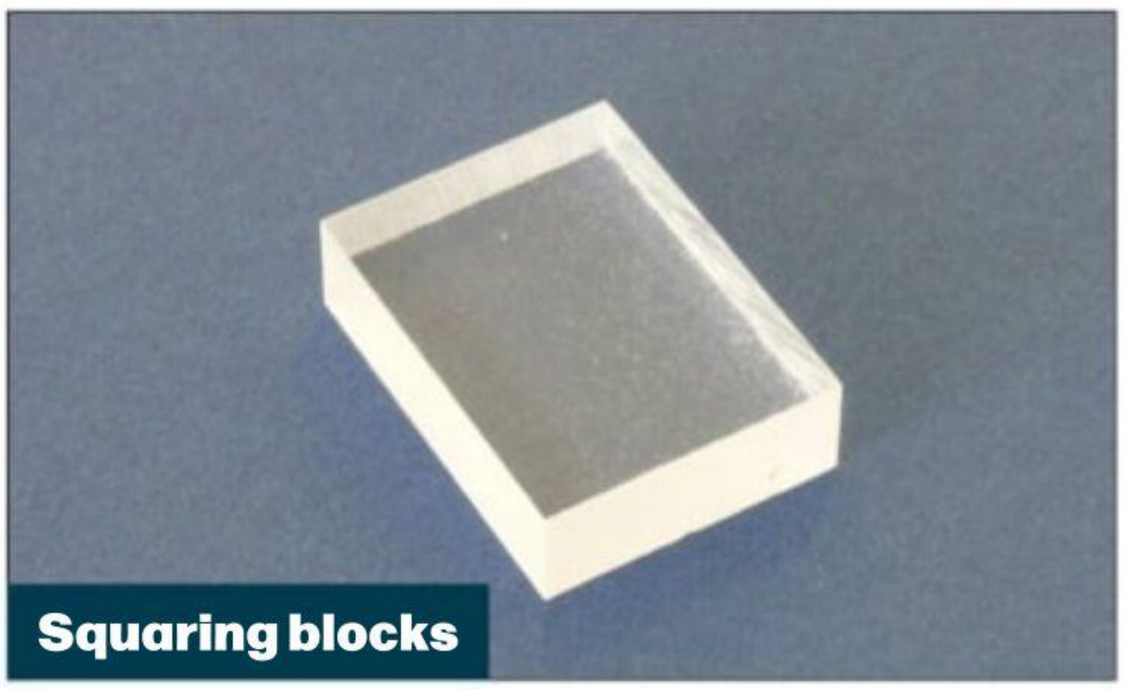
Working in TIGHT PLACES

When your tool just won't fit

BY STEVE WHEELER

Sometimes we are faced with having to do work in places that are too tight for normal tools. That may be because we forgot to do something along the way or what we need to do is just in close quarters.

Here are three, shop-made tools that could help in these kinds of situations.



Squaring blocks

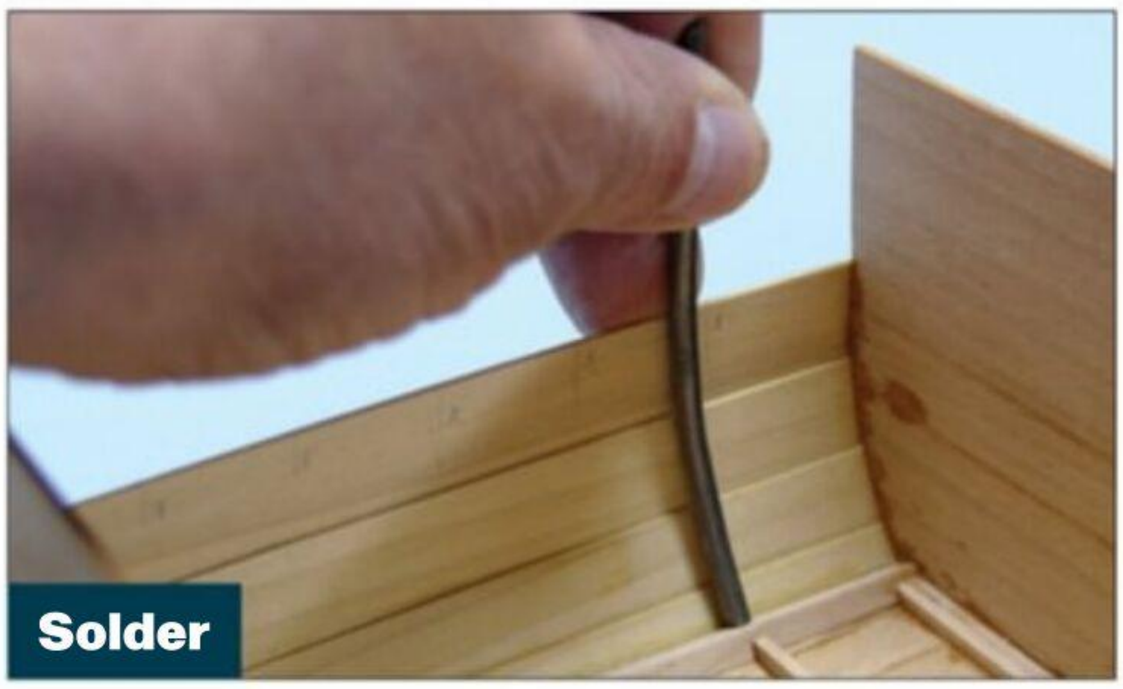
I have sometimes found that, when I need to square one element on a model, none of the typical squares I have around (combination or machinist squares, V-blocks, etc.) will not fit the space. It's easy to make a squaring block out of materials around the shop that will fit your application. I made this one from scrap ⅜-inch acrylic, but a piece of hardwood will work, too. Mine measures about an inch along the short side, and I squared it with a disk sander, checking it with a bigger square until all the sides were 90-degrees to one another. You could use a modeler's table saw, but make sure you check it for square first. The fact that my squaring block is ⅜-inch thick allows it to stand by itself – handy!

FINAL THOUGHTS

WHEN MODELING, be open to improvising with tools that you may not have considered previously to help you get into – and out of – awkward places. FSM

Drill extensions

There are always holes that must be drilled in places where normal drill bits are either too short or where a pin vise just will not fit. I have run into this problem more often than I want to admit, and here is my solution: Glue a drill bit into a length of small-diameter metal tubing with 5-minute epoxy. When it sets, wrap the end of the tubing with masking tape to give yourself a handle. Drilling a hole into the end of a small diameter dowel and gluing your drill bit into it with superglue works well, too.



Solder

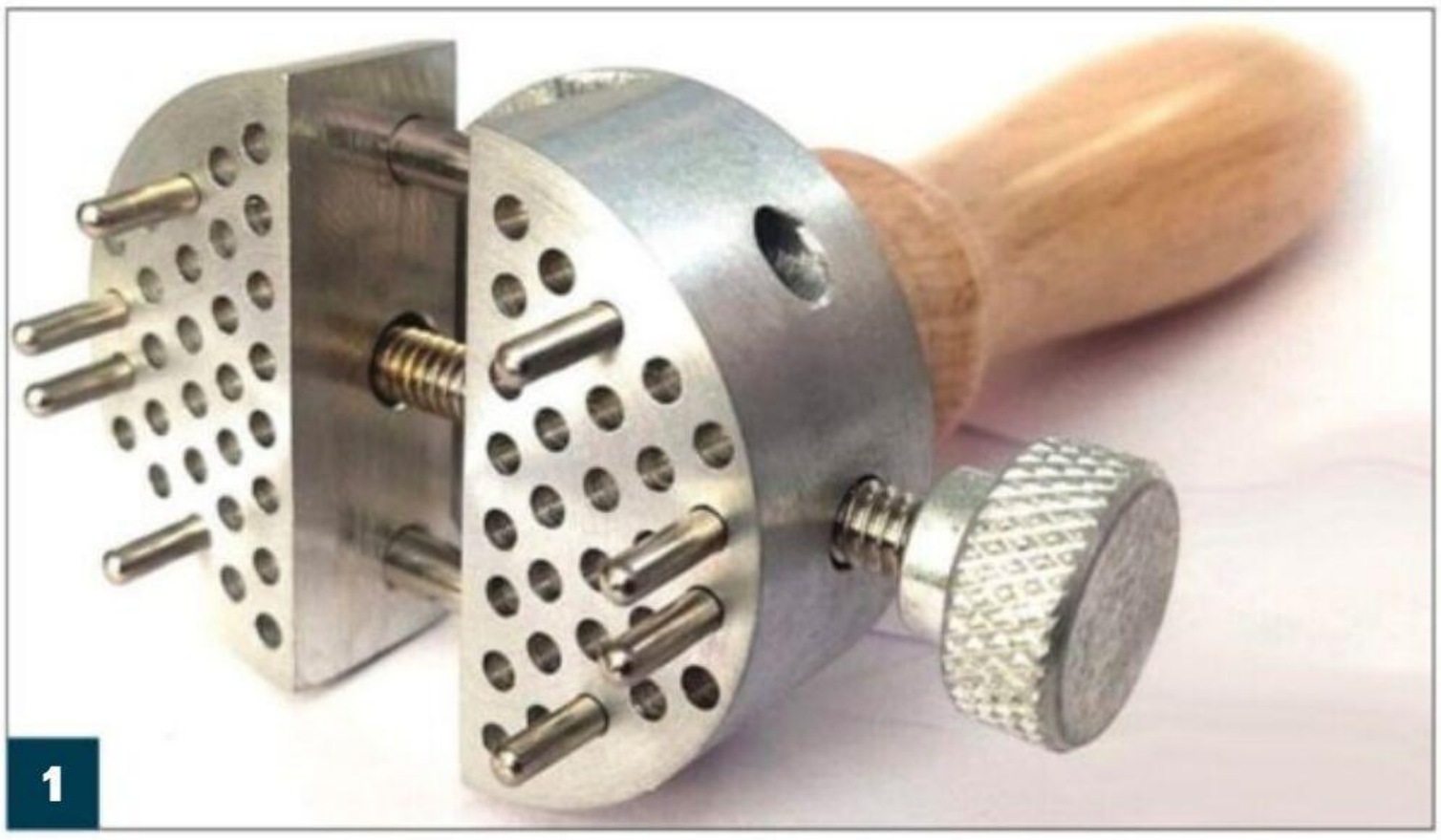
Sometimes it is necessary to find the shape of a part that is already in place and a contour gage or flexible curve will not fit. Instead, use a short piece of tin-lead solder. The solder will conform to many shapes and will not spring back once bent.

SAVE your FINGERS!

Modeling hacks to help hold small or irregular parts

BY DAVID ANTSCHERL

When you're building ship models (or any models, really), you'll often have an awkwardly shaped small part to hold while drilling, cutting, or filing. A bench vise simply will not do for holding it, and your fingers can often be the victims of a slip of a tool. Ouch! But there are tools you can employ that will save your fingers — and maybe other parts of your hands — injury and improve both your modeling experience and results.



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Universal work holder

Alternately called a peg, jeweler's, or engraver's clamp, a universal work holder consists of two flat-topped, semicircular jaws drilled to accept metal pegs, **1**. You can arrange the pegs to hold irregularly shaped parts. It can be very useful if you're working on metal or hard plastic components, but less so with wooden or soft plastic ones. Why? The pegs might mar your work unless you replace them with wooden ones. Also, you don't want to accidentally jab your knife or chisel into the vise's metal face. These can also be useful for brushing painting parts or figures. You can get universal work holders with a handle or as a tool with a positionable base and they typically cost anywhere from $50 to $200 depending on quality.

Wooden ring clamp

There are a couple of versions of wooden ring clamps. The more common variety of wooden ring clamp has leather-lined jaws at either end — one set square, the other set curved. You set insert your part in one set of jaws and press a wedge into the opposite end to force the jaws closed. Similarly, you can find single-end vises that tighten via a wing nut and screw, **2**. These clamps are less likely to mar soft parts or dull your knives and chisels. What's more, they're inexpensive tool — in the $10 range — and easy to modify, like making a needle-nosed version, if you wish.

Metal jeweler's hand vise

For small pieces, my first choice is a metal jeweler's hand vise.

Years ago, I bought an antique example operated by tightening a wing nut, **3**. Although made of metal, I line the jaws with small pieces of thick card glued in place with rubber cement. The card protects delicate parts and can be easily replaced when worn. Also, you can hold long thin rod or tube by feeding it through the handle — useful for twisting wire rope! Yes, the metal jaws aren't nice to sharp tools, so be careful. You can find a vise like this for $10-$20.

3

4

Pin vise

A pin vise should be a staple for every modeler's workbench. It allows you to hold thin wire and rod or use it as a drill using small bits. However, the size of a pin vise's collet limits the sizes it can handle. More versatile pin vises come with several collets to allow them to hold a greater range of sizes, like my own vintage set, **4**. Some pin-vise sets come with three or four handles with specific collet sizes, and still others can be found with a three-jaw chuck for even greater versatility. You can find a basic pin vise for $10, but prices vary widely, especially at the high end.

Backing block

You can glue larger, flat pieces you plan to carve to a backing block that, in turn, you can mount in a bench vise or hold in your hand. I suggest white glue as your adhesive and either a scrap piece of basswood or pine for a backing block, **5**. You can turn a block as you cut rather than turning your knife or chisel. It's a technique engravers use, and I've found it provides good control of a curved cut so long as you keep your cuts shallow on each pass.

If you need to mount a part with a curved back, use basswood or even balsa. Glue the part to the backing block and then press it into the block with the help of a bench vise, **6**. The piece indents the softer wood and provides a larger adhesion surface.

When you've finished working the part, soak it in 91% isopropyl alcohol. This will dissolve the white glue and release the part.

Pitch

One last holding device for metal parts is pitch. This is a black or red polymer liquid that appears to be solid and softens with heat and is often used by jewelers. Place pitch in a purpose-made bowl and soften it with a hot-air gun or, very carefully, with a propane torch. Be careful! Pitch is flammable and can cause burns, so heat and handle it with care.

Once the pitch has cooled and set in the bowl, it only needs sufficient heat to soften it before pressing a part into place and letting it cool, **7**.

To remove the piece, simply heat again until the pitch is soft enough to release the part. Pitch may be reused indefinitely.

5

6

Final thoughts

With these tools at your disposal, you should be able to work with just about any small part that you need to while building model ships. What's more, you'll save your fingers a number of unintended injuries along the way. **FSM**

7

Undoing GLUE JOINTS

Fixing construction mistakes

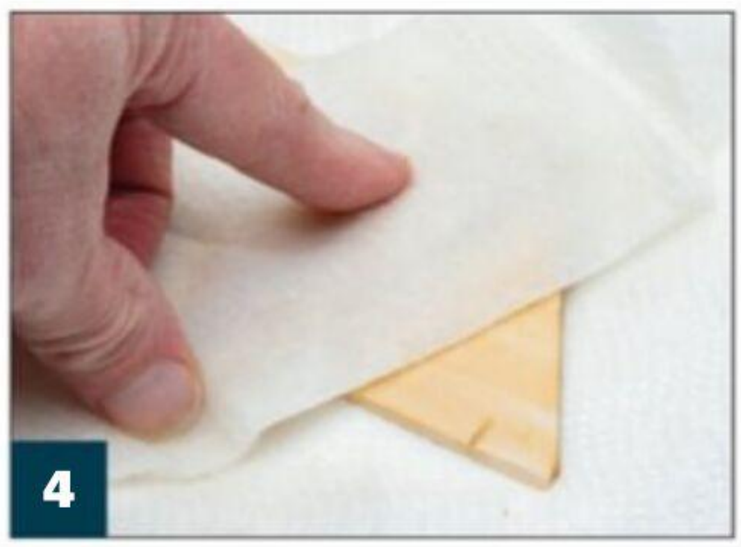
BY KURT VAN DAHM

Oops! You just noticed the glue joint you made last night was done incorrectly, and the piece will not fit as planned. Time to remake the pieces you joined with superglue or Titebond because they do not come apart once the glue has cured. What a waste of time! You can stop cussing now because most glue joints can be undone, and in many cases, the parts glued together can be saved and reused. All it takes is the right solvent and some time to let the solvent work, and you might even have what you need in already in your workshop.

A pipette or eyedropper targets the solvent exactly where you want but be prepared for runoff with a paper towel under the part.

Once the solvent has had a few minutes to work, gently try to move the parts apart. If one moves slightly, apply solvent to the gap.

Work the tip of a hobby knife into the joint and twist it carefully to separate the parts and open the gap for more solvent.



Solvent-soaked cotton balls or cloth strips on the joints can be kept active by dripping more solvent into them.

Glues and their solvents

The solvent for white PVA glues, think Elmer's, is water or isopropyl alcohol. Water works fine, but I prefer to use 91% isopropyl alcohol because the wood dries quicker than when water or 70% isopropyl alcohol is used.

For yellow PVA or carpenter's glues, such as Titebond, use isopropyl alcohol to soften the bond. The 91-percent solution works better and the wood dries quicker than the more common 70-percent solution, but either will work.

If you work in plastic, applying liquid plastic cement to a glued join will gradually dissolve the thin plastic along the join and allow the parts to be separated.

To soften two-part epoxy, I prefer acetone. Methylene chloride and methyl ethyl ketone (MEK) also work, but both are flammable and the vapors should not be inhaled. MEK has no place in the average workshop, but if one knows the hazards and how to use it safely, it does work. WD-40 can be used to remove epoxy from surfaces other than the model, but don't use it on your model because the residue will interfere with staining or painting.

Superglue can be softened using acetone or vinegar, but the latter is less effective.

If the joint is isolated, you can apply heat to soften white and yellow glue. Don't use it on wide areas because it will affect all the joints. Heat can also soften epoxy and superglue, but less effectively.

Unbinding with solvent

Before starting to undo a glued joint with solvent, you need to prepare for any runoff. Paper towels or a shallow dish can catch the excess. Apply the solvent to the glue joint using an eye dropper or pipette and let it soak in, **1.** Reapply as necessary to keep the joint wet.

After soaking for several minutes, try to ease the joint apart by gently moving the parts, **2**. Keep applying the solvent to the joint, and when the joint can be moved, work the joint apart, reapplying solvent as necessary to keep the glue pliable. As gaps appear between the parts, apply more solvent, into the gaps.

Afer the parts are separated, remove any glue residue. Dried glue can interfere with the fit of replacement parts.

To pry a plank from a deck using heat, first cut a hole in one end to accept a chisel or other pointed tool to pry up the plank. Photos by Bob Flipowski

Cautiously use a knife blade to make the gap larger, twisting it gently to open the joint and apply more solvent, **3**. Repeat this process each time you can spread the pieces farther apart. Cotton balls or cloth strips can be held in contact with the joint to be undone and kept saturated to keep the joint wet with the solvent, **4**. The joint will eventually open and be able to be separated. It is a matter of time, patience and gentle force to move the joint apart, but I have yet to be unable to undo a joint on a model using the appropriate solvent.

I recently had to remove a lift from a solid hull that I had glued and put aside for over a year. (A lift is one of the pieces of wood that are glued together to make a solid hull.) This partial lift was approximately 3 inches x 4 inches and ¾-inch thick and had been attached at the bow with water-resistant Titebond II, the dark version to show a dark line between the lifts.

I applied 91% isopropyl alcohol using a large pipette and kept the joint wet; there was a right-angle joint from the main deck at the rear of the lift. It was much easier to keep this joint wet than the flush joints at the perimeter of the hull. As the glue softened, I was able to insert a thin piece of brass into the joint making a small pocket that I kept filled with alcohol. Gravity did most of the work, pulling the alcohol farther into the joint. As the glue softened, I worked the brass under the part and applied more alcohol until eventually I could remove the lift.

Once the joint is undone, remove all glue residue while still soft or the surfaces will not fit back together, **5**. Dry glue can be sanded away, but it is easier to eliminate while it is still soft.

Turn up the heat

A soldering iron can be used to remove individual planks from a hull or deck without loosening adjacent planks, but it will most likely result in damage to the plank you want to remove.

As the tip of the soldering iron is run along the plank, the heat softens the glue and the plank can be gradually pulled up. Photos by Bob Flipowski

Most wooden ship modelers will have a plank bender at the workbench, and it can be useful for undoing glue joints over larger areas.

Remote-control airplane builders use a heat iron to shrink plastic film over frames. The same tool can be used to separate large glue joints.

Using a modified chisel blade or another thin, sharp object, cut a groove through the plank so one end can be lifted slightly, **6**. Touch the tip of a hot soldering iron to the plank and move it down the length gradually lifting it as the heat releases the glue's bond, **7**.

If you are working with larger pieces or are not worried about adjacent joints being softened by the heat, you can use a plank bending tool, **8**. Radio-controlled airplane builders use a small heating iron that can also be used, **9**. Applied to a glue joint, these tools can be controlled so they won't burn or discolor the wood so it can be reused.

Final thoughts

It can take time, but most glues can be softened, eventually, and the joint undone if you have the patience to keep it wet with the solvent and work the pieces with gentle force until they separate. A little patience goes along way. **FSM**

Cleaning sandpaper

Prolong its life with a rubber cleaning stick

BY KURT VAN DAHM

Sandpaper tends to clog with wood or styrene during use, making the sandpaper less and less effective as more and more wood or plastic dust accumulates in the grit. Many modelers replace the sandpaper when this happens, going through a lot of sandpaper. As it turns out, this is unnecessary because you can remove much of the debris.

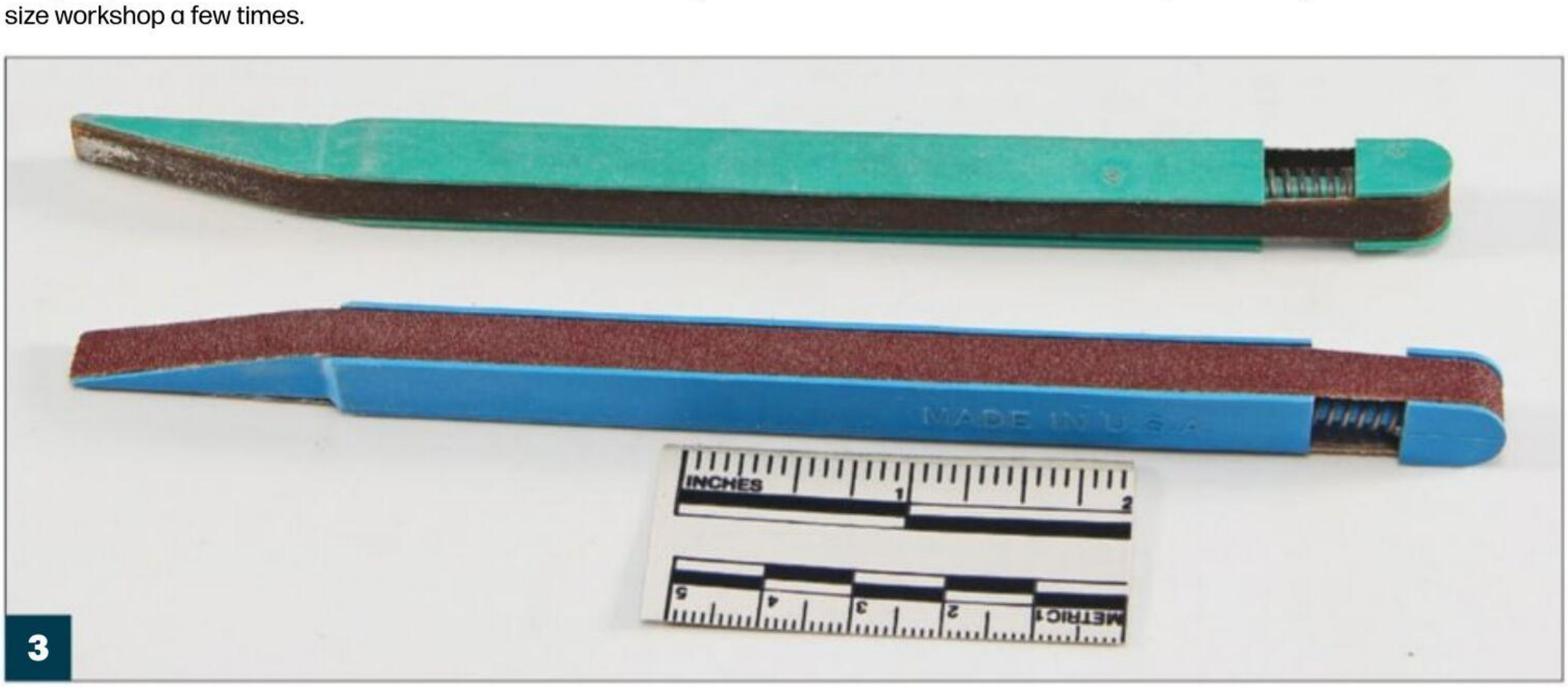
Sandpaper can be cleaned using rubber. Hardware and woodworking stores sell sticks of abrasive rubber for this purpose. Most are 1.5 inches square and 6-8 inches long and usually cost less than $10. A single stick should give the average modeler many years of service, **1**.

The rubber stick can be used on sheets of sandpaper, sanding sticks, sanding blocks, sandpaper discs on a disc sander, and belts on belt sanders.

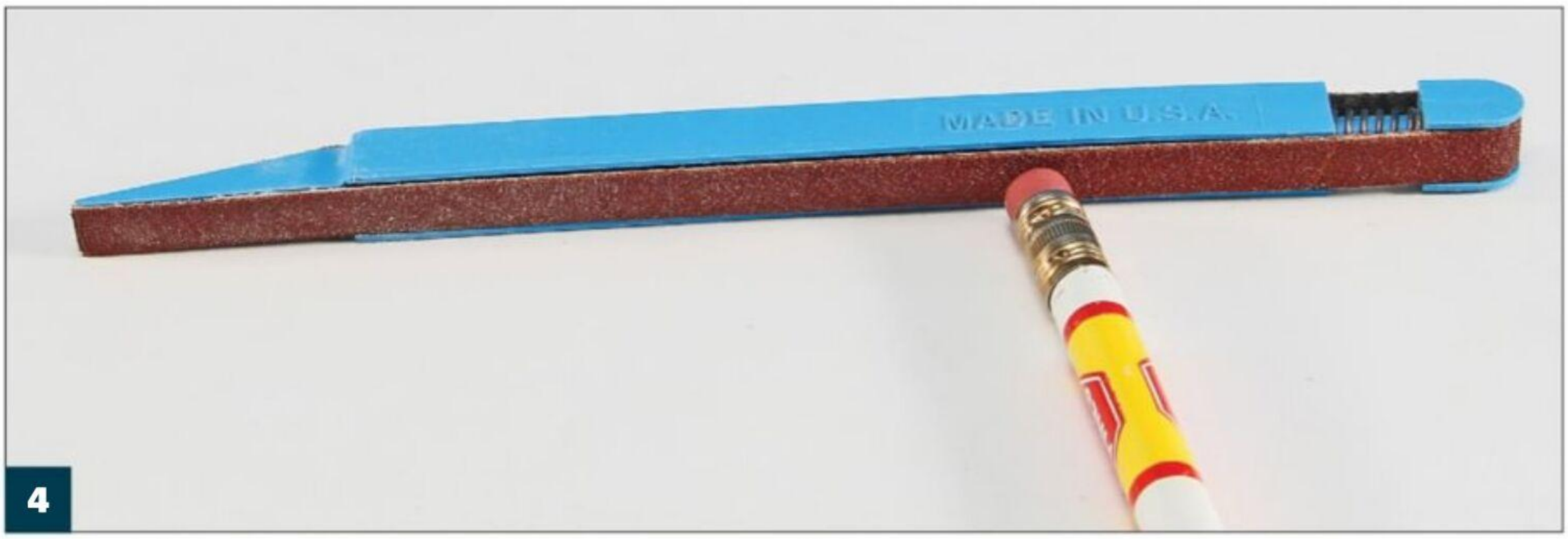
To clean sandpaper, hold the sheet on a bench or other surface and drag the rubber stick across the surface, pressing as hard as is

This abrasive sandpaper cleaning stick has lasted at least 10 years in my shop – and I've borrowed it to clean belts and discs in my full-size workshop a few times.

Prolong the life of your sanding sticks by hitting them with an abrasive rubber stick before they are too far gone.



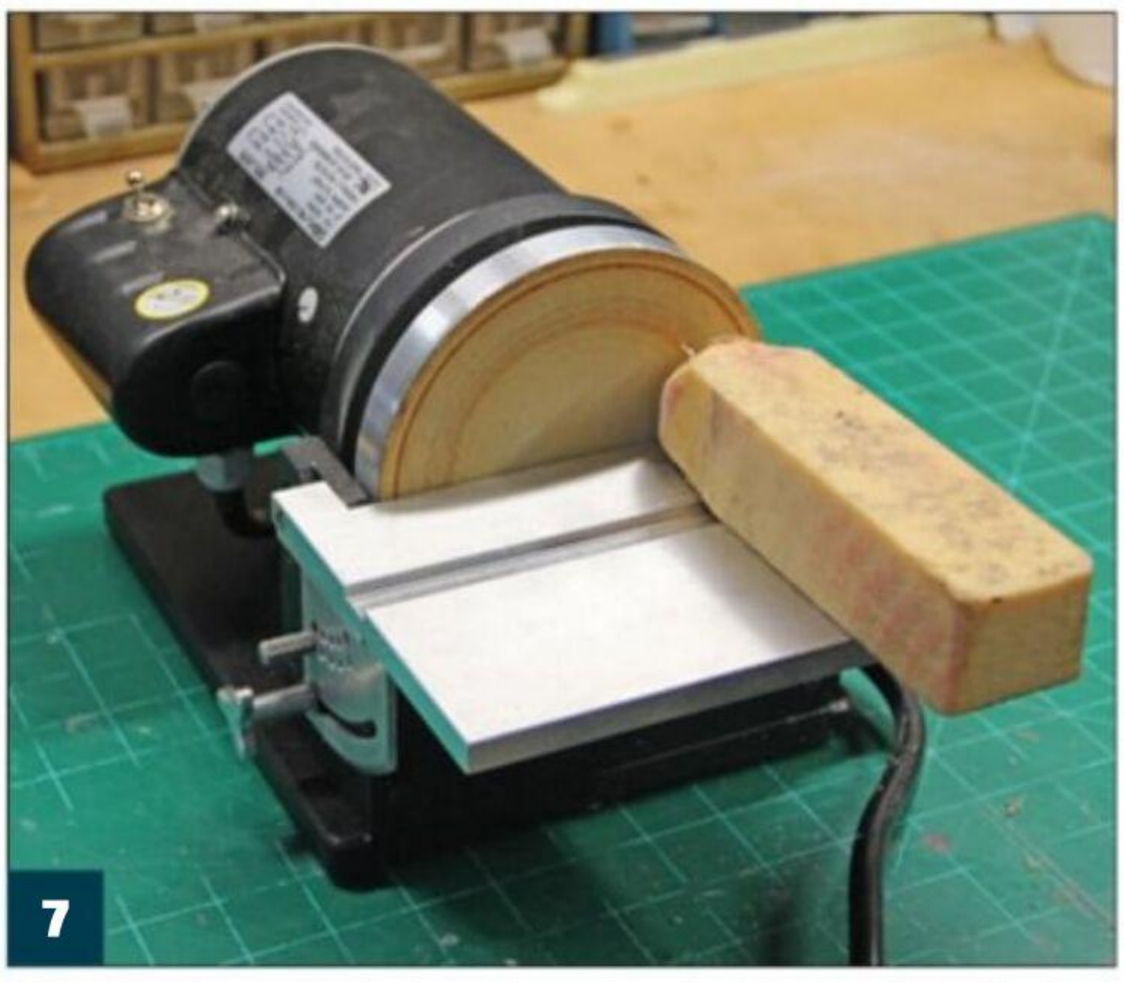
These handy manual belt sanders are great for getting into tight spots. These were made by X-acto, but you can find similar sanders from other manufacturers.



For fine tools like belt and twig sanders, consider using a pencil eraser. It's the perfectly sized tool for the job.

Some sanders, like these blocks, are beyond redemption. A neighbor borrowed them and returned them with sections completely filled so even the heaviest cleaning stick treatment won't work.

Rather than changing out the sandpaper in hand-held sanding blocks, consider cleaning the abrasive It only takes a few minutes and saves you money in the long run.



When cleaning motorized sanders, move the block back and forth across the moving abrasive. Be careful of your fingers!

necessary to clean the paper. If you do this before the grit is completely clogged, most, if not all the collected debris will be removed. Foam-backed sanding boards or sticks will last a long time if they are cleaned before getting too clogged, **2**. I lay these on the workbench and rub the sanding surface with the cleaning stick because the former tend to bend if done the other way around.

Small belt-fed hand sanders are commonly used by modelers, **3**. When cleaning them, I find it easy to attack the rubber stick with the sanding belt rather than rubbing the stick along the belt. Thin belts or sanding sticks can also be cleaned with a pencil eraser, sizing the tool to the job, **4**.

The surfaces of the metal sanding blocks made by Midwest Products and others using sintered bronze can be cleaned with the rubber stick as if they were sandpaper unless they get filled in too much, **5**. Wood, metal, and other hard blocks that are wrapped with sandpaper are easily cleaned using a cleaning stick. And don't forget Sanding blocks of wood, metal or other hard surfaces with wraps of sandpaper or self-adhesive sandpaper can benefit from a thorough cleaning, too, **6**.

Resuscitating a sanding disc is done with the motor running, **7**. Support the cleaning stick on the table of the sander and press it against the rotating disc. Usually there is a band of accumulated material on the disc and very little elsewhere. Concentrate on the band but go over the entire disc. Better yet, clean the band of accumulated wood as soon as it appears before it gets too clogged.

Larger belt sanders can be clamped into a vise and turned on while the rubber stick is moved back and forth across the abrasive surface. Smaller, hobby-sized motorized belt sanders can be cleaned by holding the unit in one hand and the cleaning stick in the other.

These techniques will remove wood and styrene equally well, unless the plastic has melted and solidified in the grit, not uncommon when sanding styrene with powered disc or belt sanders. I have ruined sandpaper by melting plastic with powered sanders. It is good practice to sand styrene slowly and steadily to avoid melting it. **FSM**

Bending BRASS PIPES and making FITTINGS

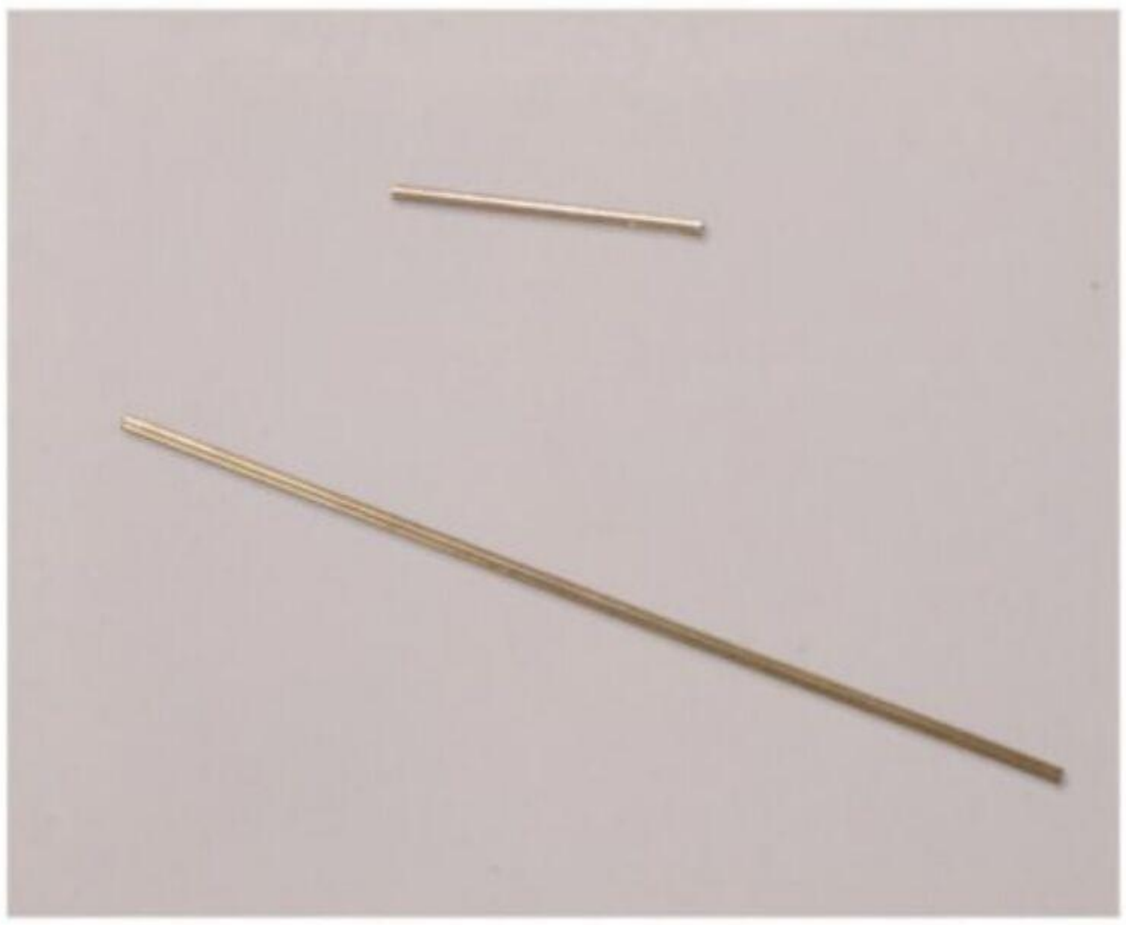
It's not as hard as you might think

BY STEVE WHEELER
ADDITIONAL PHOTOS AND TEXT
BY TIM KIDWELL

Sometimes we are faced with making odd pieces of hardware. Models containing exposed plumbing or fuel lines sometimes need elbows or other fittings where the pipes change direction. Occasionally these things may be available commercially (Plastruct has a series of plastic pipes), but those may be the wrong size or shape. However, it's not too hard to make your own.

To bend brass to make your own elbows, goosenecks and the like without kinking the material, first cut a length of appropriate-diameter brass tubing or rod with a rotary tool and cutting disc. Hold one end of the tube with pliers and heat the rest of the tube with the flame of a butane torch to anneal the brass. You'll know it's at the right temperature when the brass glows bright red, **1**.

Quench the brass in water — you may hear this step isn't necessary, but you'll be able to start working it quicker by quenching the metal.



Plug one end of the tubing with either poster putty or masking tape, **2**. Mix a thin paste made of flour and water and use a 12-gauge hypodermic needle to fill the tube, **3**. Make sure to tap the tube to get out any air bubbles and then top it off. Put the tube in the freezer for an hour to make sure the paste hardens.

Remove the tube from the freezer and place it against a form and bend. Make sure the form does not have a sharp corner or you will still kink the tubing, **4**. When you have made all of your bends, rinse the tubing with hot water to get out any paste that may still be inside, **5**.

To model a simple elbow, slide small washers onto a bent brass rod or tubing with 5-minute epoxy between them, **6**. The washers can be anything, like slicing rings off metal or plastic tubing of correct diameter to fit around the pipe. Alternatively, you could purchase washers from a retailer like Model Motorcars (modelmotorcars.com).

The epoxy will build up the space between the washers, and the result will look like a cast fitting. Epoxy is self-leveling and will smooth out between the washers; a coat of paint will finish the look, **7**.

A muffler assembly may need a slightly different approach. Take a jacket of larger diameter aluminum or brass tubing and join them together at the ends with brass elbows bent to the necessary angles, **8**.

When you have all of your pipes made with their fittings, test-fit them on your model and make any necessary adjustments, **9**.

You can use this process to adapt a variety of pipe sizes for your scale model.

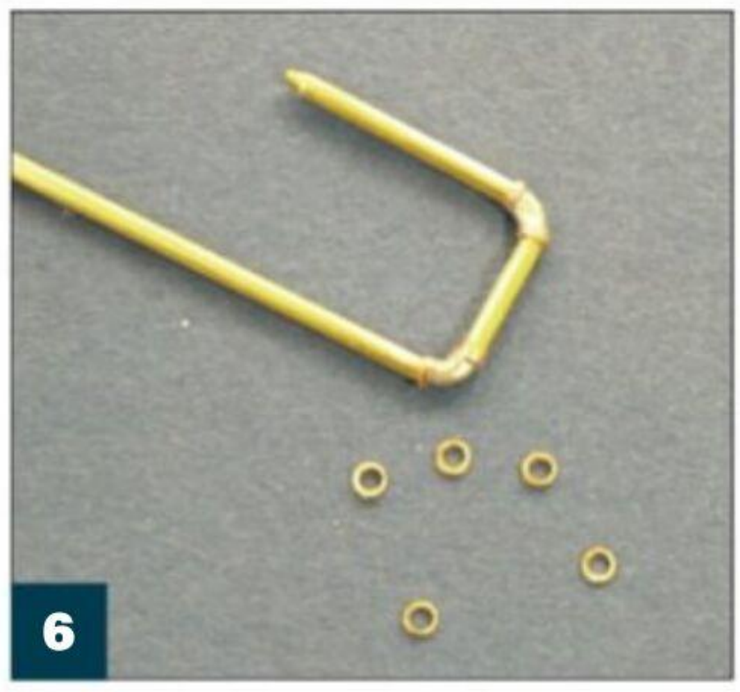
The first step for bending brass tubing or rod is to anneal it. That means heating the metal to around 700 degrees Fahrenheit. Hold one end of the tubing with pliers and heat the rest with a butane torch. You can burn yourself, so be careful!

If you use tubing, plug one end of the tube with poster putty, masking tape, or some other easily removable stopper.

Just bending brass tubing will cause it to crimp. To avoid this outcome, fill the tubing with a slurry made from flour and water. A 12-gauge hypodermic needle with the end cut flush and a syringe works nicely for this job. Put the tube in a freezer for an hour.

You'll need a form to bend your tubing or rod along, like this thin piece of plywood with a rounded corner for a 90-degree bend. Do not shape the brass around a sharp corner because you'll kink it.

When you've finished making all of your bends, rinse any remaining paste out of the tubing with hot water.



To model pipe fittings on your newly bent pipes, use washers that fit over the pipe and coat the intervening space between them with 5-minute epoxy. The epoxy, when hard, will create a cast-metal look.

Here, you can see a couple of examples of washers on pipes with the epoxy filled between. On the bottom, the pipes have been painted and are ready for placement.

You can use this process to create all sorts of plumbing, like the parts of a muffler. All you need to do is pair bent pipes and fittings with aluminum or brass tubing to model different diameter parts.

I'm test-fitting the muffler and other pipes with elbows to a model. When you do this, make any adjustments at this stage and then glue them in place with a small amount of epoxy or superglue. **FSM**

Thoughts on BENDING WOOD

Straight talk about making curves

BY STEVE WHEELER

1

The cabin sides and coamings on this U.S. One Design racing sloop are pear and the bends were gentle, so I bent them by hand and glued them in place. Wood strips cut to the inside cabin shape were added to the base as formers before the sides were bent.

Ship models are curved objects and almost nothing on them can be made without having to bend the wood used to build them. Bending wood can be frustrating, but here are a few thoughts that could make that easier. These methods work for me. Every situation is different and what may work in one case may not in another. There are many ways to attack the problem and these examples only scratch the surface.

Wood and what to use

Wood comprises two basic materials: cellulose fibers and lignin, a complex organic material that binds the fibers. If you can soften the lignin with heat, the cellulose fibers can slide past one another and that is what allows wood to be bent. When the lignin cools and solidifies, it will bind together the bent fibers so that the wood will retain much or all its new shape.

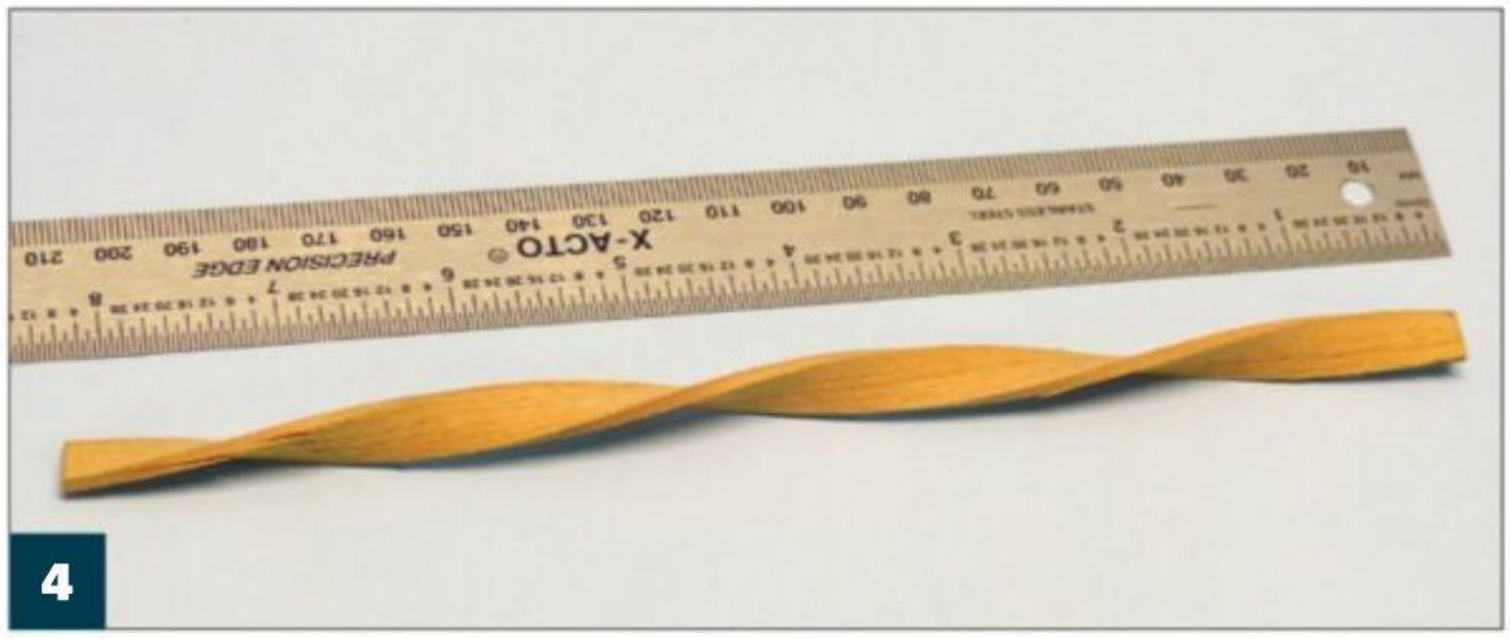
In general, hardwoods bend more readily than softwoods, and domestic hardwoods usually bend more easily than those from the tropics, such as ebony, although some mahoganies bend well. Fruitwoods — apple, pear, cherry and the like — are among the most easily bent domestic hardwoods. Birch and alder also bend well, as do aspen, basswood, poplar, and walnut. The pore size and grain structure of walnut and most mahoganies preclude their use in most applications, but they are found in kits and have a place in the hobby.

In the softwood family, cedar bends reasonably well; I have used bent close-grained cedar stock for deck planking.

2

This is a typical plank crimping tool.

This catalog image shows the Amati 7205 plank bender, which looks very similar to a soldering iron.



I soaked this alder – .080-inch thick, ⅜-inch wide, and about 8-inches long – in hot water for a couple of minutes and hand twisted this shape. The ends were clamped and, after the part dried overnight, there was almost no spring back. Alder, related to birch, is one of the best woods for bending, and I use it for most planking.

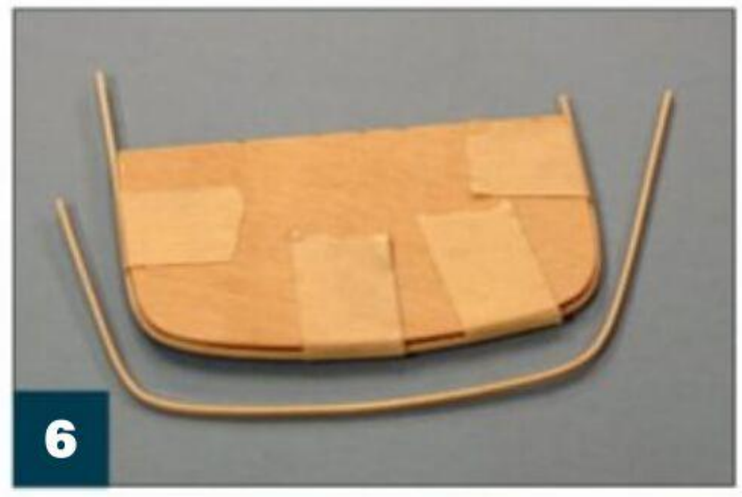
We can use many other woods in our models, but I have the most experience with those listed. Always test the bendability of a wood before committing it to a model, and it is advisable to have a spare piece or two in case you run into trouble with the first attempt.

Thinner stock bends more easily than thicker pieces and grain direction plays a large part, too; cross-grain, even in usually bendable wood, almost always will cause it to snap or fail in the process.

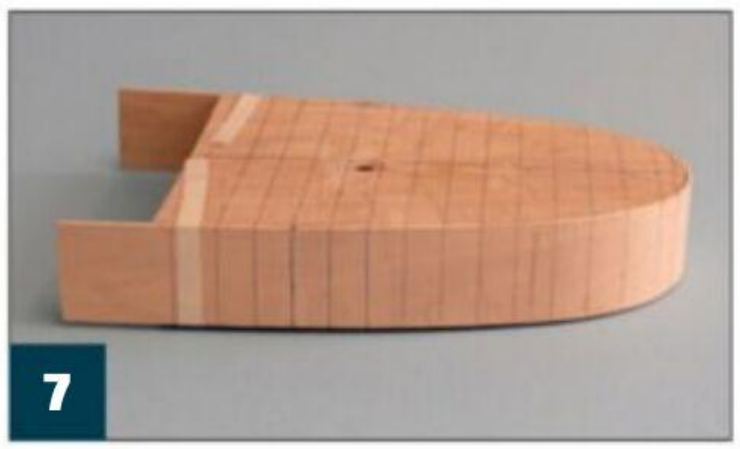
Avoid chemicals

I don't recommend using chemicals to help soften wood for bending. Ammonia, according to the Forest Products Laboratory, destroys the structure of the wood. I have seen references to using both vinegar and fabric softener to aid bending, but I have no experience with either of them. Chemicals may color the wood or impair the ability of adhesives or paint to stick or cure properly. The only liquid I use in bending wood is plain water.

Before and after: I cut .050-inch alder for a pair of rowboat garboards (outer pair). After soaking them in hot water for a couple of minutes, I hand-formed them, clamped them to a wood plug carved to the hull's shape, and left them to dry overnight.



The ribs for a Whitehall rowboat after steam bending. They are aspen, about .040-inch thick and .060-inch wide. Any spring back proved less of an issue because the rib conformed to the inside of the hull without much effort as it was sprung into place.



Here, I am forming the cabin side for a hunting boat. The wood is a substantial birch plank – 1/16-inch thick by about 1¼-inch wide. It was steam bent over the wooden form and left to dry overnight. Note the extra length on each end.

Here's the same cabin side, finished. Cutting openings for windows before bending would make it hard to curve the wood evenly around the form. The blank was extra wide to accommodate the hull's sheer and allow the front of the part to stay vertical once it was in place on the model. Details like these require planning.

Dry bending

Wood, by nature, is flexible to a degree. That means gentle bends, such as some planking, decking, or smaller moldings, can be sprung into place, clamped, and glued. This is by far the easiest way to bend wood, but it creates a certain amount of stress in the piece and may cause distortion of the structure to which it is applied, **1**.

Crimping

There are tools on the market that make V-shaped crimps in one side of wood strips so that they can be bent, **2**. I have not used any of these and, personally, I suspect they would be of limited use.

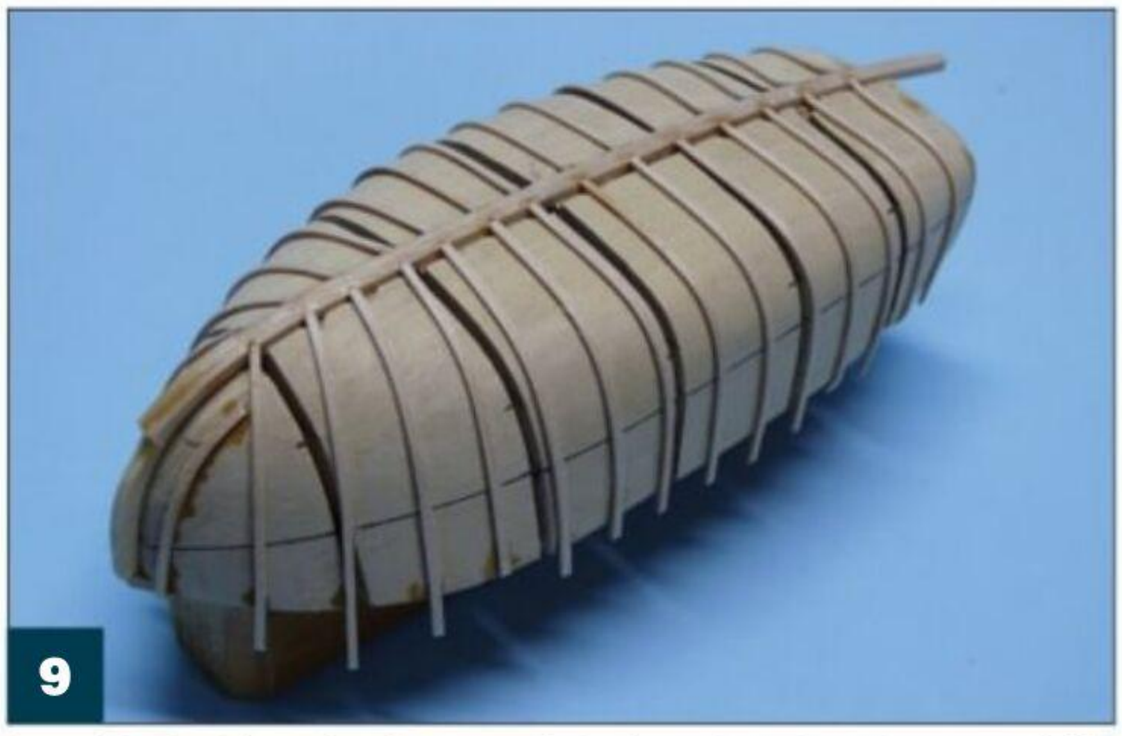
Bending with heat alone

Heat softens lignin, so wood sometimes can be bent dry over a heated metal pipe or the shank of a soldering iron. A small iron or commercial bending tool like those from Micro-Mark and Amati can also be used, **3**. These tools generate localized heat, so it probably takes longer to make bends. Wetting the wood probably makes things easier. In some cases, wood can be softened with a heat gun, but beware of scorching.

Hand-forming with hot water

Of all the ways to bend wood, this is the one I use the most. If you soak a strip of wood in really hot tap water, the lignin will plasticize and the wood will be surprisingly flexible. (It only takes 1-2 minutes; long soaks are not really needed for the thinner stock we typically use.)

Now, you can form the strip into roughly the shape you want by working it with your fingers, **4**. Go slowly and gently. Work along the piece, holding it between your thumbs and forefingers, and bend it as



I used the building plug for a small dinghy to bend its ribs using .040-inch by .080-inch birch ribs. After soaking the strips in hot water for a minute or two, I bonded them to notches in the keel, pulled and bent them over the outside of the plug, and bonded them to the bottom of the plug.

Here is a double-curved ogee (S-shaped) cover piece for the transition between two deck levels made from a .080-inch x 7/16-inch strip of pear. After soaking it in hot water, I hand formed it to the approximate final shape and clamped it between forms to dry.

The image shows kerf-bent deck supports. The "teeth" are glued to the inside of the bend or, in this case, the hull. These are lumberyard pine, around ¼-inch square.

Each plank on this deck had to be edge bent, as in bent against the widest dimension, to conform to the shape of the hull.

you go along. Avoid trying to create the entire bend at once. Instead, go over the part several times, bending it more as you go. Finish by bending it a little beyond what is needed. It takes a while for the lignin to harden, so the wood will remain flexible for a surprisingly long time. If it begins to stiffen up before you are done, simply soak it in hot water again.

I hand form planking this way and then clamp it on my model or building plug to fully cool and dry before gluing it in place. Wetting wood causes the grain to raise and the part to swell slightly. I give a plank, for example, a day to stabilize and shrink back to its original width before I release it from the clamps and do any finish sanding. Done this way, there will be very little spring back and, once wood has assumed a specific curve, it takes little effort to re-form that curve even if there was some spring back. Surprising shapes can be made with hands and hot water. Twists, as one finds in the garboards of some rowboats, are a good example, **5**.

Steam bending

Bending with steam accelerates the process and is useful for extreme bends. An actual steam box is not necessary. I use a low-cost steam iron — don't use the household's clothes iron, get one dedicated to the process. I set it to the highest heat setting, but I do not use the steam the iron makes.

A bending form of some sort is usually required for this process. It can be made of scrap and does not need to be complicated. Wet the wood in hot water for a minute or two and place it on the form. It may be necessary to hold it in place with tape.

To provide water for the steam, I cover this with a strip of wet bath towel or a heavy-duty shop towel doubled over several times. The blue Scott shop towels are best for this as they can be reused, but regular paper towels can be used in a pinch. Press the iron down on top of the form and slowly roll it along. The water in the towel will flash to steam and the wood will soften and bend around the form, conforming to it as you go along, **6**. It may be necessary to re-wet the towel and go over things more than once.

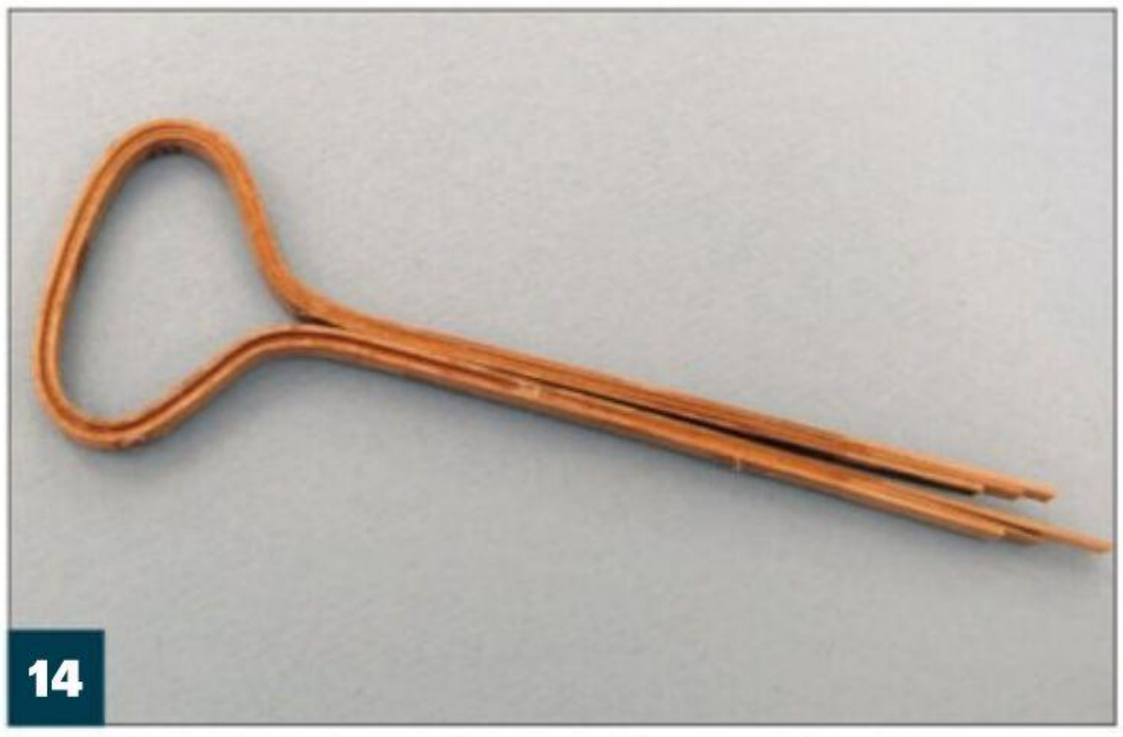
It is advisable to make the strip being bent longer than necessary, because pulling on the free end during the process can help the wood sit properly over the form. When the bend is completed, remove the towel and tape or clamp the free end before letting the wood cool and dry. It will retain its shape without much spring back.

If holes need to be cut in a part or if there's final shaping to do, take care of that after bending, **7** and **8**. It is easier to bend a piece that has a uniform width rather than one that has been cut to final shape to prevent hard spots in narrow sections.

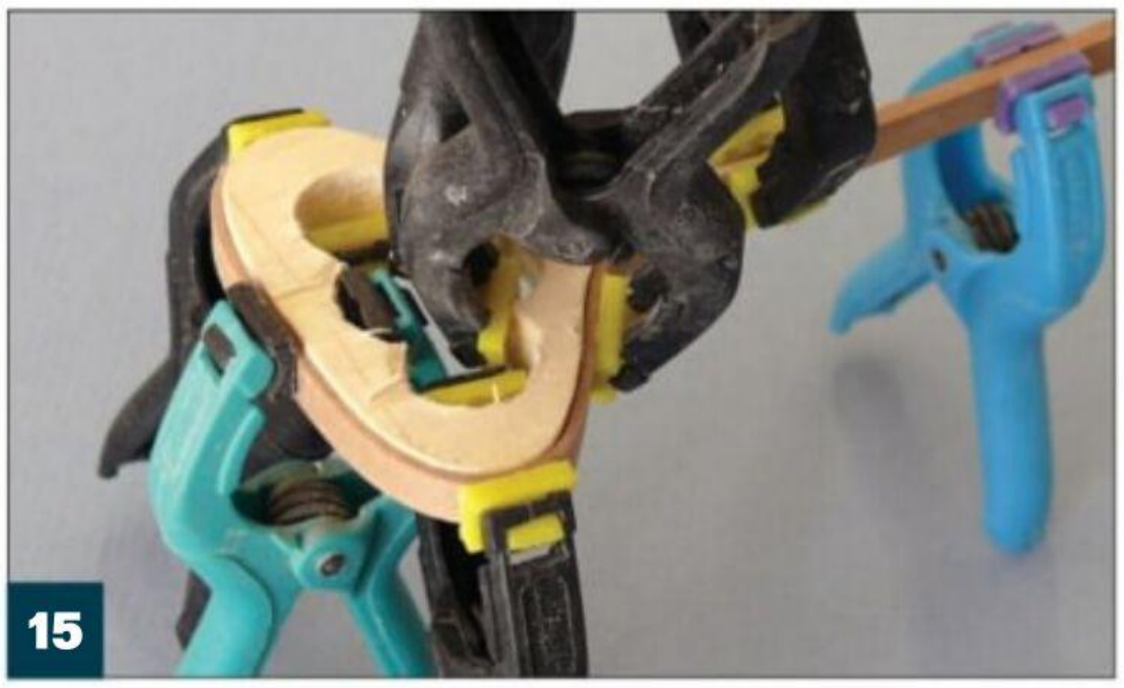
Bending over forms

A form of some sort usually is needed to ensure the bend will take up the correct shape. Steam is not always necessary but can be used for tight bends. Forms can be an actual hull or building plug, **9**, a simple convex piece of wood, or a more complicated affair incorporating both

Using steam, I bent each of the cedar deck strips to its rough final shape. One end was held in a stop on the form while the plank was slowly steamed and maneuvered over the curve while being kept level and flat. This is not particularly difficult, but it can be challenging.



A complicated tiller for a sailboat model was made with bent laminations and steam bending. The width of the part across the "eye" is about 2 inches.



Here's the bending form for the tiller. Only the first layer has been wetted, formed, and clamped. The outside curves required steaming. Two additional layers will be applied, each one bent like the first, then glued and clamped onto the others.

With all the layers applied, the long ends can be glued together and the rest of the bend – the S-shape between the eye and the base – can be shaped.

convex and concave shapes and/or twists, pretty much anything you can imagine, **10**.

Kerf bending

Typically, kerf bending is used for parts that will be covered and not seen, such as under-deck supports, **11**. It involves sawing repetitive kerfs, usually in heavy wood members, to make the wood more flexible and then bonding it in place. The deeper the kerfs, the easier the part will be to bend; the closer together they are, the tighter the possible bend.

This process can also be used to conform a heavy plywood deck to its crown. Rip grooves close together down the length of the part. Again, the depth of cut and the spacing will determine how easily the plywood will bend. I always fill the grooves with epoxy before placing the decking. This ensures the plywood will not crack over time and it makes it easy to adhere the plywood to its deck beams while the epoxy is wet.

Edge bending

Usually, we bend wood along its thinner dimension, but trouble can arise, for example, when you must bend a wide deck plank across its width, **12**. Wood will tend to buckle on the inside of the curve unless the ratio between its width and thickness is less than 3:1 and the bend is quite gentle. Usually, a form is necessary, but it need not be exact, **13**.

In the example shown in the photos, these deck planks are cedar strips ⅛-inches wide and 1⁄16-inches thick. I bent each one to the approximate shape on a form using steam.

While still flexible, they were hand sprung into the curve of the covering boards and superglued in place. Successive planks were bent the same way, each one nestling into the curve of the one before it. These planks did not buckle as they were not too wide.

If buckling is a problem, clamping the buckled area can force it level.

Bent lamination

Sometimes, extremely tight bends or heavy, complex parts are better built up from thin laminations glued together. Such was the case when I made a sailboat tiller, comprised of three separate strips of apple that were bent and glued together, **14**, **15**, and **16**.

The S-bend between the eye and the rudder head was made by steam bending the lamination over another form. In such situations, one must be careful to avoid breaking previous glue joints. The number of laminations required depends on the application, and generally, there will be little or no spring back with three or more.

Final thoughts

As I said at the outset, these are the methods that I use and have worked for me over the years. Not all of them will work for every situation, but it is a good idea to know how to use all of them for when the need arises. **FSM**

Simulate SPLICES

Make the end of your rope easier

BY STEVE WHEELER

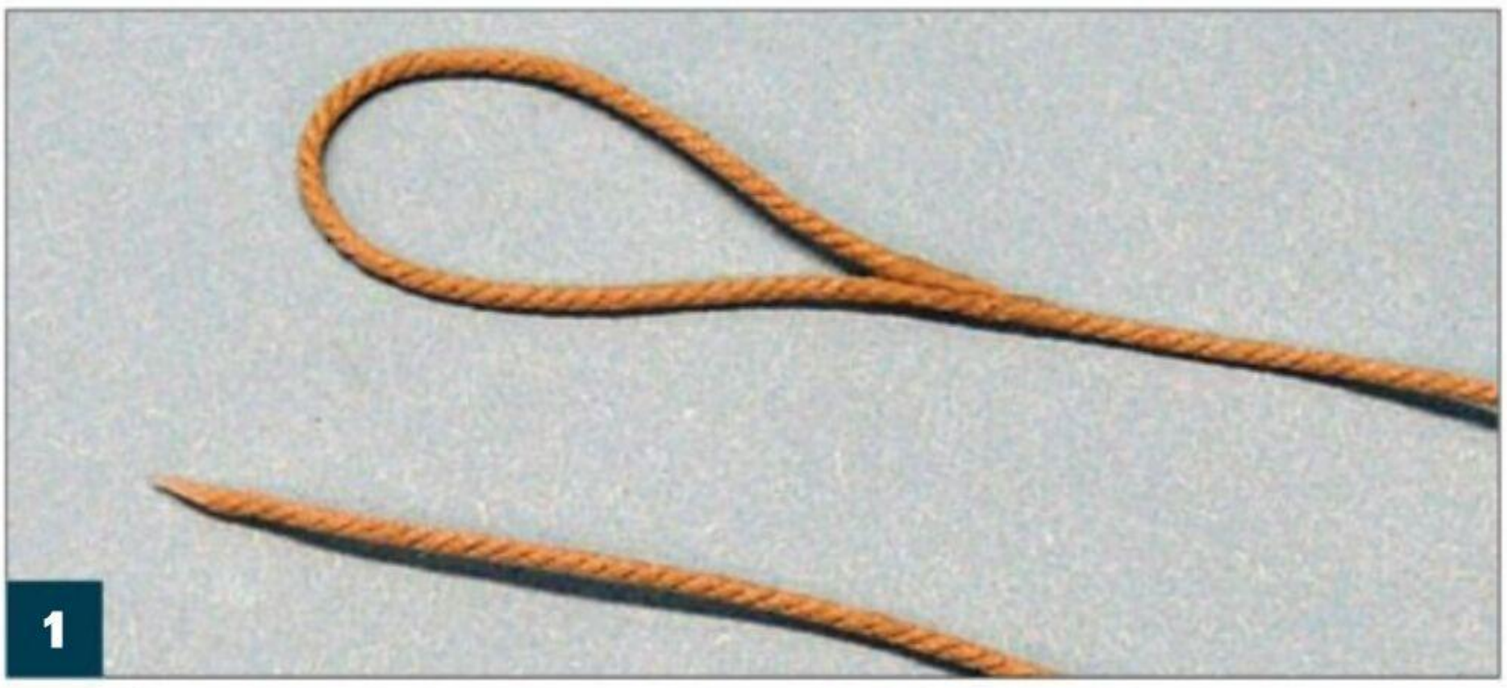
Much of the rope used aboard ships from ancient times to today terminated with splices. There are many different types, but among the most common was the eye splice, used to make a loop in the end of a line.

Many of our models substitute knots for splices, but these can have unsightly "tag" ends and leave us with an out-of-scale appearance. Almost any book on knotting and splicing can show you how to execute a real splice, and actual ones can be worked in model-sized line. But those can be difficult to do, particularly in tight places, and can be a real test of patience. I have spliced line down to .020-inch diameter. Where eye splices are called for on a model, reasonable simulations can be done that look like the real thing, are strong, and can be made in tight places with much less swearing.

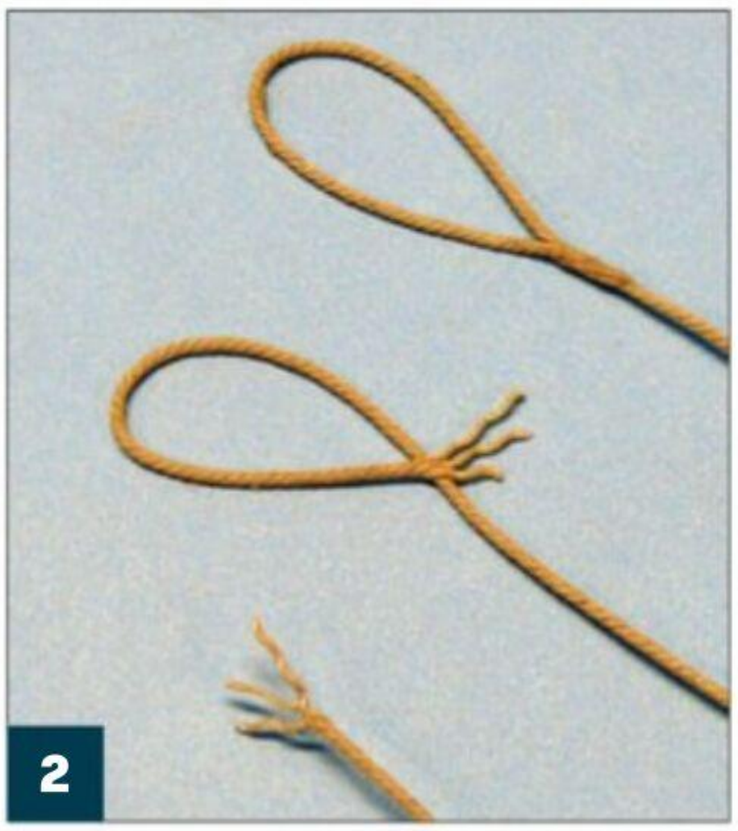
There are two methods I have used, and both can be done in much less time than an actual splice at scale. Both employ three strand line. I get mine from syrenshipmodelcompany.com, and it is perhaps the best model rigging line around. These methods use white glue, which remains somewhat flexible and will not change the color of your line the way superglue can. Both the examples shown here are done in 0.025-inch diameter line that has been lightly coated with beeswax.

Method One

Coat ¼-inch or so of the bitter end with common white glue, working it in with your fingers. When that has dried, cut the end of the line at a long diagonal angle with an extremely sharp blade. Cutting this diagonal sometimes works better if you glue the line somewhere in the middle and cut it there. The glue will hold the line together.



For the first method, make sure to get the correct angle on the cut to simulate the splice.



Cut each of the three separated strands slightly shorter than the one next to it and lay them across the rope with the shortest strand away from the loop.

Form a loop of the desired size with the cut end laying right next to the body of the line and apply a small drop of white glue under the cut end; hold the "splice" together with your fingers or tweezers until the glue sets up, **1**. You may find it necessary to squeeze or form the cut end slightly to make it lay down with no lumps or bumps. Once the glue is dry, coat the outside of the splice with white glue and let everything dry completely.

In place on a model, it's hard to tell that these are simulated splices.

Method Two

A bit stronger than the first method, this "splice" is easily made. Unlay the end of your line into individual strands and cut those strands off at an angle, **2**. To make the splice, form a loop with the cut ends overhanging the balance of the line and coat them with unthinned white glue. Complete the splice by wrapping the cut ends around the line, gluing them in place. Make sure the cut ends follow the lay of the line. Again, tweezers may help. Because the cut ends are different lengths, they will make a tapered joint as they wrap around. To finish, coat the outside of the splice with white glue, working it in with your fingers. This produces realistic splices that look right at home on a model, **3**. **FSM**

Making round EYEBOLTS

A little time will turn out exactly what you need

BY STEVE WHEELER

You can buy scale eyebolts, but I prefer making my own, and you should, too. There are several advantages for doing so: You can make eyes of any size you need. They will all be uniform and quality because you made them. And the twisted shanks provide more resistance to pulling out when they are glued into holes.

The process couldn't be easier. First, you'll need a supply of wire in the size or sizes required. You can find brass wire in many diameters from many outlets — a quick internet search will make it easy for you. Always look for "solid brass wire," and it should be dead soft. Annealed and blackened iron or steel wire or anodized aluminum can be used and can be found from craft and jewelry-making stores or even ship-modeling websites.

You'll also need a pair of pin vises and a mandrel. The mandrel can be anything cylindrical and of the correct diameter for your eyebolt. Drill bits come in particularly handy in this capacity because they are available in a wide variety of sizes.

First, loop the wire and clamp it in one pin vise. Place the mandrel in the other pin vise and then put the loop around the mandrel.

Twist the pin vise with the wire. The end will begin to wrap and the eye forms on the mandrel. Continue twisting until the loop pulls tight.

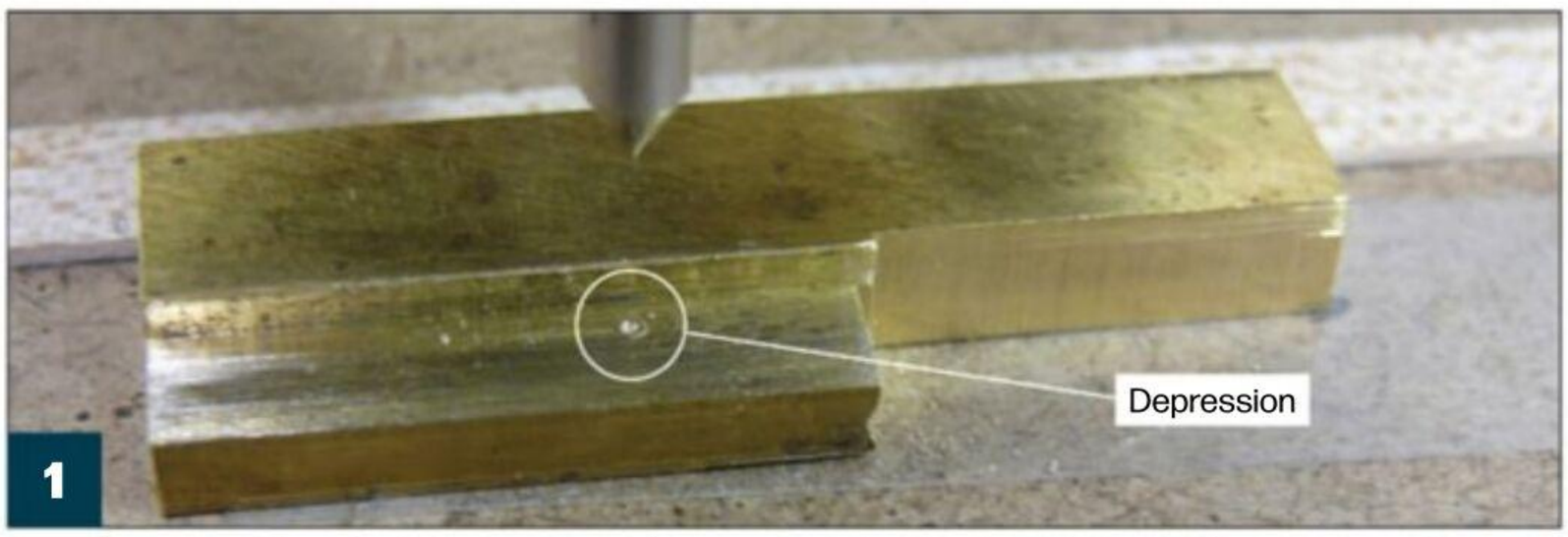
Slip the finished eye off the mandrel, clip the twisted part to the desired length, and you are done. Repeat the process for as many eyebolts as you need. Useful for ships, World War I biplanes, and just about anytime you need a round eyebolt on a model. **FSM**

EMBOSSING dimples

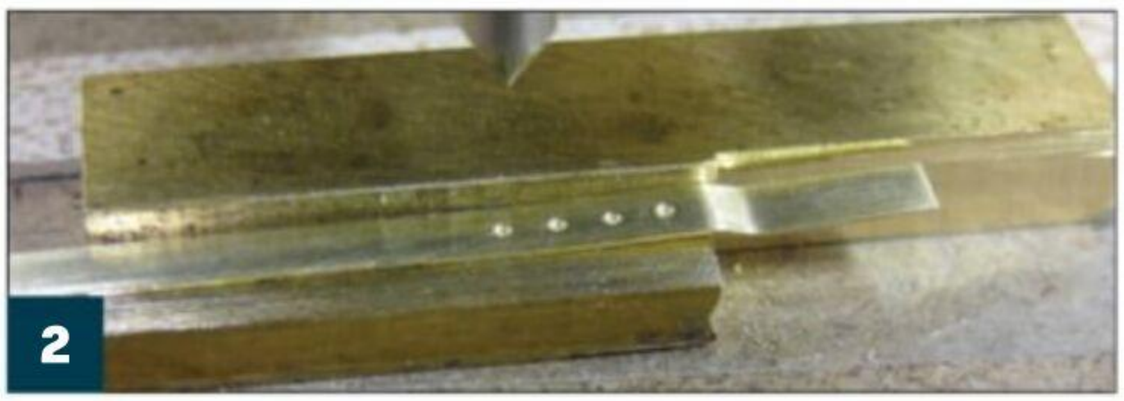
Simulate rivets or nail heads with a modeler's drill press

BY STEVE WHEELER

Simulating nail or rivet heads in thin brass or copper can be one way to eliminate actual fasteners or reproduce those thousands of nails when coppering a ship's bottom. The process is relatively easy if you have a modeler's drill press.



To make a round-headed screw in sheet brass, grind the shank end of a drill bit to a point. Fasten a piece of brass to the drill-press table with double-stick tape and make a small depression by turning the machine on and running the point into the brass.



Place brass sheet on top of the brass buck and, with the drill press off, push the point of the bit down until it stops. That will form a concave dimple in your part.

Turn over the brass sheet and you'll find a nice rounded screw head on the other side. To keep the heads straight, you'll want to use a piece of scrap metal or wood for a fence. The depression in the brass buck will ensure the dimples are uniform. Feel free to experiment to produce the dimple sizes you are looking for.

To make countersunk nails like those holding copper sheathing to a ship hull, start by grinding off the sharp end of a hypodermic needle and sanding away the burrs and any sharp edges. Chuck it into your drill press and, with the machine off, press the tube into the surface of adhesive-backed copper tape. Do this on a metal or hardwood surface, and don't press so hard you cut through the copper.

This process creates a ring around a raised dome. Now remove the paper backing, attach the copper to your model's hull, and carefully burnish it with smooth plastic. The result is a ring around a central, flat nail head. Use different-diameter tubing to make various nail sizes and a fence to keep things straight. **FSM**

How to COPPER A HULL

Materials, tools, and techniques for a realistic appearance

BY ROGER FRYE

Copper plating on model ship hulls often looks out of place because embossing the fastenings regularly results in oversized bumps or dimples. On real ships, the copper plates were attached with nails pounded flat that left only a small depression. Since the nailing pattern is generally subtle, the decision to depict it becomes a matter of scale. There seems to be a consensus among ship modelers that depicting nails in 1/96 scale or smaller is difficult to appreciate without magnification and can be eliminated, while at 1/48 scale or larger, the nailing pattern adds visual interest — if done well.

While researching and building his 1/48 scale *Kate Cory*, Roger Frye dove deep into the ins and outs of coppering hulls and came back with his process for realistic copper plates.

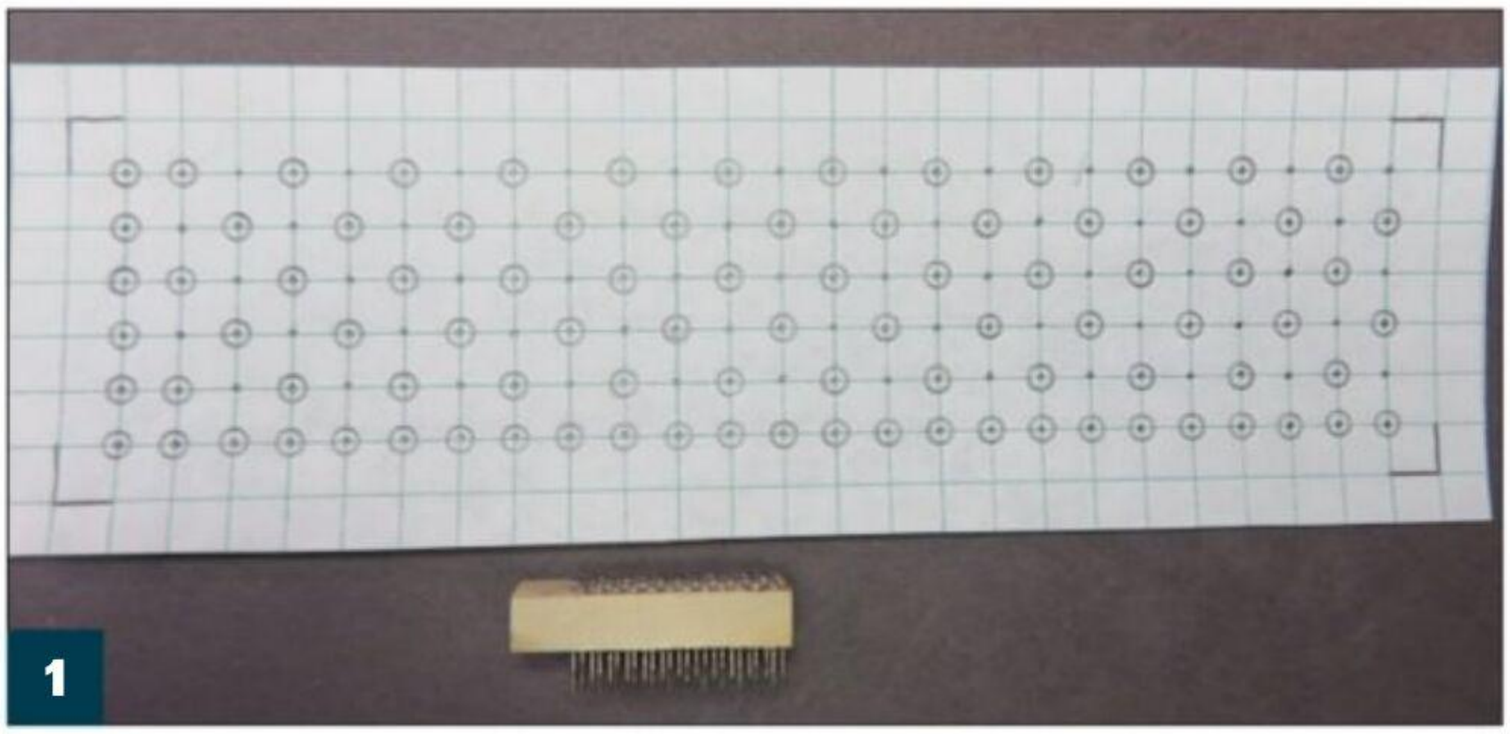
Methods for depicting nail patterns on plates include photo-etching and use of a ponce wheel. You can use them successfully, but the process can be laborious and expensive. It is also easy to underestimate the number of plates required. For example, my 1/48 scale *Kate Cory* model required over 500 plates.

Another issue is plates appear to be nailed at the overlap with closer nail spacing at the overlapped edges, which happens in the direction of the water flowing over the hull. However, in 1/48 scale and smaller, the degree of overlap doesn't much affect the plate pattern. So, keeping it to 1mm or less is fine. The critical factor is ensuring there is no gap between adjacent plates.

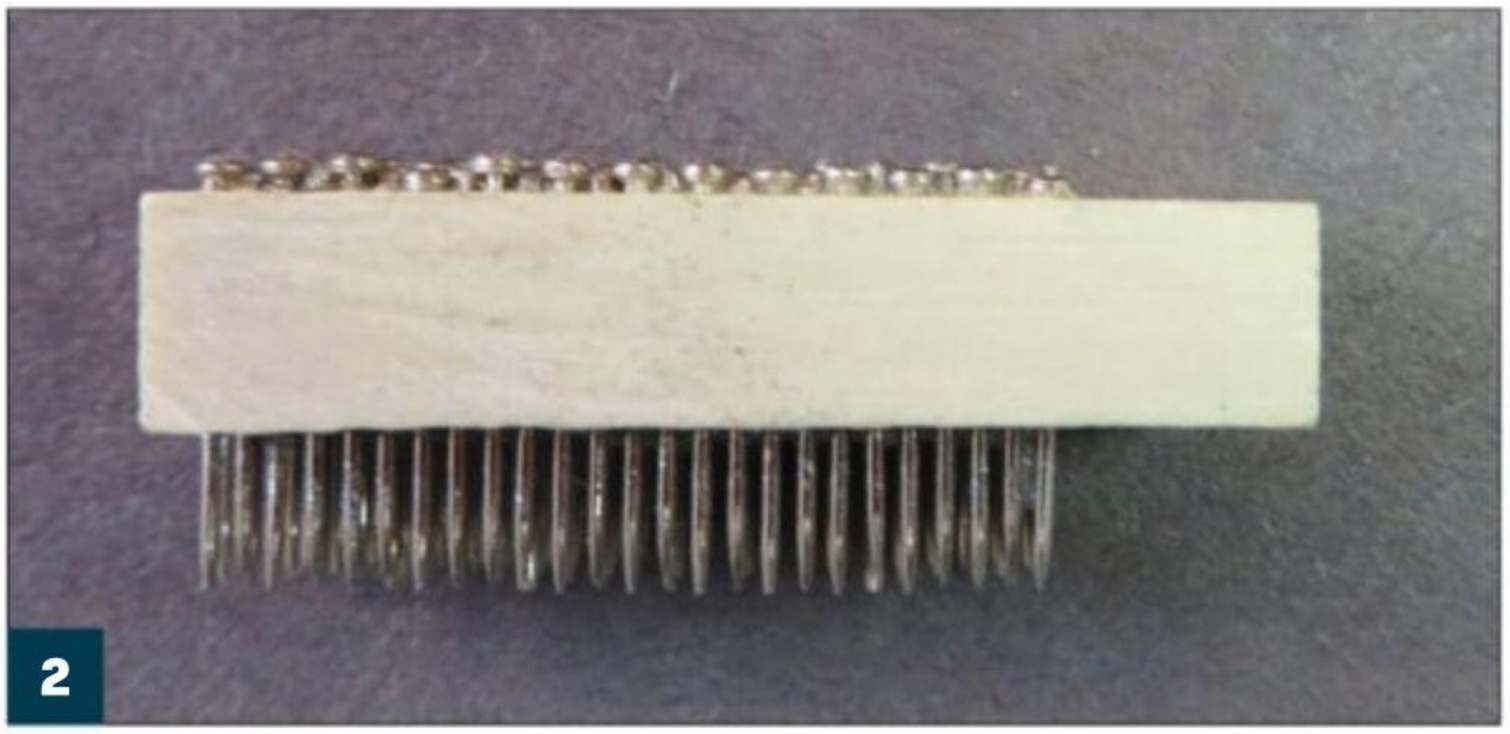
Choosing copper

First, consider the scale of your model and the size of the copper plates you are trying to replicate. The plans I used for *Kate Cory* (drawn by Erik A. R. Ronnberg and supplied by the Whaling Museum in New Bedford, Connecticut) showed the copper plates measured 48-inches x 14-inches and overlapped 1 inch to a side when fastened. Thicknesses were gauged in ounces: 30, 26, 24, 22, and 20. The heaviest plates were placed at the bow and diminished toward the stern and waterline. At full size, the plates would be between .04 to .01 inch thick, or .0008 to .0002 inch at 1/48 scale. Keep in mind, a typical plate (24 ga.) would be .02 inch thick, or .0004 inch at 1/48 scale. The differences are so miniscule there is no visual advantage to use varying thicknesses on the model.

Choosing the optimum thickness (close to prototype but easy to work) for model sheathing requires balancing several factors:



Pin pattern for embossing tool drawn on graph paper and the tool for comparison.



Ninety pin locations were bored into the a holly block and filled with applique pins.

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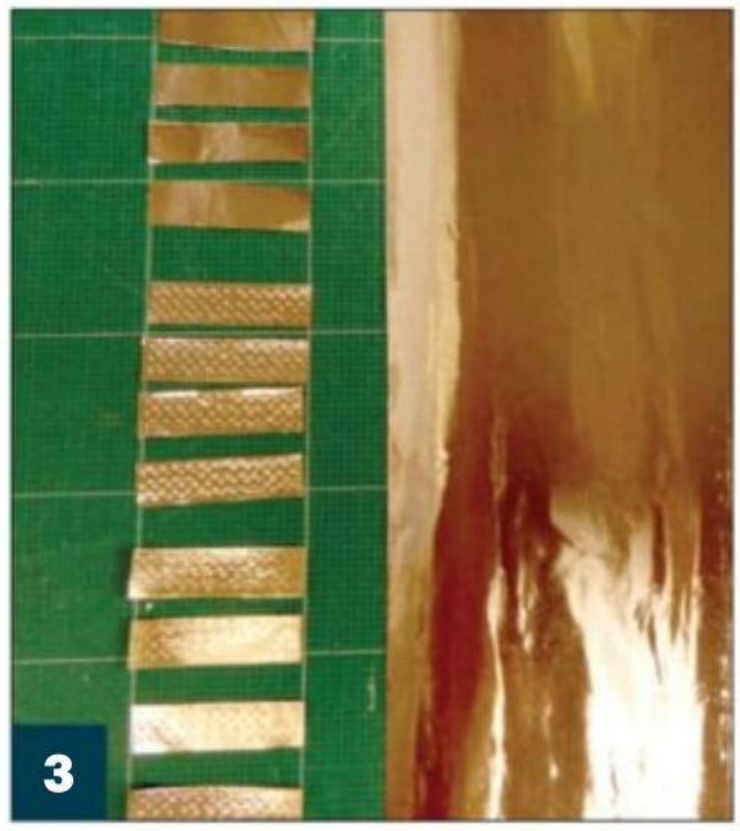
"Scratchbuilding *Kate Cory*, Part 1," Thomas J. Lauria, *Ships in Scale* (November/December 2013)

"Notes on Copper Sheathing Tacks," Edward Von der Porten, *Ships in Scale* (March/April 2014)



Stock copper with cut plates. Top: four newly cut plates. Middle: four embossed plates. Bottom: four plates rolled to flatten dimples.

• .0007-inch (0.7 mil) appears to be the thinnest copper sheet — foil, really — commonly available

• Foil is closest to prototype thickness and shows the most realistic overlap

• The thicker the foil, the more prominent the overlapping plate edges appear

• Handling and resistance to accidental marking is more problematic as the stock gets thinner; copper foil wrinkles easily and is difficult to smooth during installation

I buy copper from Basic Copper (basiccopper.com). For *Kate Cory*, I chose to use .001-inch (1 mil) annealed copper sheet, the thinnest they provide, and bought a 6-inch x 4-foot roll. To glue my copper to the ship's hull, I used Pliobond 25 contact adhesive. (If you aren't familiar, read the instructions and make sure to recap the bottle when not in use — it dries quickly!)

Preparing the copper plates

After some quick calculations, I determined I needed 515 plates for my model, 1 inch x 9/32 inch to match the scale. In the end, I made 576 to account for partial plates frequently needed in small areas.

The plan sheet for the hull plates showed the typical plate with about 100 nails arranged into five rows and 14 columns and around the edges. Using the plan as a guide, I sketched my nail pattern, **1**. There are about 90 pin locations (circles), and the rows are offset in a diamond pattern except for two edges where plates would overlap.

I wasn't about to stamp each of those individually on every plate. Instead, I made a tool purpose-built for the job. I cut a 1¼-inch by ⅜-inch block from holly (cuts smooth and doesn't chip with closely drilled holes). I drew a grid on the bottom of the block with a sharp pencil with 1mm spaces between rows and columns; intersections indicated pin locations.

Using a drill press with a 0.0225-inch (#74) bit, I bored a hole at each intersection. A ½-inch applique pin was pushed through each hole, and I placed the array against a flat surface to level the pinpoints before securing them by coating the back of the block with superglue, **2**.

The sharp points need to be dulled so they created dimples instead of puncturing the copper foil. I ran the array over emery paper, test-pressed some copper plates, and repeated until I obtained suitable dimples.

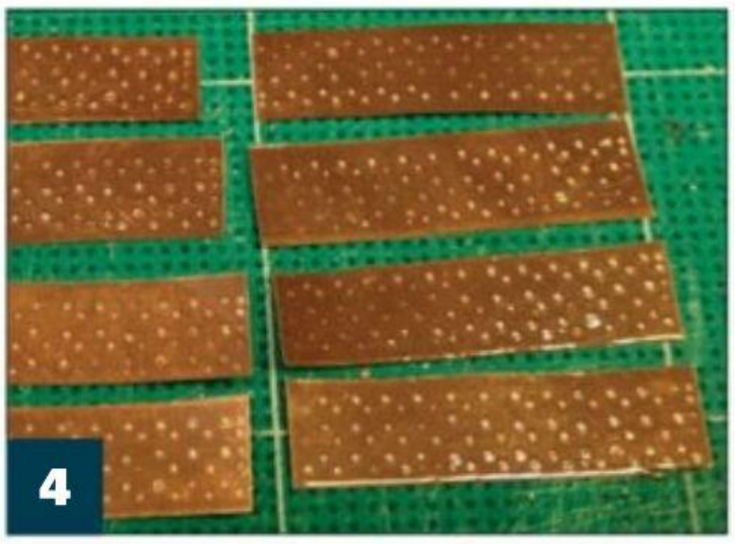
This is how you do it

At this point, it's about getting a process down to efficiently and correctly make each copper plate. First, cut the required number of plates using a No. 11 blade. Make sure the blade is sharp. You don't want to snag and tear the copper. As soon as the blade begins to dull, change it. Then roll each plate beneath a hardwood or plastic roller on a smooth, hard surface to remove bumps or dents. I used a 1-inch PVC dowel for the roller and a steel ruler for the hard surface; a sheet of thick glass would work, too. After that, I repeated the following process, **3**:

A. Place a blank plate on a self-healing cutting mat. Center the embossing tool on the blank, making sure the borders are even all the way around. The cutting mat material has just enough cushion to allow formation of nice dimples with minimum push-through.

B. Press down hard on the embossing tool with thumb and forefinger of both hands. Under continuous pressure, rock the tool back and forth and side to side.

C. Inspect the plate. There should be



Finished plates ready to install.

uniform dimples with few or no punctures. Repeated punctures indicate sharp points on the embossing tool that should be filed or sanded.

D. Place the plate, dimples up, on the hard surface. Roll the roller back and forth once, smoothly and evenly.

E. Inspect the plate. The dimples should be crushed flat but still visible, giving the impression of nails hammered flat.

I prepared the plates in batches of 50-75 spending about two hours per batch. When finished, you'll have copper plates ready to go on your ship's hull, **4**.

Gluing plates on the hull

When you're ready to paint your hull, you're ready to put on the copper plates. That means any imperfections have been filled and the hull sanded smooth. Examine your plans. If they provide a plate pattern, mark the waterline and belt borders on the hull. Belts are regions where rows of plates run generally parallel.

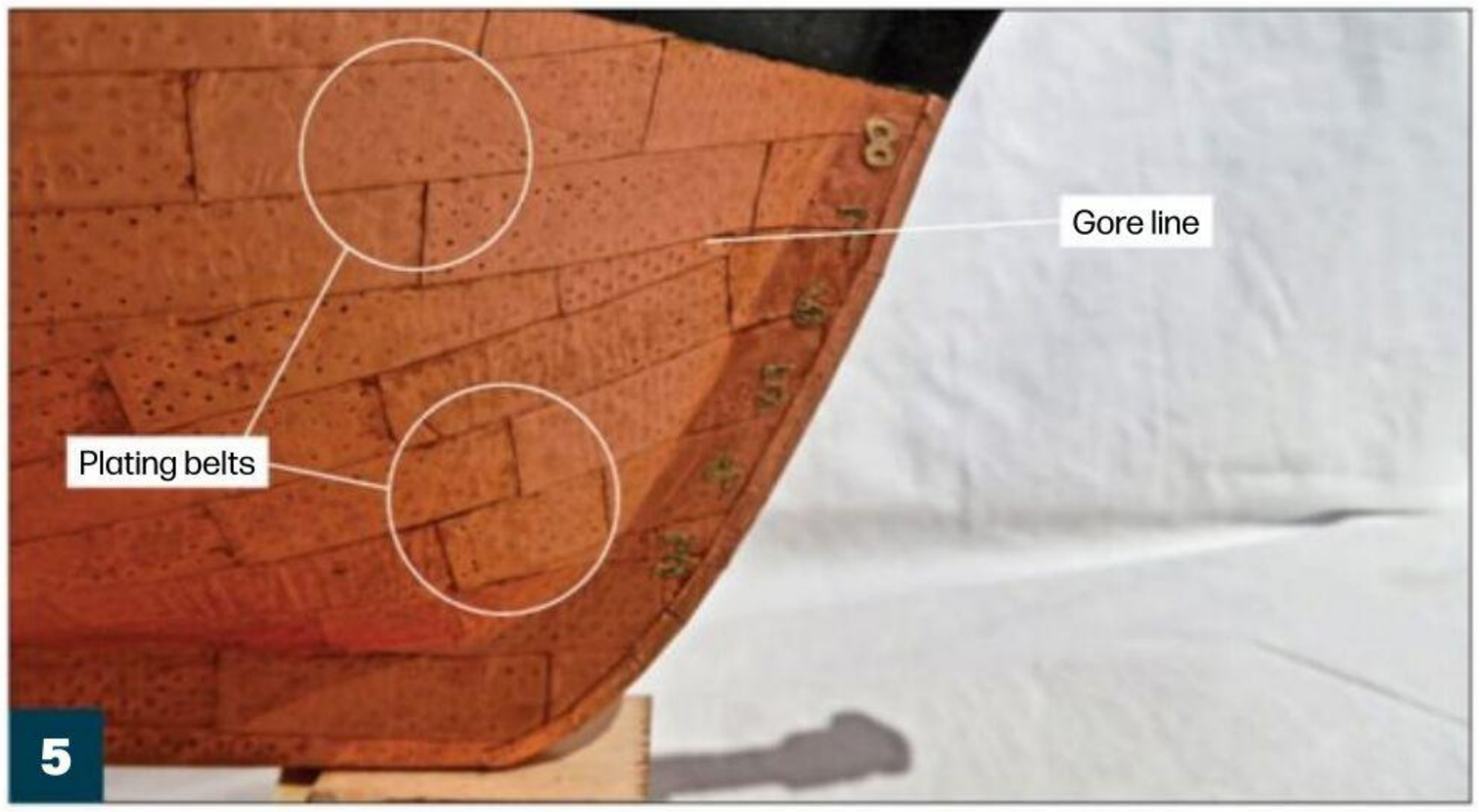
When placing plates, start at the keel and stern working toward the waterline and bow. You want the plates to overlap in the direction the water flows over the hull. That means, the rear and bottom edges of plates should overlap the leading and top edges of the plates behind and below them.

Work in manageable sections and plan to plate your hull over multiple modeling sessions. You mix the Pliobond by shaking it. Paint a section of the hull with a uniform coat using a cotton swap and let it dry until it's no longer tacky.

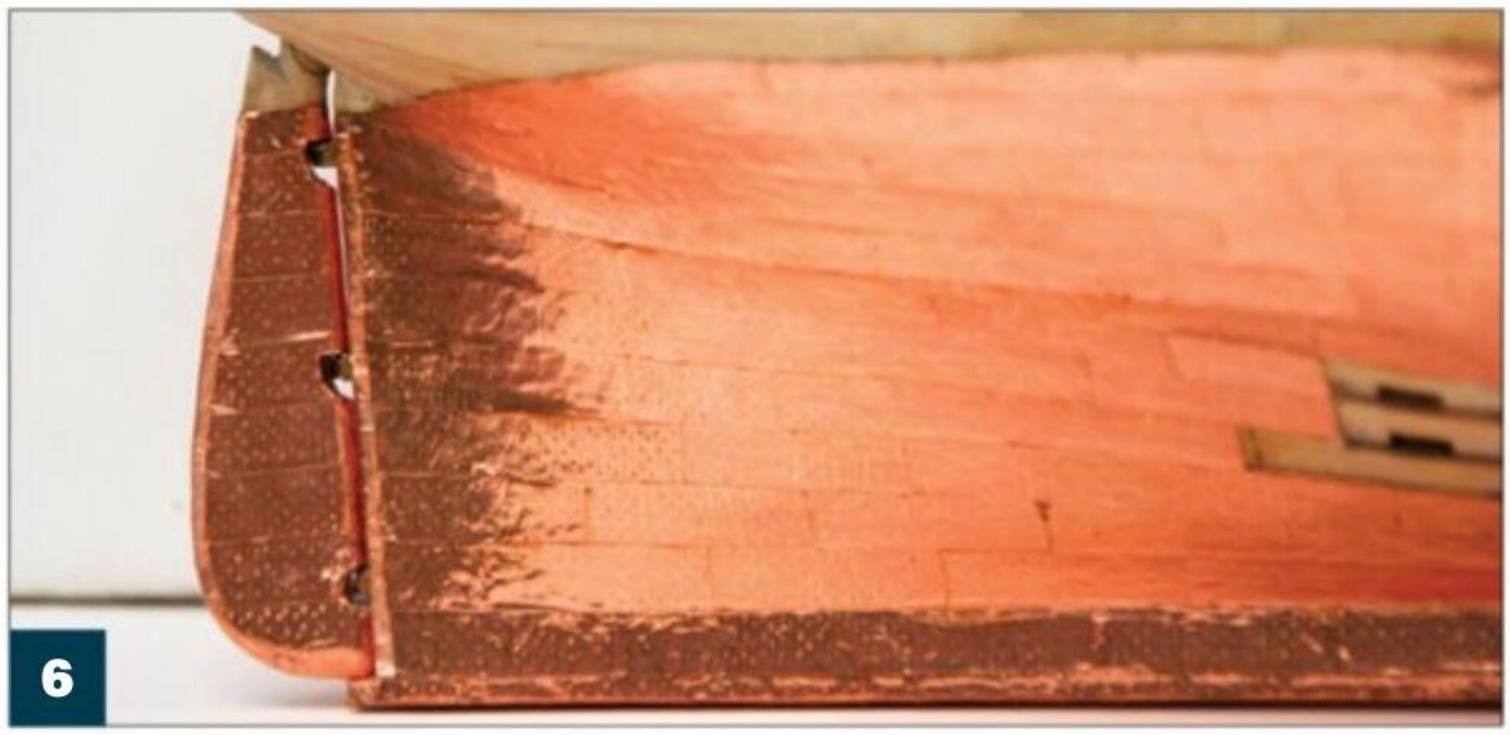
Loosely tack the plates, backside up, to masking tape laid sticky-side up on your workbench. This prevents the plates from moving when applying glue to them. Now, apply a second coat of glue to the area of the hull you plan to plate and evenly coat the back of the prepared copper plates. Let the glue dry for about a minute or until it's tacky.

Apply the plates, working stern to bow, keel to waterline, overlapping the previous plates ever so slightly. Remember, the overlap is only an inch at full scale, so, no more than 1mm on the model. Press the plate firmly to seat it, especially the edges. The roller you used earlier can also be used to roll the plates smooth. Press and roll with the overlap (stem to stern) to avoid catching and lifting edges.

Note, that even though the glue dries quickly, you can use finger pressure to make small adjustments to plate location. But you have to be fast. Place each belt before moving to the next one. This will allow you to keep the belts aligned and smooth.



Notice the two plating belts and the gore line, that line where the belts meet each other.



When plating the rudder, use the same rules as the hull: bottom to top, back to front.

Special cases

I began plating at the stern post, wrapping plates around it lengthwise, beginning at the keel and working up to the waterline with the typical overlap. After the plating was complete to the bottom of the keel, I finished by wrapping the bottom face with a row of plates, overlapped as usual. The finish row should show evenly on both sides of the keel. Wrap the stem similarly to the keel from keel to waterline. Make sure the same amount of plating shows on each side of the hull, **5**. Plate the rudder using the same rules as the hull, **6**.

Cleanup and finishing

With the copper plates glued and any unsecured edges and corners reglued, clean up any excess glue with cotton swabs and acetone. For a final clean, apply acetone to the copper with a soft cloth and gently swipe, always from bow to stern. Go in the other direction and you'll catch plates, bend up corners, and might even have to redo some of your work. And when using acetone, make sure to do it in an area with plenty of ventilation and while wearing gloves and eye protection — it is hazardous and flammable.

Modelers disagree about applying a finish coat to copper plating such as this. For me, I wanted to avoid the "bright penny" appearance and sprayed the copper with Tamiya Flat Clear (No. TS-80). I appreciate that the bare copper will dull naturally over time. Unwilling to trust the uniformity of the tarnishing on the hull, fearing glue traces would leave streaks or spots, I made my decision. Time will tell if it was the right one. **FSM**

Painting a WATERLINE

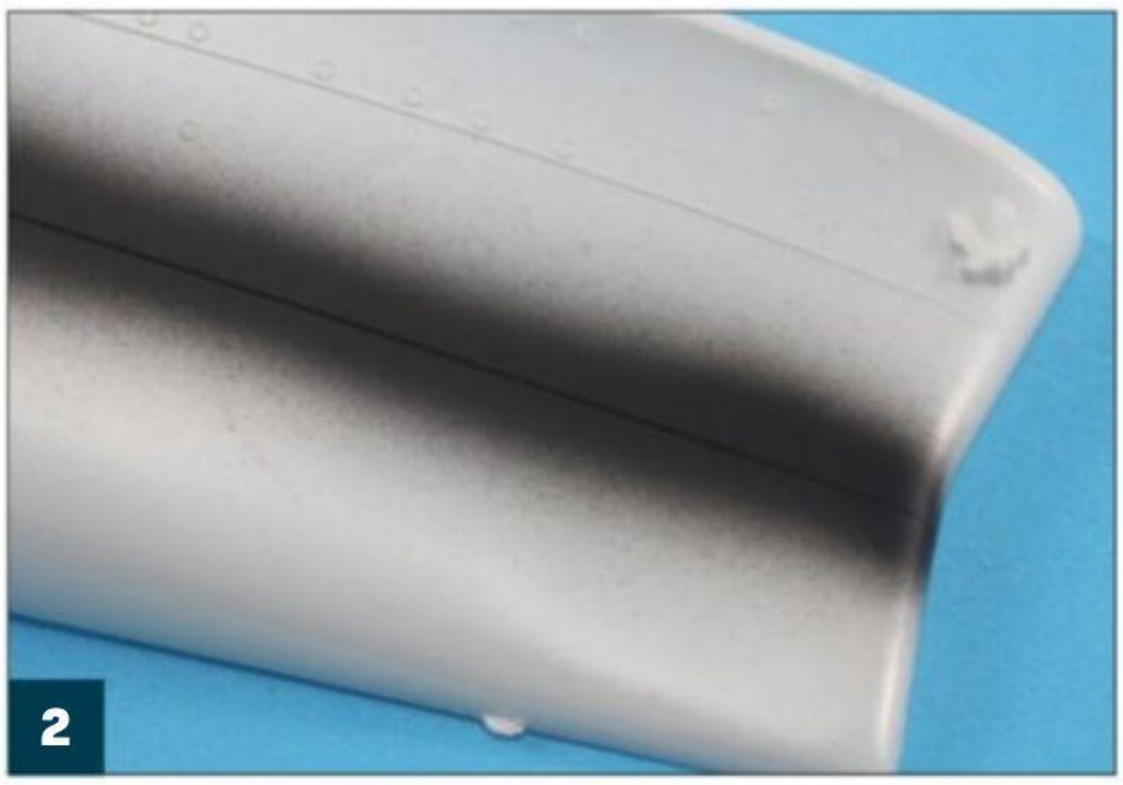
Start with the line and work out

BY KURT VAN DAHM

Painting a waterline always involves masking, but I use a method that makes the entire enterprise easier. With it, you can paint a waterline that will only have you masking carefully once, for the waterline itself. All subsequent masking is applied over the waterline tape.

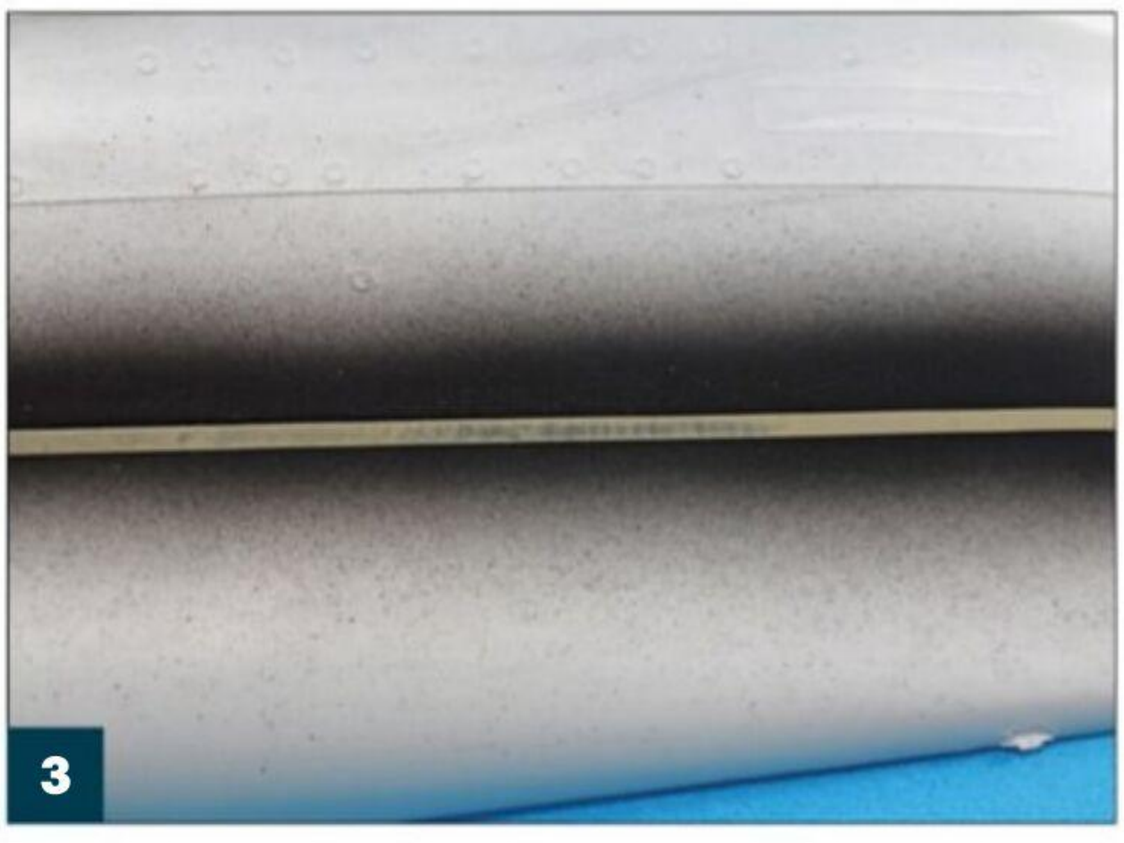
1

Start by marking the waterline along the hull with a pencil or scribing tool. This will help align the tape.



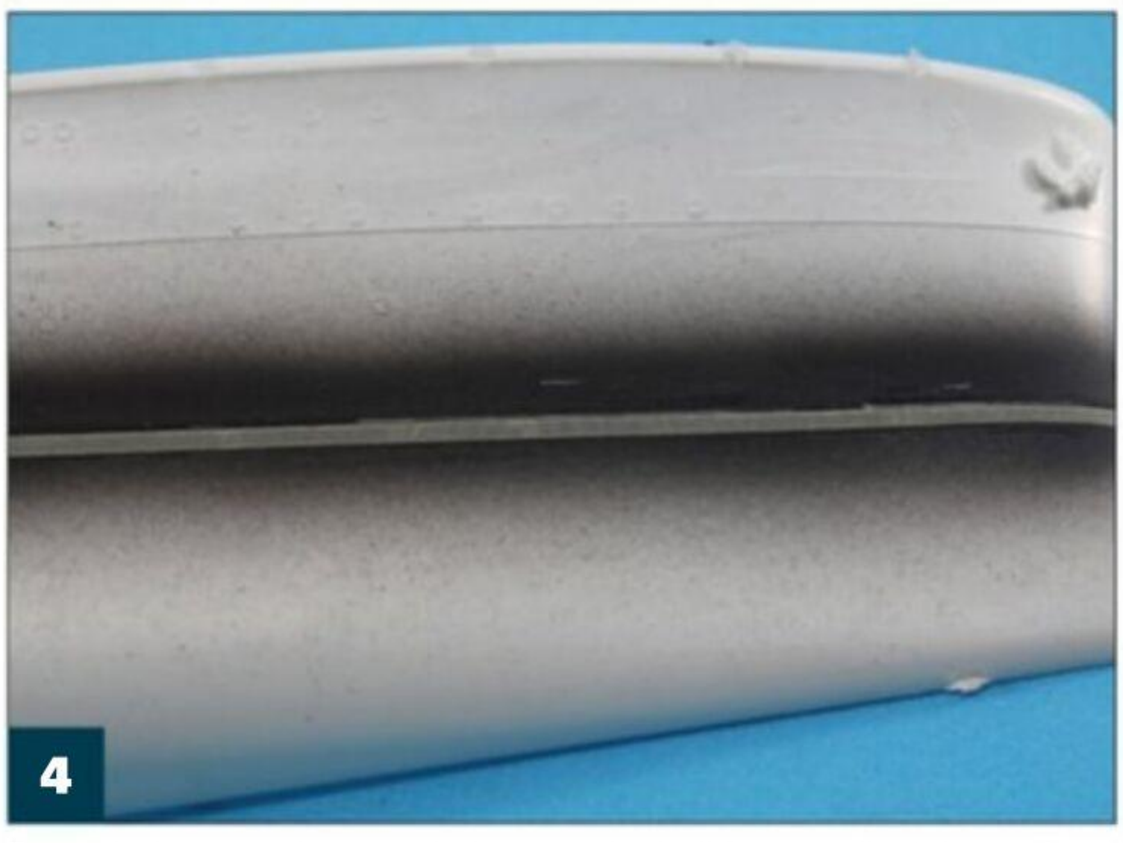
2

Airbrush the waterline color, in this case black, keeping the pattern wider than the finished waterline.



3

Re-mark the waterline and apply tape the width of the waterline.



4

Burnish the waterline mask down to the hull for a really tight seal.

Overspray the tape with waterline color to seal the edges. Any bleeding that occurs will match the waterline.

Mask the upper hull so the edge of the tape overlaps the waterline tape. I use either ProMask or tape and paper.

Now, you can spray the lower hull, in this case a dull red for the antifouling color.

Remove the mask from the upper hull. If you do it carefully, it can be reused.

With the mask removed, you can see the waterline tape showing the lower half covered with the lower hull color.

Mask the lower hull using the same technique used on the upper hull and, in this case, the same masks.

After spraying the upper hull color, carefully remove the mask to uncover the tape along the waterline.

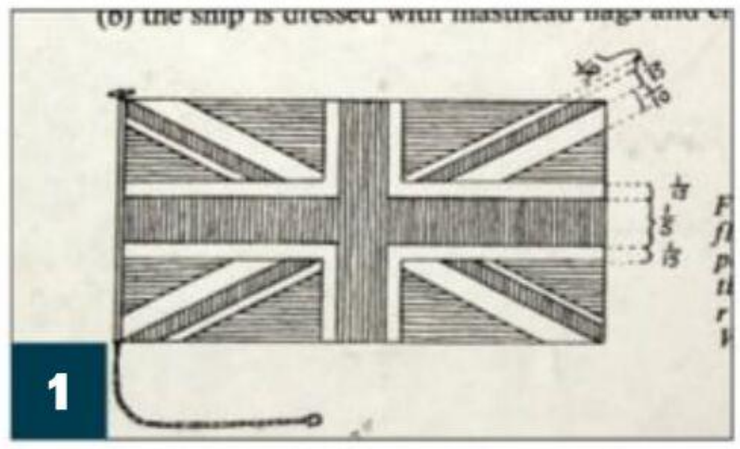
Peeling the tape from the waterline reveals a perfectly executed black line with no need for touch up. **FSM**

HOIST your colors

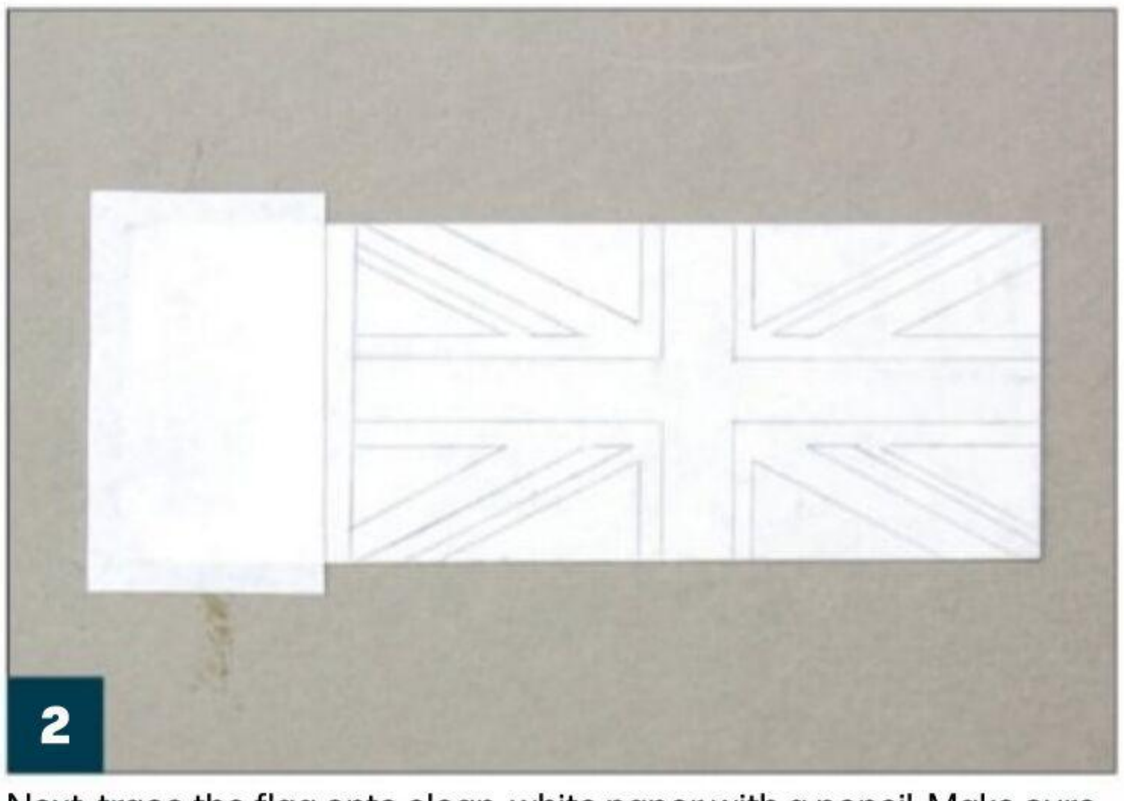
Learn to make beautiful, realistic, scale-model flags

BY GUS AUGUSTIN

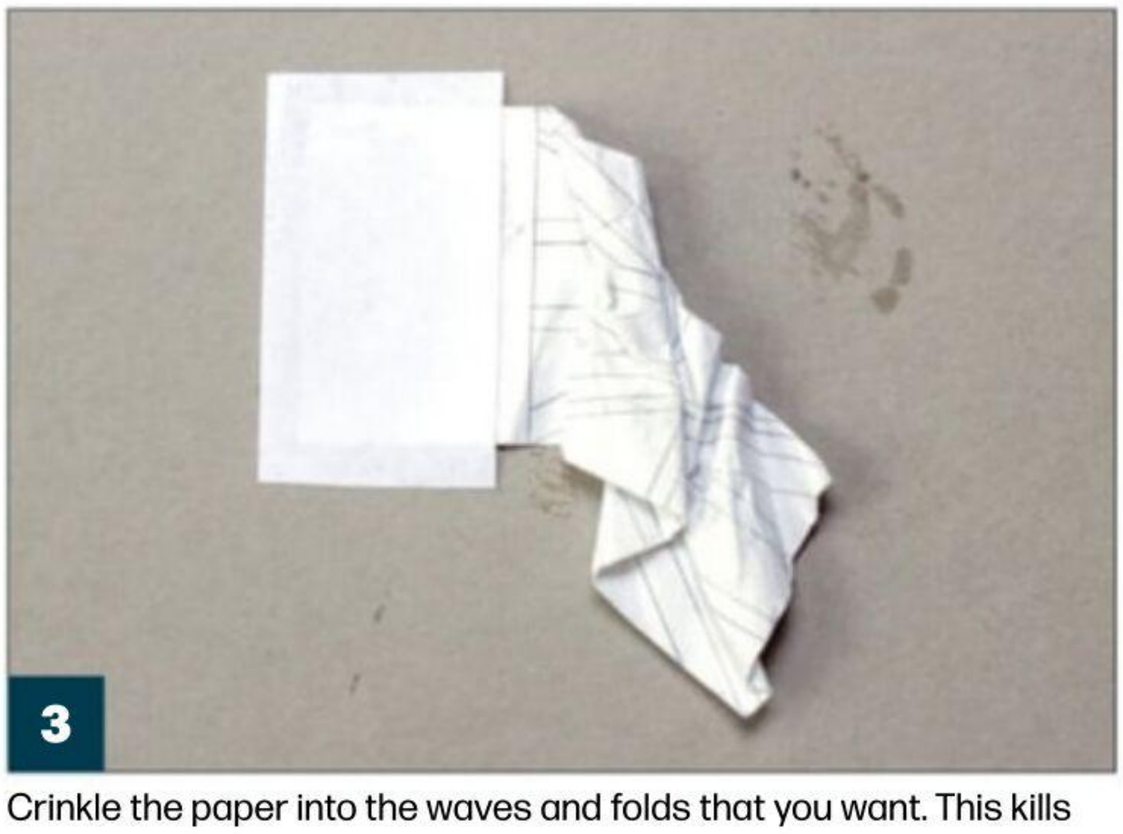
Over the years, I've seen many ways to make flags for scale models. However, I've developed a method that works for a variety of scales, from tiny (1/192) to what some might call regular (1/48). It's not hard, but, as with most things, you'll notice that the more you practice, the better you become at it.



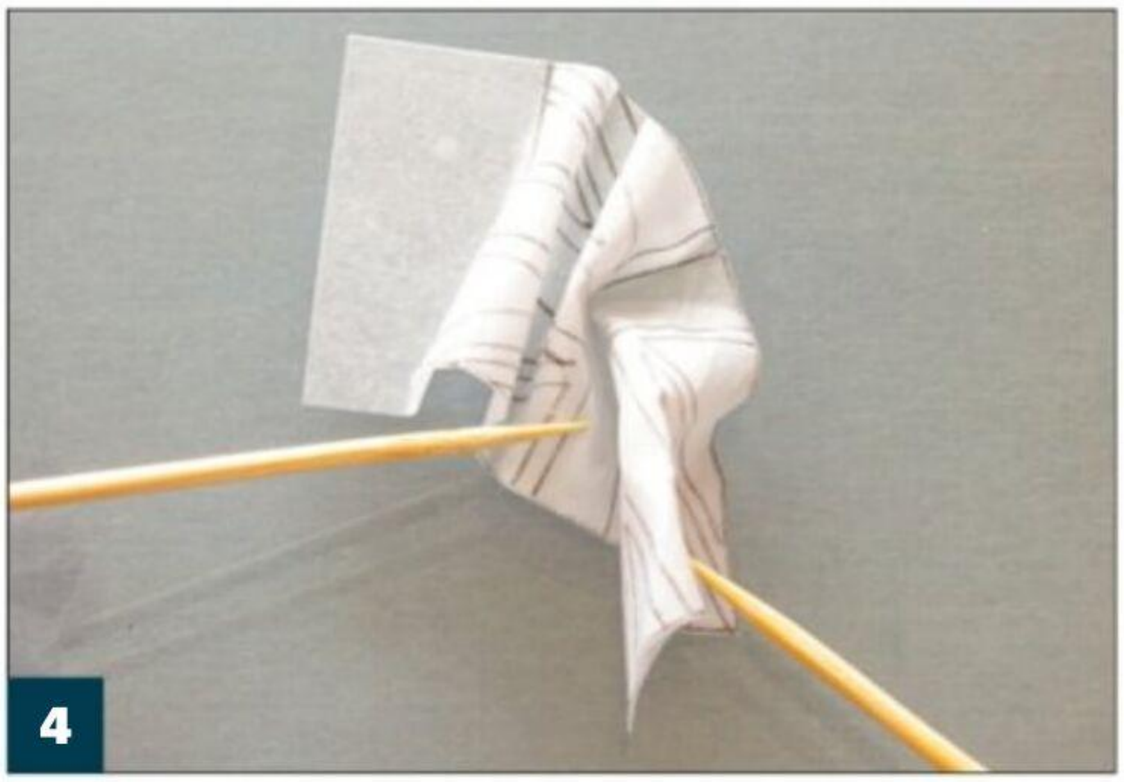
First, you'll want the pattern for your flag at the size you plan to use for your model. For example, I wanted to make the Union Jack, so I scanned and enlarged an illustration of the flag from the book *Flags* (Conway Maritime Press, ISBN 978-0-85-177281-3) to the correct scale.



Next, trace the flag onto clean, white paper with a pencil. Make sure to trace the pattern on both sides. Then trim the flag on three sides, leaving the fourth side long to use as a handle as you work.



Crinkle the paper into the waves and folds that you want. This kills the memory in the paper and allows you to shape it into what closely resembles how it will be displayed on your model. Remember what I said about practice? Have fun! It's only paper.



4

Submerse your flag in water and lay it out on flat glass while wet. Use toothpicks to gently reshape it again into your desired waves and folds. Set it aside to dry for 24 hours. You've now given your flag a new memory. You can open it and, with a little coaxing, it will return to the shape you created.

5

Now, you can start painting. Begin with the lightest color and proceed to the darkest. I prefer water-based acrylic paint. It allows you to fold and twist your flag and the paint won't chip or flake off. Watercolors will flake off and artist oils take too long to dry. Let it dry and then paint the same color on the other side.

6

Now, proceed with the next darkest color. Again, paint it, let it dry, and then paint that color on the other side. This helps make sure you replicate your work and lessens the chance of you missing something.

7

When you are finished painting, trim off the handle (the remaining side) but leave tabs at the top and bottom to attach to the mast, ensign staff, or flagpole. At this point, you can still adjust and refold the flag. If the color is too bright, mist light gray on the flag with an airbrush to deaden the color.

FINAL THOUGHTS

YOU HAVE NOW MADE YOUR FLAG. Don't be disappointed if it's not perfect – you'll improve with each one you make. I still have some of my first flags, and I look at them from time to time to see how much my skills have improved and what I still might do better with the next flag. Use this technique on models, whenever you need a flag, not just on a ship. Keep at it, because practice makes proficient! **FSM**

Make your SHIP'S GR

Don't let an ill-made hatch be the downfall of a first-rate model

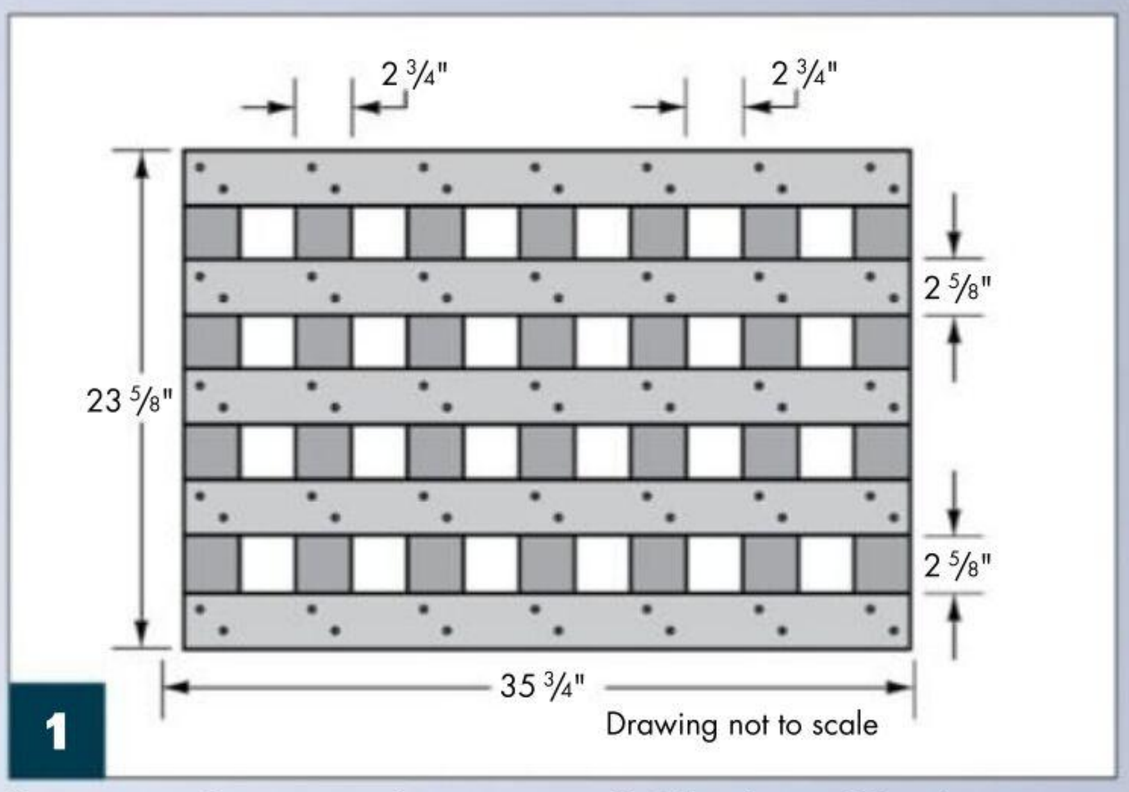
BY TONI LEVINE

Much of model building involves thinking 10 steps ahead so you can construct and install seemingly simple items correctly. Hatches and gratings are two of those things. In a typical plank-on-bulkhead kit, there is a plywood subdeck with openings for masts, stairwells, and hatches. The instructions tell you to plank the deck and then make the hatch, only for you to

ATE

discover that the grating does not fit the hatch and there is only a sliver of deck planking on one side and whole lot on the other. To make matters worse, the grating openings are so large that your scale-sized foot would get trapped in it.

To avoid this whole matter, make your own gratings with prototypical openings and build the hatch around it. Then install the hatch and lay the deck planking. I'll show you how.



1

For grating dimension of approximately 24 inches x 36 inches, increase the space between and the width of the battens (shown horizontally) from 2½ scale inches to 2⅝ inches; increase the space between and width of the ledges (shown vertically) to 2¾ inches.

2

The picture shows all the materials needed to make a 1/48 scale 2-foot x 3-foot grating with its hatch. Do not make the grating from a softwood, like basswood; the teeth will break off. Make sure to cut all of your parts tall enough to accommodate the deck's camber.

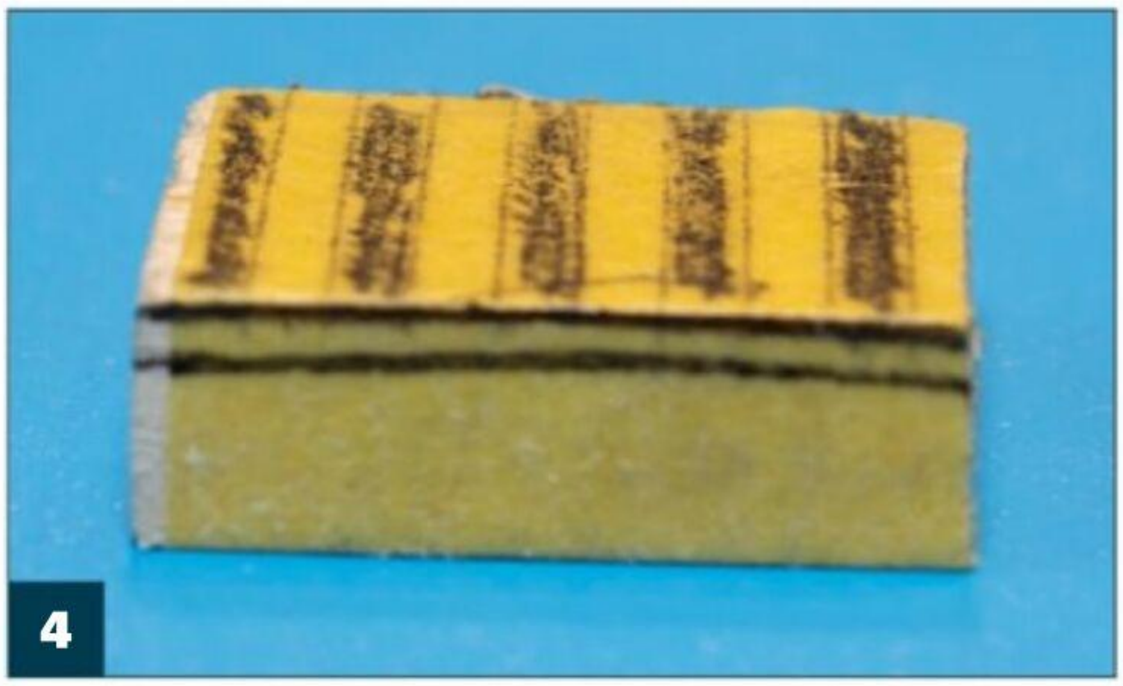
Let's start with the basics

Kit grating often builds from strips with interlocking teeth. Real ship grates are made from two different shapes and sizes of wood — ones with teeth (called ledges) and thinner ones without teeth (called battens). Ledges are oriented athwartship (across the deck, starboard to port) and look similar to the strips you'll find in many kits. Importantly, the notches match the thickness of the battens. On a real ship, a ledge is 3 inches thick and a batten is ¾ inch thick. Both are approximately 2½ inches wide and the openings between them are 2½ inches square. (Because we work in various scales, all the numbers shown are full size.)

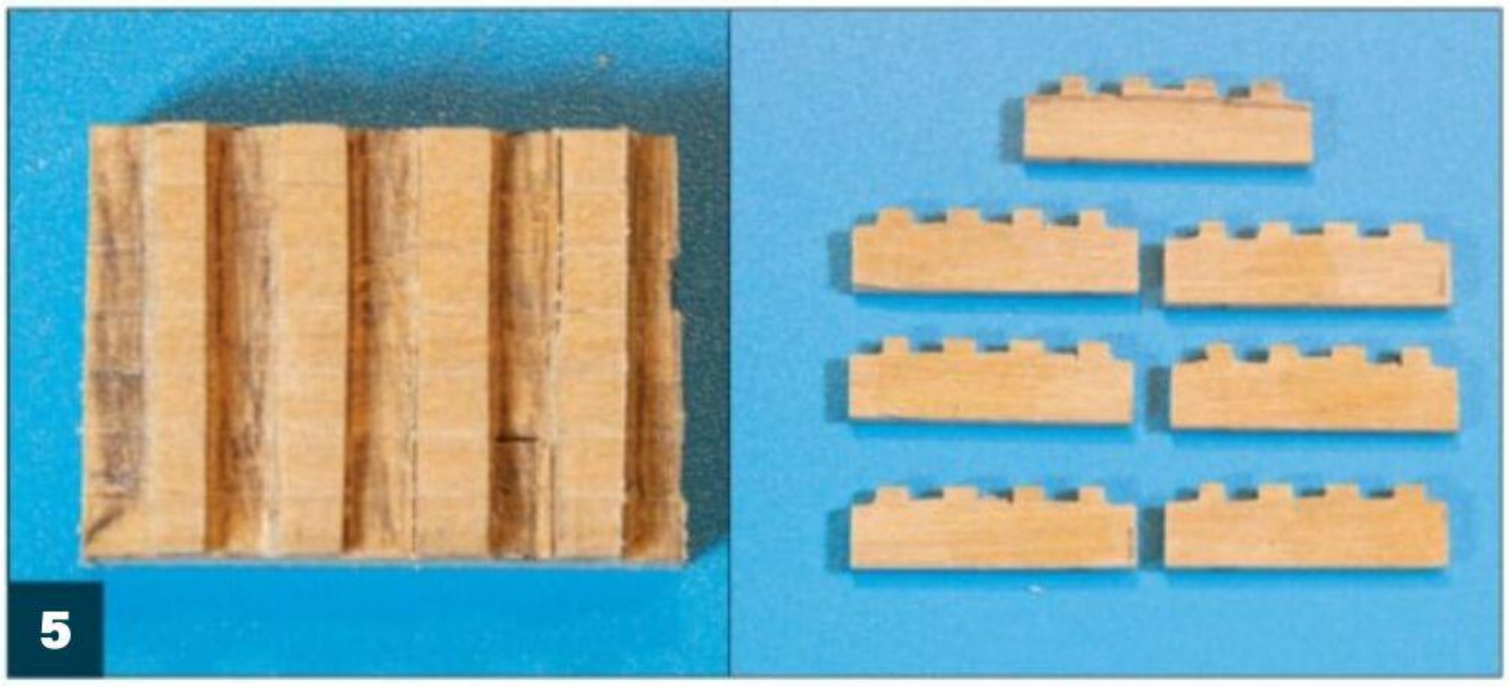
Start with the layout of the ledges and battens. The grate has a ledge at both ends, and every ledge has a notch at both ends to accommodate a batten. Measure the inside dimensions of your hatch. For this example, let's say the hatch is 24 inches wide and 36 inches long. The tooth + notch measurement is 5 inches. That gives us four tooth-and-notch pairs, a fifth notch and an extra 1½ inches.

The solution is to either make the hatch 1½ inches narrower or increase the size of the teeth and notches to 2⅝ inches, for a width

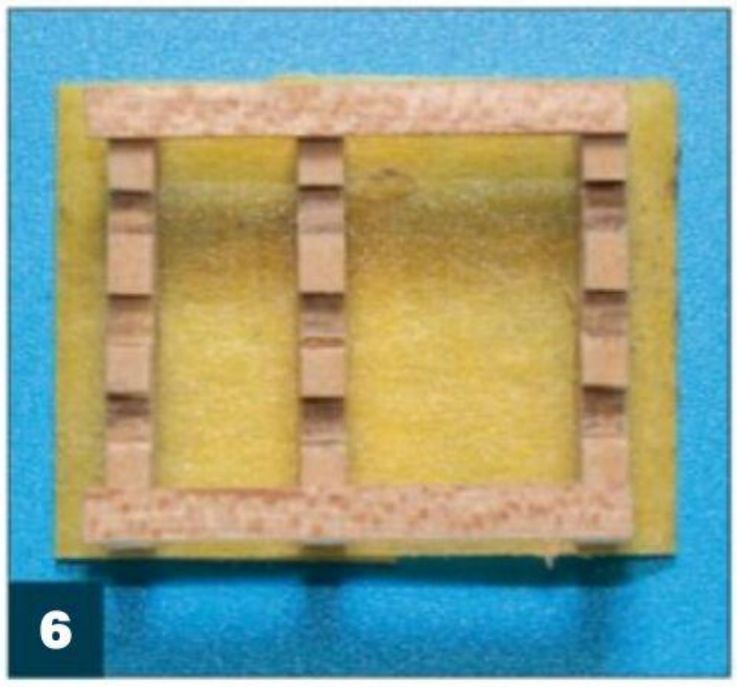
The ledge sandwich doesn't taste too good but works well for cutting notches and teeth in the ledges for the grating. The line drawn across the sandwich will help align the ledges when you dissolve the white glue holding them together.



I've used templates to mark the camber (upper line) and the notch depth (camber less the batten thickness, lower line). On top of the ledge sandwich, I've marked the tooth-and-notch pairs plus an extra notch. Yes, there is wastage on both ends, but that's okay.



Remove the material for the notches with a razor saw and micro chisel. Make sure to work inside the lines you've drawn and then sand or file to the guide. Sawing on the line will create a notch larger than you need or want. Use 91% isopropyl alcohol to dissolve the white glue, separating the ledges so you can assemble the grating.



Using a square to maintain a 90-degree corners, glue the outermost battens and ledges to form a rectangle. Attaching the ledges to double-stick tape laid on a work mat helps minimize unwanted movement.

of 23⅝ inches, which is what I did. Doing the same calculation for the length results in six ledge-and-space pairs, a seventh ledge, and an extra 3½ inches. Increase the distance between and width of the ledges to 2¾ inches for a length of 35¾ inches, **1**. Perfect!

Camber, wood, and you

Before cutting any wood, you need to determine how much camber, or curvature, there is in the deck. Your kit plans should show this, but you can figure it out by tracing the top of a bulkhead onto a piece of paper. This same curvature is found in the ship hatches and grates. Cut your wood strips tall enough to accommodate the camber, **2**.

A table saw makes cutting notches into the ledges easier, but it's unnecessary. All you need is a simple razor saw.

First, cut strips of wood for the battens and ledges a little longer than required — they will be faired up later. I usually cut a few extra ledges in case I break teeth. Glue all but two of the ledges together, side by side, with white glue. This allows you to cut the teeth in all the strips simultaneously, guaranteeing good alignment. After the strips are glued together, sand the bottom and sides of the sandwich flat and draw a line across the bottom to help orient the strips after the glue has been dissolved, **3**.

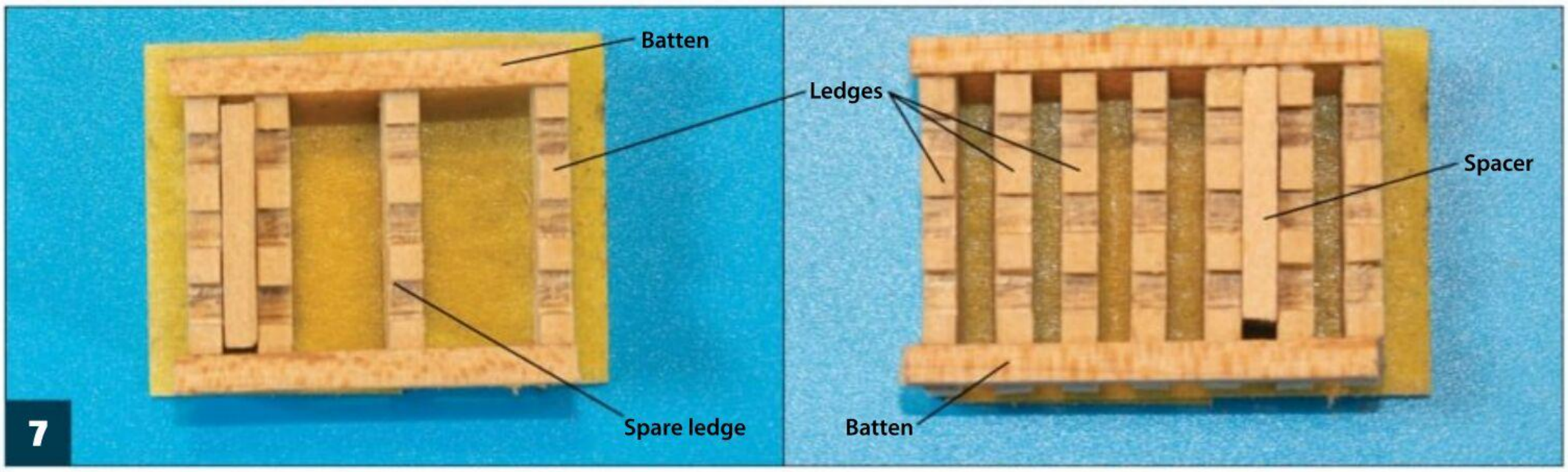
To make templates for the deck camber and notch depth, you'll need two of your extra ledges. Mark the camber on one, and on the other, mark the camber less the thickness of the battens. Sand both of these ledges to these lines. Place the templates, one after the other, against both sides of the ledge sandwich and mark the camber and the notch depth.

Divide and mark the top of the ledge sandwich into four tooth-and-notch pairs with an extra notch at the end. Remember, make your ledges longer than they need to be. Darken the areas that will become notches to prevent confusion, **4**.

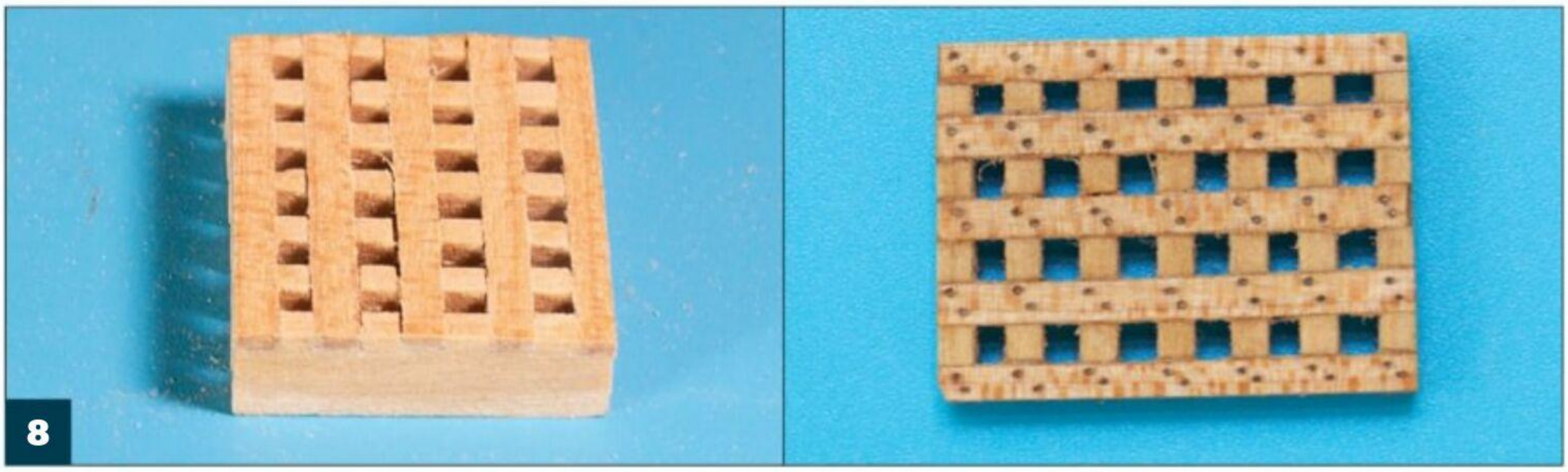
Cut inside the darkened notch lines on top of the ledge sandwich with a razor saw until the blade kisses the notch-depth line. Make sure to cut inside the notch lines — not on them — because a saw creates a kerf. If you saw on the line, the notches will be wider than you want. You can always remove more wood. You can't put it back. Remove the rest of the wood in the notch with multiple passes with the saw or a chisel. Clean up the depth of the slots with a sanding strip. Sand the top of the ledge sandwich to the camber line. Lastly, soak the sandwich in 91% isopropyl alcohol until the white glue dissolves and the ledges separate, **5**.

Ensure all the ledges are oriented correctly — remember the line you drew on the undersurface of the sandwich? Then use an engineering square to guarantee a 90-degree angle and glue the outermost battens and ledges together, **6**.

After the glue has dried, take one of the spare ledges and install it — do not glue it! — somewhere in the middle of the grating assembly. This will prevent racking (the grating being forced out of shape) while you install the next several ledges and battens. The



After the framework has dried, insert, but do not glue, a spare ledge to prevent racking. Place a spacer the correct thickness for the space between ledges next to an outermost ledge, place a ledge next to the spacer and glue the ledge in place. Move the spacer and repeat.



You'll need to sand the battens to match the camber present in the ledges. Before you do, decide if you want to show the nails holding the battens in place. If you do, make depressions like you see here with a needle and twist a sharp No. 2 pencil in the dimple.

larger the grating, the more important this step is.

Insert a piece of scrap wood the correct thickness of the gap between the ledges, 2¾ scale inches in this case, inside the outermost ledge as a spacer. Take the next ledge, place it next to the spacer, and glue it to the outermost battens. Move the spacer and repeat until all the ledges have been placed, **7**.

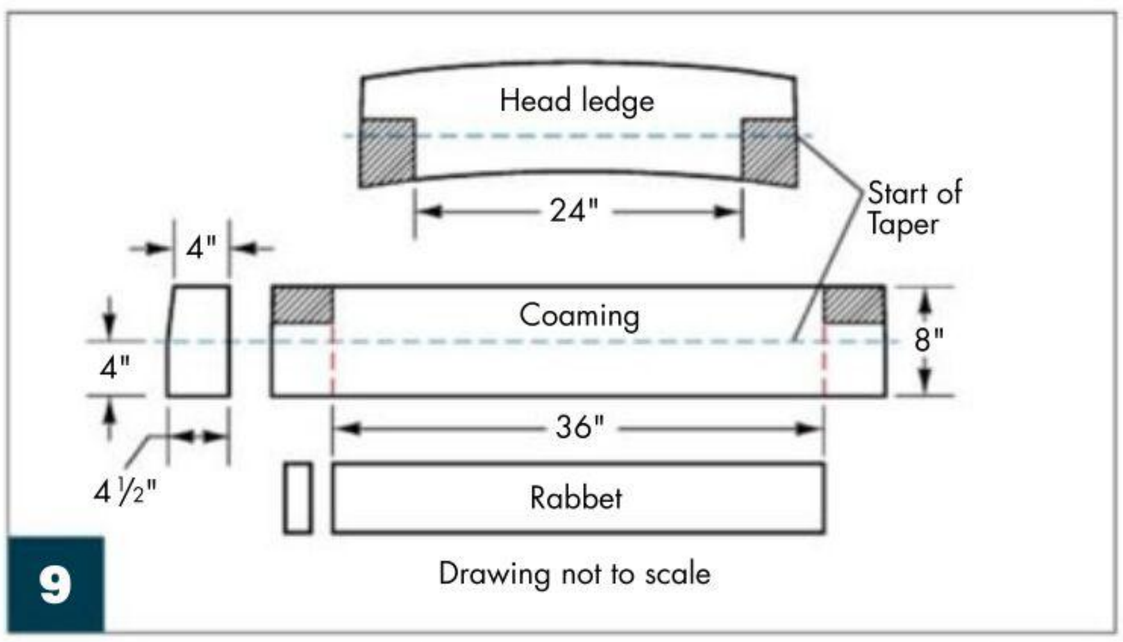
Install the remaining battens in the notches. Depending on your model's scale, you may wish to show the fastenings securing the battens to the ledges. Make a depression in the wood with a needle and then twirl the tip of a sharp pencil in the depression. Sand the surface so the battens match the camber, but do not handle the grating again until after you've applied a finish to prevent from smearing the pencil dots, **8**.

Building the hatch

Now that the grating for the hatch is finished, it's time to build the hatch proper. First, understand that traditional hatches are constructed from two timbers running fore and aft called coamings, and two transverse timbers called head ledges. As with the ledges, the head ledges have the same camber as the deck. The hatch height and thickness are determined by the ship's nationality, type, deck, and era, so check your plans.

This hatch is 8 inches tall and 4½ inches thick at the deck, tapering to 4 inches thick at the top. The coamings and head ledges were joined with either simple lap or scarfed joints. I used a lap joint for this hatch. The grating rests on rabbets, 2-inch-wide strips of wood attached to the inner surface of the coamings, **9**.

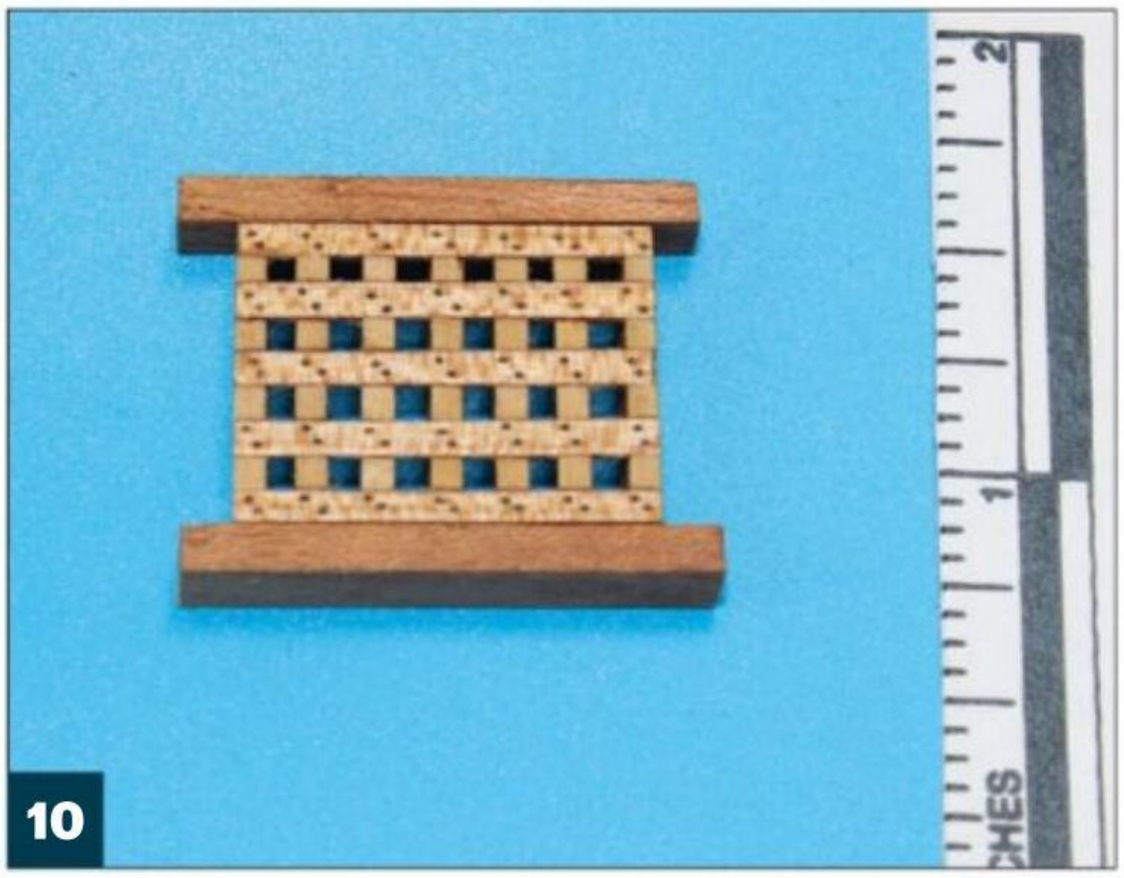
Place the coamings against the grating and mark its length on them. Leave 4½ inches extra on both ends for the head ledges. Extend this line (red on the plans) to the bottom of the coaming.



Here are the basic plans for the coamings and head ledges for a hatch. I used lap joints at the corners, although scarf joints (a joint with interlocking opposing angles) could also be appropriate.

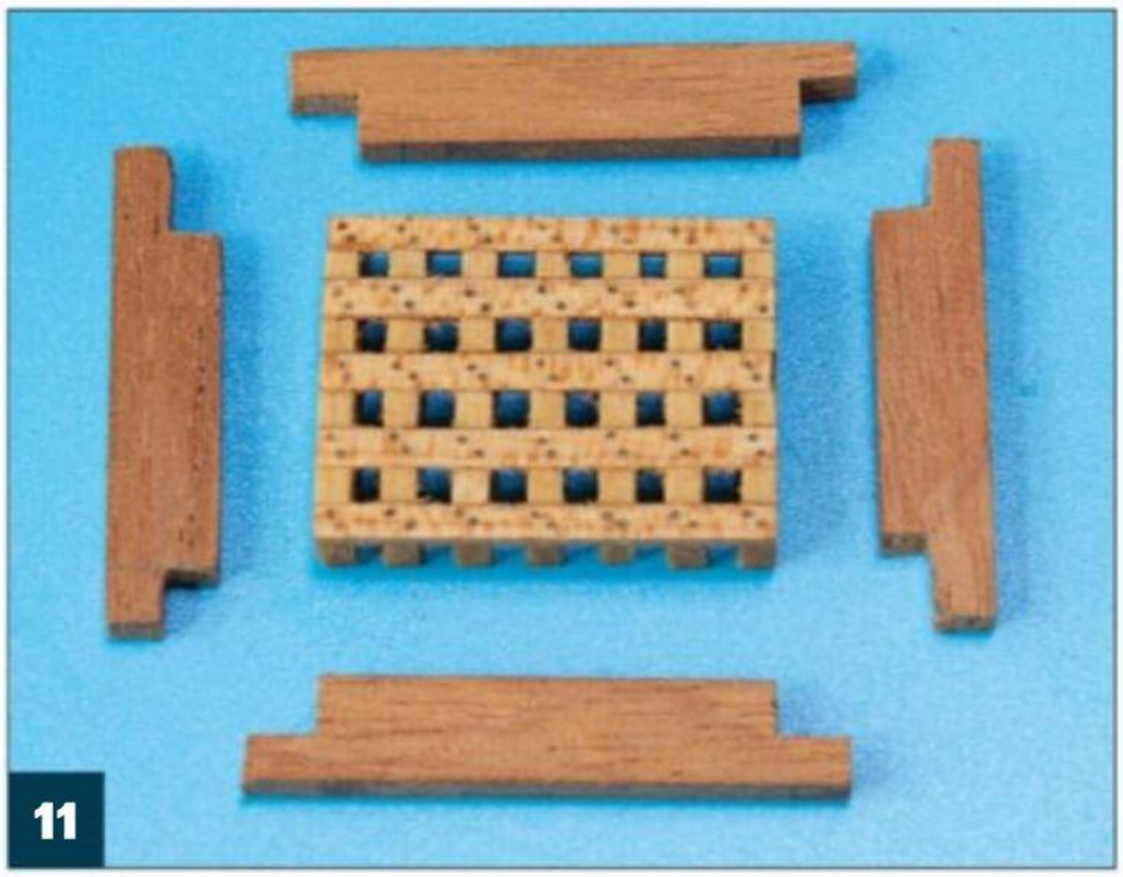
Draw a horizontal line (blue) to mark the start of the taper at the midpoint of the coaming. Draw a second horizontal line one-third down from the top outside the grating line. This marks the wood that you need to remove on both coamings for the lap joint (gray areas), **10**.

The deck camber makes the head ledges a little more complicated. When cutting out the head ledges, make them 20% taller to accommodate the camber. Mark the camber with the same template you used for the grating along the bottom and top edges. Use the coamings as a template to mark the taper line, the notch for the lap joint, and the upper edge of the coaming. Remove the wood for the lap joints and sand the top camber to the line you've drawn, **11**.



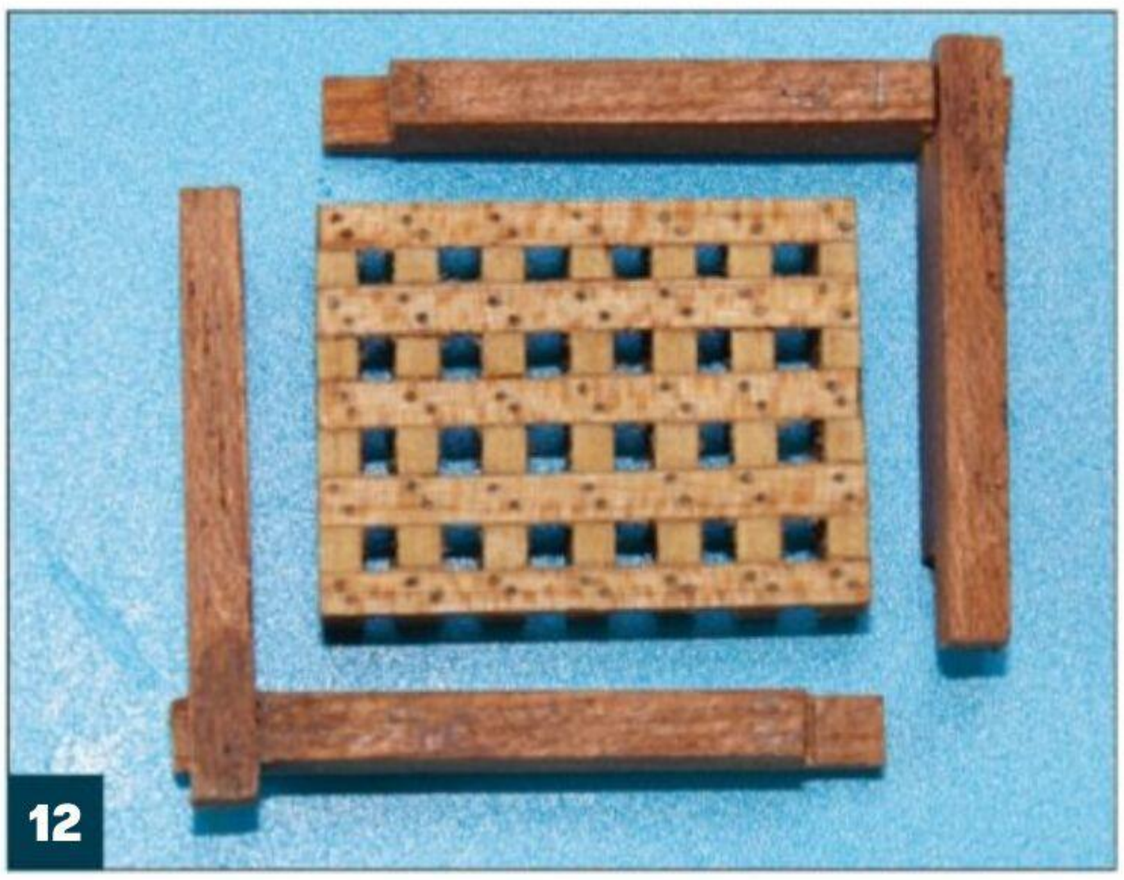
10

Start building the hatch with the coamings. Transfer the lines from the plans in Step 9 to the coamings to mark the ends of the grating, and remember to leave space for the head ledges, where the taper begins, and the material to be removed for the lap joints.



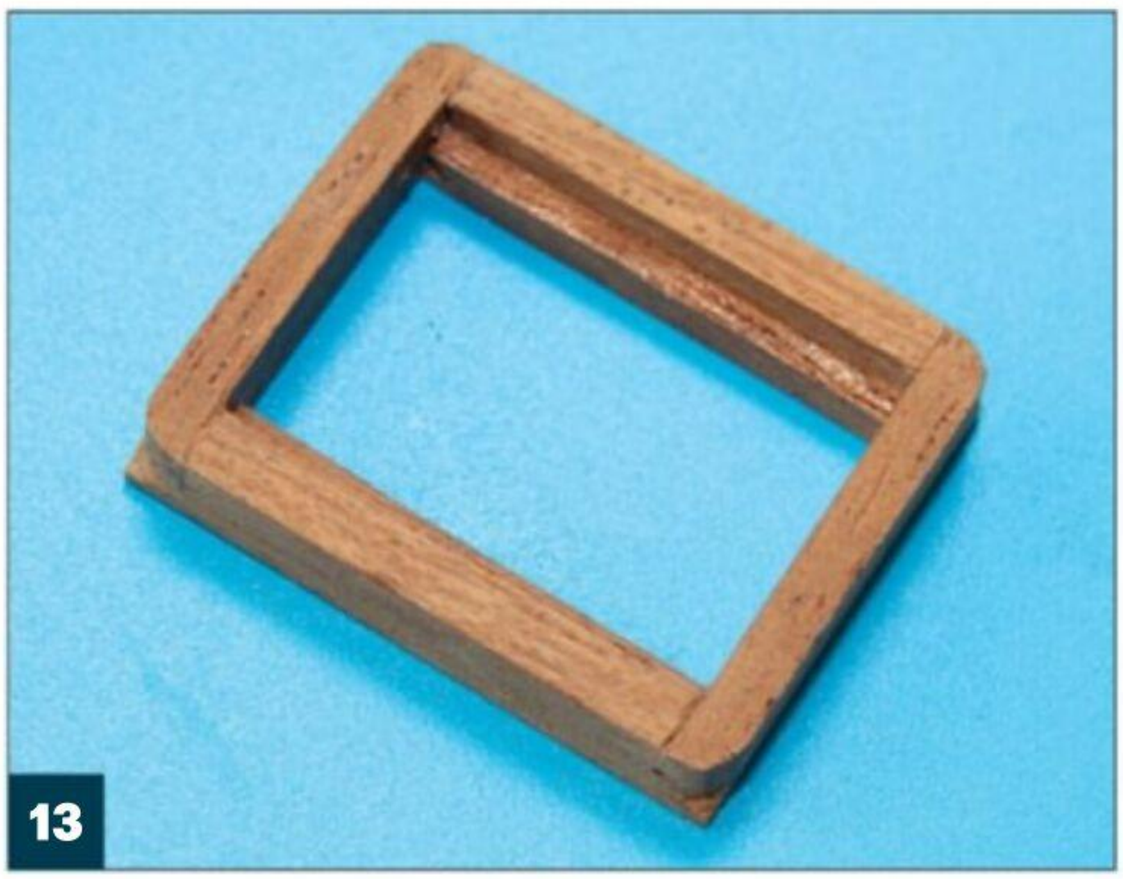
11

Because they run athwartships, constructing the head ledges takes a bit more work. When roughing them in, make the head ledges 20% bigger than what they need to be to allow for room for the camber along the top and bottom and to accommodate the lap joints.



12

Assemble one head ledge and coaming and then the others, making sure they are square. Test-fit the parts around the grating to make sure they all go together correctly and then glue the final two lap joints. Glue the rabbets to the inside of the coamings.



13

At this point, you should shape the hatch's taper and round the corners of the lap joint to the level of the decking. Leave the square edges from the level of the decking down. Lastly, sand the camber on the bottom to the lines you've drawn on the head ledges.

14

Tack the hatch in place on your model and install the deck planks around it, making sure to keep everything symmetrical. When you're finished, remove the hatch and finish your deck. You can detail the hatch with the bolts and nails used to attach it on the real ship, glue it in place, and attach the grating. **FSM**

Assemble the hatch, careful to keep it square. Double check that the grating fits. When the glue has dried, glue the rabbets onto the inner faces of the coamings, **12**.

Sand the taper on all four sides and round the corners to the level of the top of the deck planking. Leave sharp corners on the bottom of the hatch so the planking fits snugly. Finally, sand the camber into the lower edge of the head ledges, **13**.

Temporarily attach the hatch to the ship and plank the deck. Remove the hatch and apply a finish to the deck. A hatch would have been fastened with three bolts in the head ledges (copper wire blackened with liver of sulfur) and two treenails in the coamings. Reinstall the hatch, place the grating, and you're done, **14**.

Bases and mounting models

Think about displaying the model before you start building

BY STEVE WHEELER

There are hundreds of ways to mount and display ship models, but many models are completely finished and taken off the build platform before the modeler realizes they have not thought about that. Worse, they have a finished model, all rigged, in their hands without any easy way to add mounting holes or fastening points or pedestals to it. A mounting system should be one of the first things thought of, even before building begins, so holes, threaded fasteners, pins, or other features can be incorporated before problems arise. That is part of the thought process known as sequencing or working out problems before they actually become problems.

The second thing to consider is how the mount should look. Mounts and bases should not distract from, but rather complement, the model. For example, I saw a well-done Admiralty model mounted on two pairs of brass dolphins. Unfortunately, the dolphins were huge, verging on the size of fireplace andirons, and immediately drew the viewers' eyes to them rather than the model. Another extremely nice model was cased in an elaborately inlaid box with glass sides and a solid top. It was a great piece of furniture but the model within was completely overshadowed. Coins, patches, and plaques on a base, if not carefully done, can overwhelm a model too.

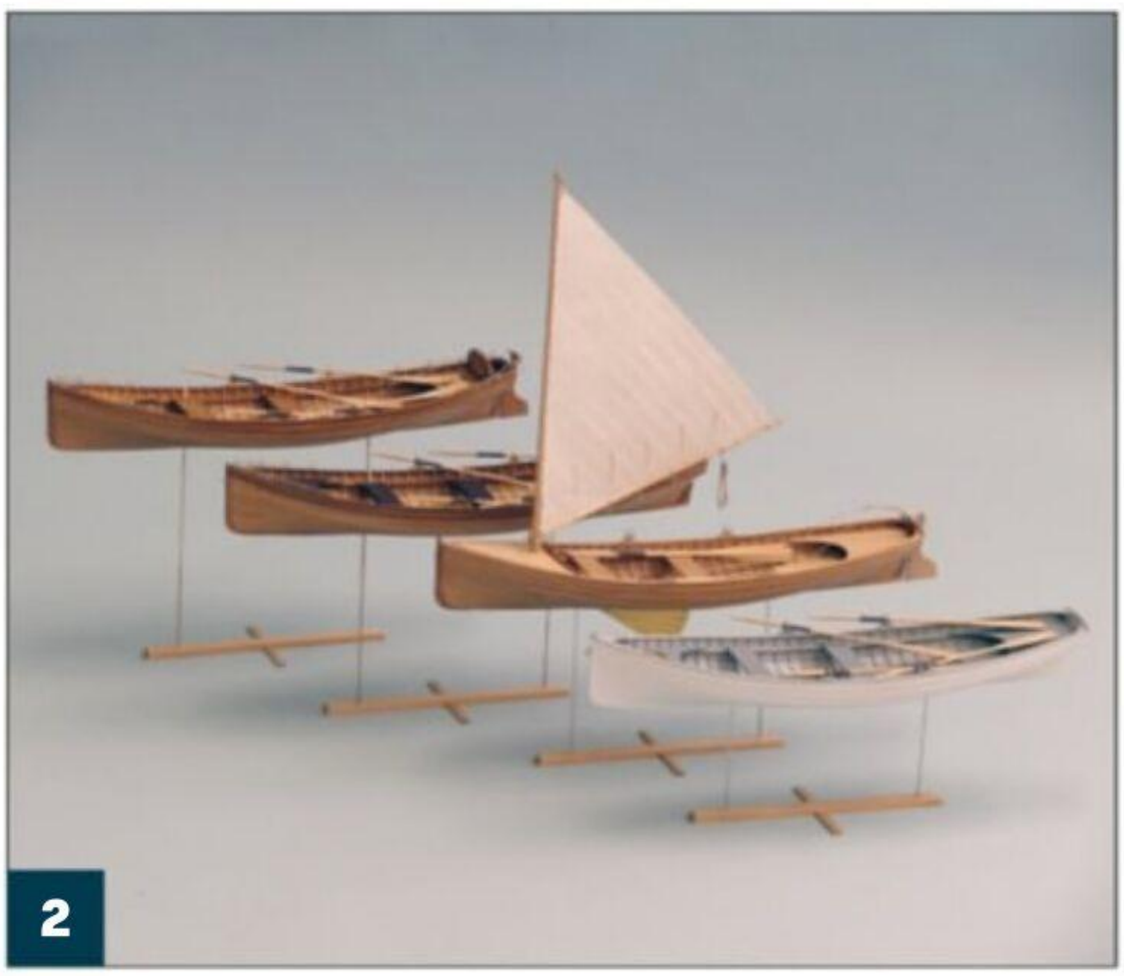
For conventional mounts, fitting and kit suppliers offer a wide variety of brass pedestals (some are slotted, others not) and there is an array of shapes and heights. Wood gallery spindles used for making plate rails can double as pedestals. Also, check out purveyors of dollhouse supplies because miniature stair spindles and balustrades can be used to mount smaller models. Own a lathe? You can make your specialized mounts for particular projects. Finally, found objects, like driftwood, rocks, and sand can also be incorporated into mounts and dioramas if one is careful.

Display and mount ideas

Here are a few mounts I have used in the past. They may be applied to all types of models, not just the ones shown here. These are just the tip of the iceberg as far as mounting goes, and there are thousands of ways to go about it. You are building that model for yourself, not somebody else, so do what pleases you.

1

For a less obtrusive mounting, try a minimal wood cruciform. It provides a lot of support and still appears small. Use thin, brass rods or wood dowels to raise the model several inches, reducing the base's visual impact and drawing the eye to the model.

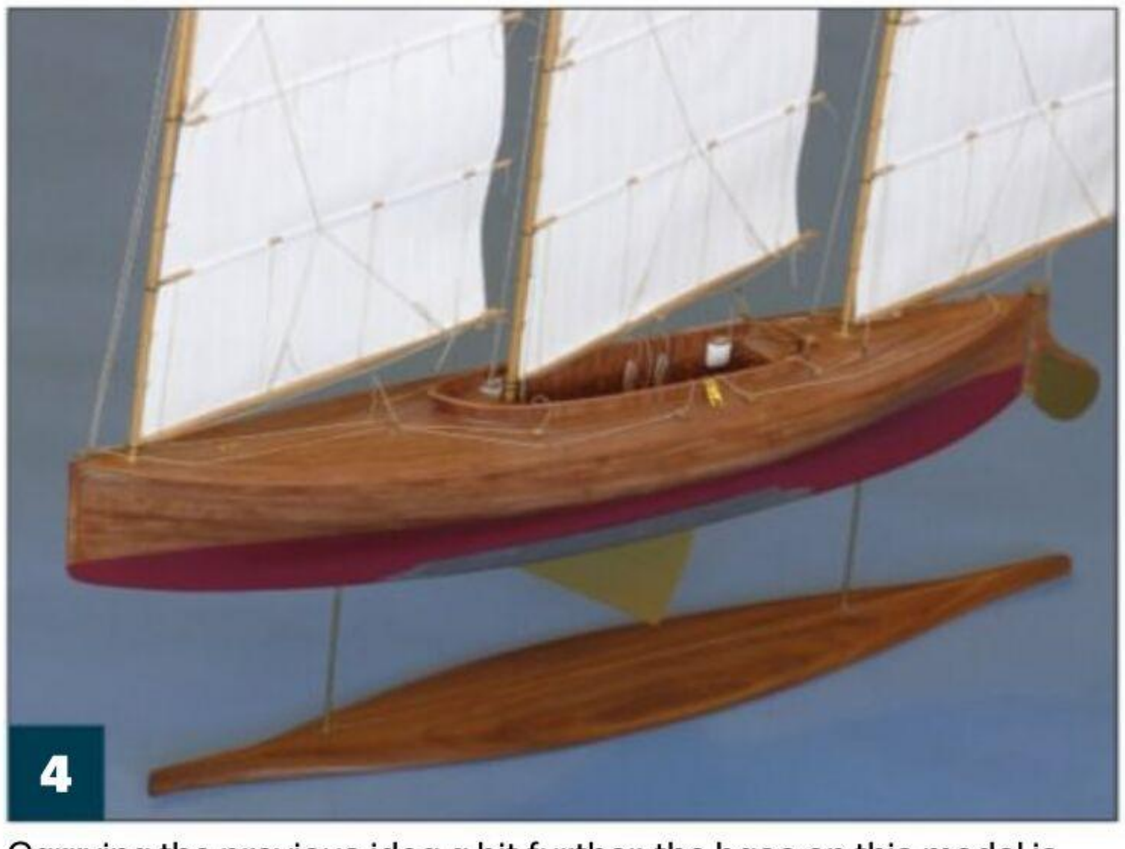


2

I built a series of four Whitehall-style rowboat models, one for each construction grade specified by the designer. By mounting each model on successively shorter rods, I conveyed the differences between them, from the highest Fancy Grade to the lowest Grade B.

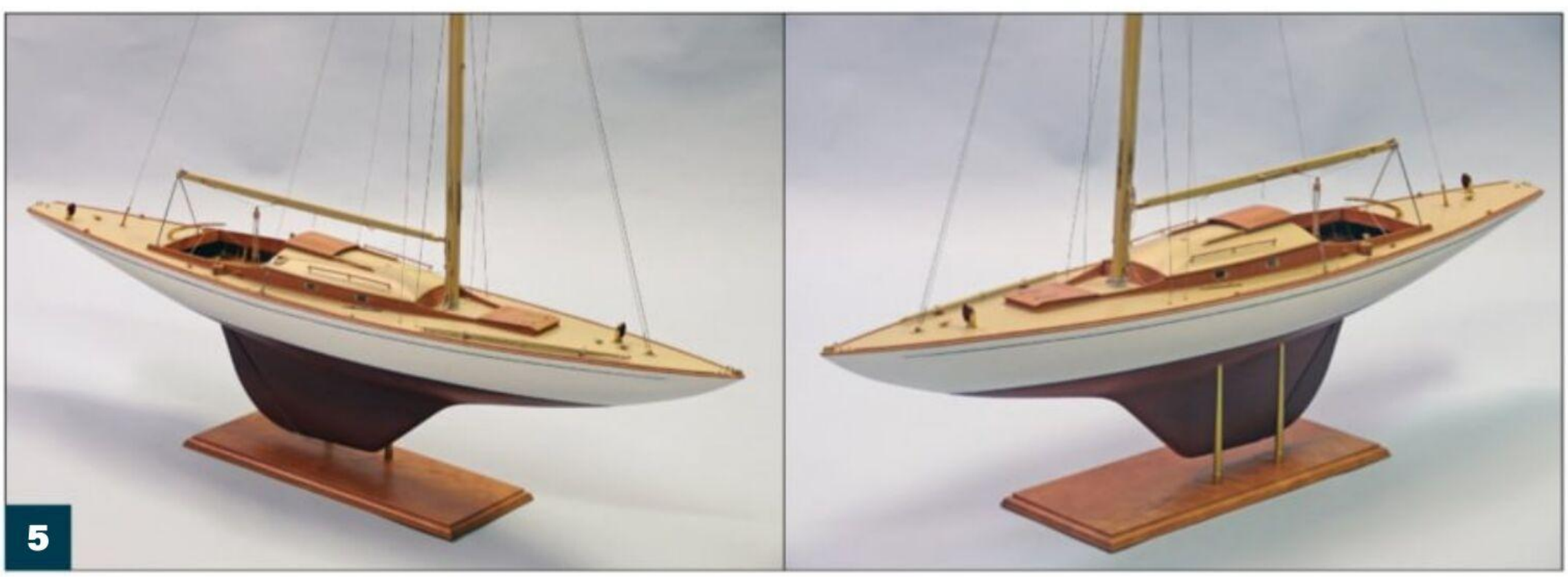
3

The shape of a base can tell a story, too. People tend to look at a model from the side or slightly above. A base shaped like a hull's waterline can add interest and teach something about a vessel's design.



4

Carrying the previous idea a bit further, the base on this model is carved to not only show the shape of the waterline but also mimic the shape of the hull just below it.



5

Mounting the pins on the "back" of the model can make it appear to float over the base. The mount pins will be in shadow and nearly invisible. This type of mount is especially handy when a model will be placed on a shelf next to a wall.

6

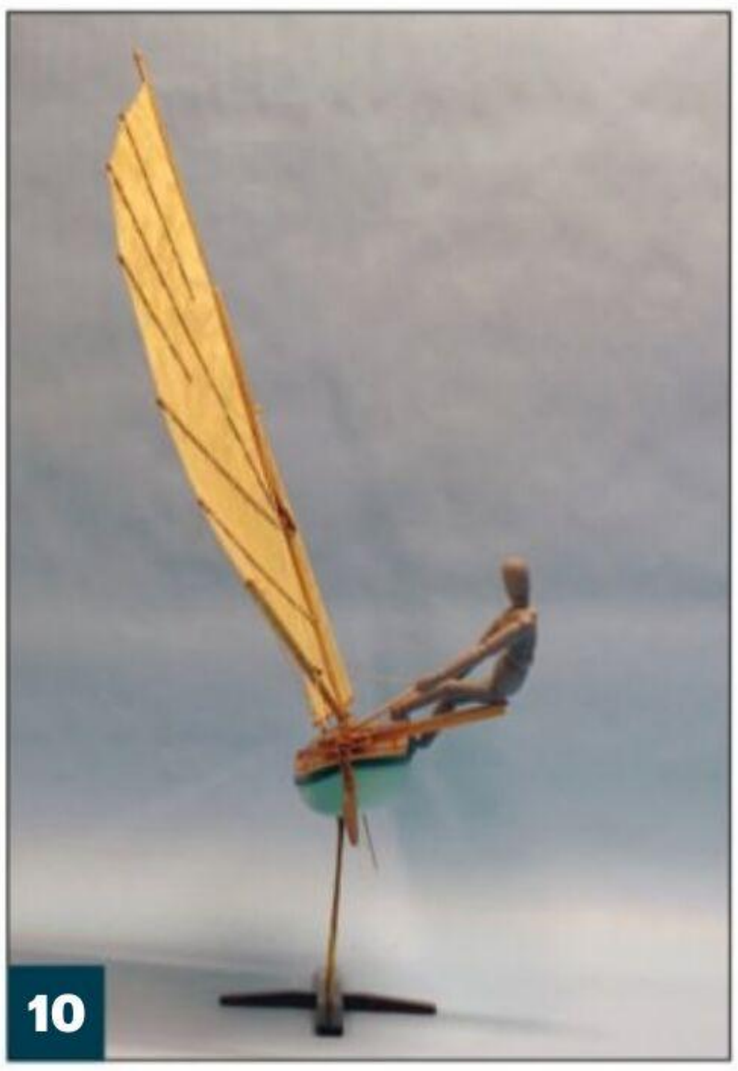
An easy way to introduce a sense of motion to a display is by biasing the mounting pins toward the rear of the base and mounting the model slightly forward on them. The differences don't have to be much.

7

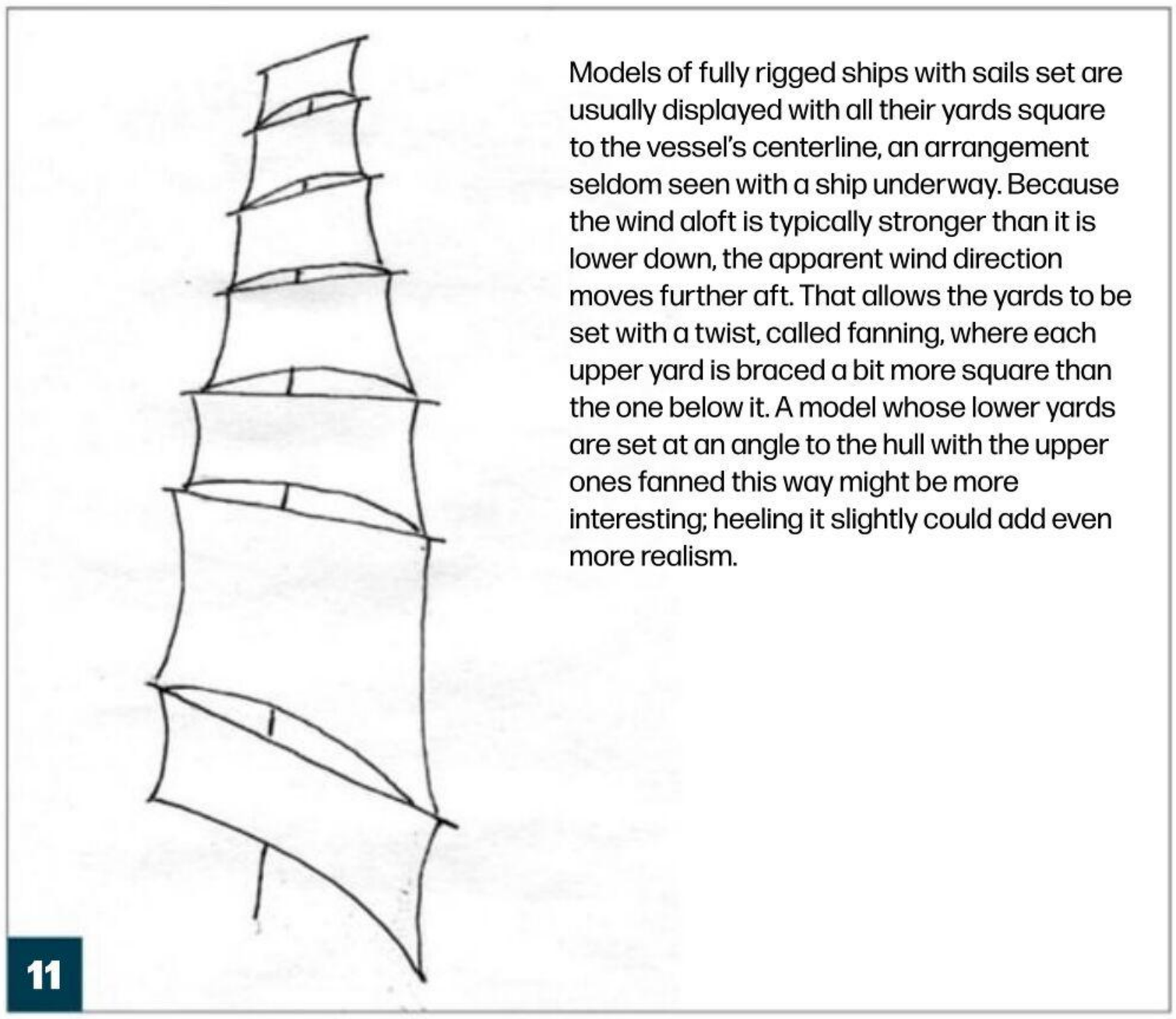
A relatively thick wooden base can be made to look thinner if the top surface is given a gradual taper. This concept can be adapted to almost any size or shape.

Cradles, used a lot with radio-controlled models, can make for good-looking displays and offer many possibilities for size and shape.

Look to the real world for mount systems, like this sailboat model sitting on yacht stands with simulated concrete blocks under the keel, a scene found in many marinas. Timbers can be used rather than concrete blocks and wooden cribbing and supports are commonly seen under larger vessels and can be simulated. Model and photo by Kurt Van Dahm



Boats with sails set look much more interesting and realistic mounted slightly heeled over.



Models of fully rigged ships with sails set are usually displayed with all their yards square to the vessel's centerline, an arrangement seldom seen with a ship underway. Because the wind aloft is typically stronger than it is lower down, the apparent wind direction moves further aft. That allows the yards to be set with a twist, called fanning, where each upper yard is braced a bit more square than the one below it. A model whose lower yards are set at an angle to the hull with the upper ones fanned this way might be more interesting; heeling it slightly could add even more realism.

Another way to increase interest and the visibility of a model is to tilt the whole display, base and all. This can be done by adding a simple wedge or angled stand under it and can be particularly useful with smaller displays.

Done carefully, mirrors can add a lot to a model. A mirror under a hull shows what the underside of the vessel looks like, something rarely seen. Mirrors can also show unusual views. A pair of front-surfaced mirrors set at 45 degrees to the bow and stern of a model will show the side view and both ends at the same time. This approach is useful for smaller models and has the advantage, through an optical trick, of making the inside of a case look bigger than the outside. **FSM**

Zen and the art of CREATING THE OCEAN

Model realistic water for a large-scale ship

BY RON NEILSON

The first thing I learned about making water is that most of one's acquired skills as a model ship builder are useless; kitbashing or scratchbuilding doesn't matter. Model ship making is precise, organized, and sequential, not to mention mostly symmetrical, especially for sailing ships. Water is free-form, random, chaotic, transparent, mutable. I draw this contrast because once you have assembled the materials and have decided to make some water, you will need to use your fingertips (a lot) and, since there are no plans to follow, you will need to invoke your best intuitions and what your mind's eye and experience tells you about how water behaves.

Luckily, I was able to consult two distinguished members of my ship modeling club, Justin Camarata, author of *Waterline Dioramas: A Modelbuilder's Artform* (Seawatch Books, ISBN 978-0-982-05792-6), and Michael Mariano, who paints seascapes and other maritime subjects. Between them, I was able to learn how to make water for my large-scale ships and help you do the same.

Make the base

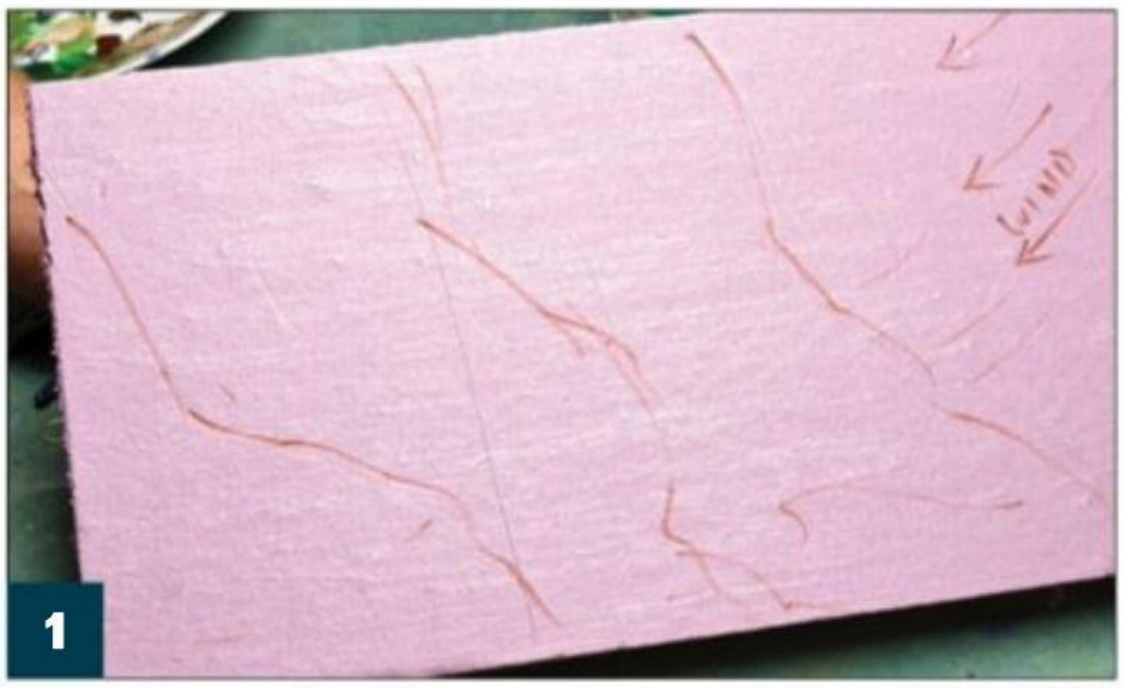
I used XPS foam board insulation (often pink or green; not the crumbly white stuff) for the base, **1**. You can buy foam insulation in a number of thicknesses from hardware stores, and they usually come in 4-foot x 8-foot sheets. I bought a half sheet of 1-inch-thick insulation board, which was plenty for my diorama, including minor errors. I cut two sections of the insulation 18 inches x 38 inches and glued them together for a 2-inch-thick base, but you'll find for many dioramas, a single layer will be adequate.

After cutting the insulation to the overall size needed, I turned to a hot-wire cutter to form the waves and ocean swells, **2**. I sketched the direction of wind over the water and roughly where I thought the crests and troughs would be properly placed.

Be warned, carving foam insulation is extremely messy business. I wanted a dynamic sea, not a Nor'easter, so I didn't need to cut down more than half an inch into the insulation at any point.

The hot-wire cutter was useful for accomplishing the water's overall shape. A long-bladed craft knife was perfect for refining the appearance, **3**.

I believe scale fidelity in portraying water is paramount. It is critical to make the water's



1

Use a marker to sketch where and how far apart the wave action will be. This preliminary step should take into account the scale of your ship model. Decide the direction of the wind.

2

A hot wire cutter will give you a good start on where to put the troughs in your water's surface. It is difficult to make a mistake at this stage; follow your crest markings.

Use a razor-sharp knife, but be careful! The foam insulation material is spongy and tends to deflect the blade. A serrated bread knife will work better for cutting through the insulation for the hull opening.

A completed section of carved foam. It does not look like much at this stage. You should strive for visual randomness while taking into account the wind direction across your water's surface.

Sheetrock joint compound is a perfect top coat for the carved foam base. The material comes ready-made. You will need a spoon not only to scoop it out, but also to work the surface crevices.

Work the joint compound across the foam with a spoon and then your fingers. The object is to achieve an even layer, but you will want to retain some of the slightly bumpy build-ups; you can fill holes and spots you are not happy with.

surface appear to undulate like a real sea and have a credible appearance consistent with the scale of your model, **4**. You also want your ship positioned appropriately for your subject — in this case a sailing ship, stem down, stern high, like the real thing in moderate swells. I also decided on a heeling angle of about ten degrees to starboard. Aim to achieve a dynamic, non-static appearance for your diorama by placing the model in it at interesting, non-linear angles, just like a ship would appear in the water in the real world.

I use a 24-inch bendable curve (available from art supply outlets) to achieve an accurate shape of the ship model at the waterline. You can also refer to your ship's building plans for the exact shape of the waterline if you have them. I trace the resulting curve to a thin piece of cardboard, to make a template of both sides of the ship's hull at the waterline. Cut out the template, place it on the base, and transfer the shape of the hull to the insulation with a black marker. Then proceed to remove the insulation where the hull will rest with a sharp, serrated bread knife. A bread knife or similar blade works better in this application than a craft or utility knife. By angling the knife while making the hole, you'll be able to achieve the heeling and yawing angles to support the hull on both sides. This process takes time, removing small areas, test-fitting the model to the recess, and then adjusting, especially around the stem and stern. Proceed gradually and try to make the fit as tight as possible because that will save work around the hull later when modeling the wake. I'm satisfied when the hull fits and the ship's keel is fully supported by the bottom of the base.

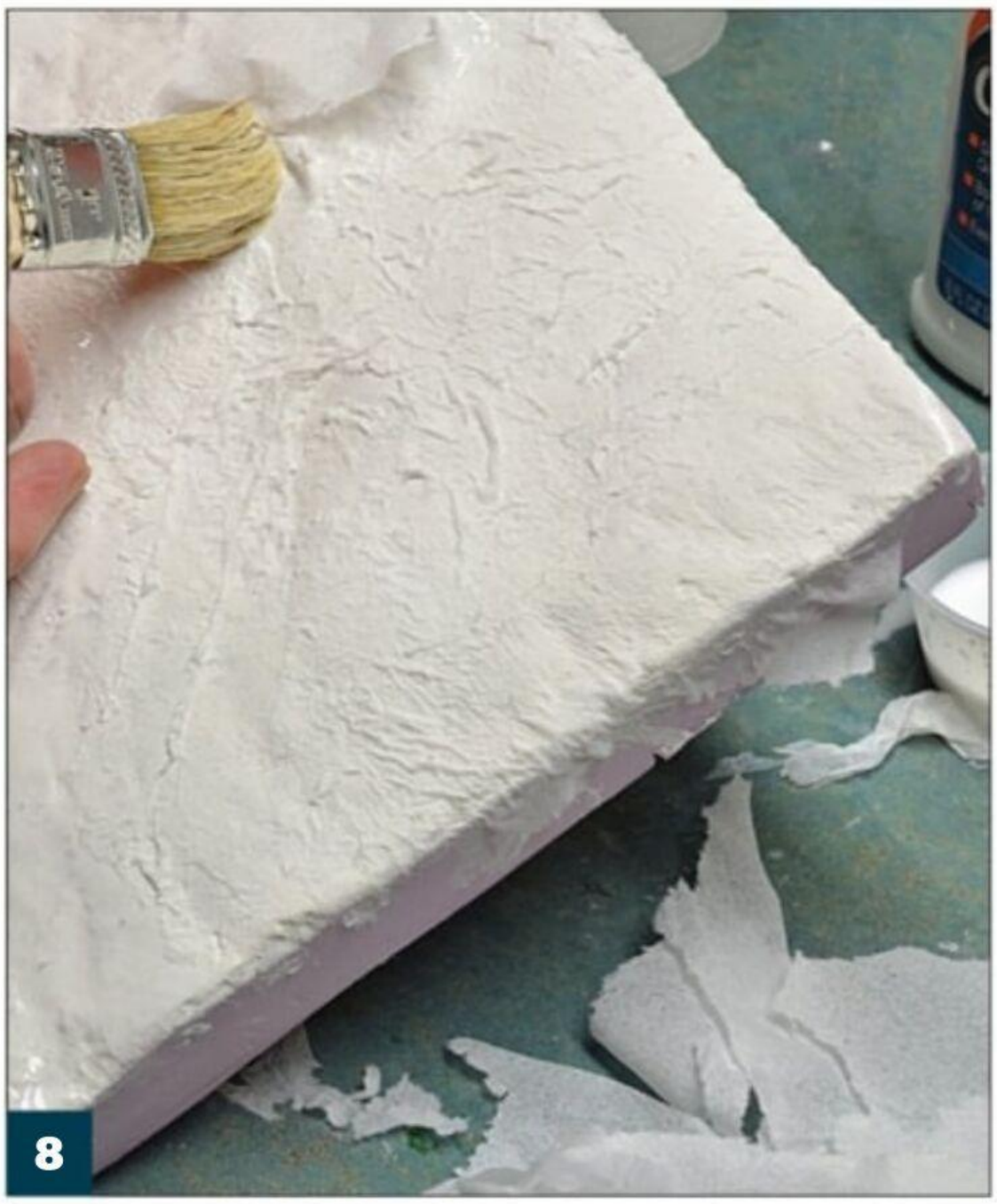
Adding textures to the insulation base

Cover the top of the base with premixed, lightweight, joint compound, **5**. The plaster provides a solid surface for subsequent acrylic paints, mediums, and gels. You can spoon it out directly from the container. Once the surface is covered, I use my hands to smooth out the compound, **6**. Finally, apply a wide brush to the compound to even everything out, **7**. When you're satisfied with the look, let it dry thoroughly.

After the joint compound has completely dried, lightly go over the surface with 400-grit sandpaper. Use a loose sheet so your fingers can feel the undulations as you gently smooth the surface.

Tear variously sized strips of single-ply toilet paper (no

Before the compound sets, add one final touch: use a wide brush to smooth out the surface with feather-like strokes. Do not worry about the small areas that do not look right. You will fix most of these at the next stage.



The secret sauce: single-ply toilet paper and thinned white glue applied with a 1-inch-wide paintbrush. As the thin paper dries it will shrink and yield hundreds of miniature ripples, rivulets, and wind devils – focus on making the results as random as possible.

patterns!), the more ragged and random the better. Apply diluted white glue (1:1 water to glue) to the plaster and place the toilet paper strips across the entire base. Yes, you'll overlap the paper strips. Texture the strips by pushing them around with a paintbrush while they and the glue are still wet, **8**.

Make sure to cover the entire surface of the base. Before everything sets up, use a second, smaller paintbrush to shape some of the finer water effects, **9**.

Painting the water

For this example, I'm modeling the North Atlantic. You'll want to adjust colors for your specific location. I chose Liquitex acrylic products, including Phthalocyanine Green, Ultramarine Blue, Titanium White, and Ivory Black paints, Gesso, and Matte Medium, **10**.

Place a generous amount of your colors on a palette and use a large brush to mix and then apply them, **11**. Work the brush into all the crenulated surfaces. I find it better to do this work in two light coats. The first coat will allow you to create a "map" of colors. You'll mix the colors in different ratios, keeping the darker tones in the troughs between the waves, and working up to lighter colors toward the crests. Look at photos of the water you are modeling for reference and make sure to work in manageable sections — don't try to paint the whole base all at once.

Combine black with both the green and blue to heighten contrast with varying mixes of the other two. This will also yield a semitransparent appearance, as if the colors are at different depths. In places, let the white base color show through to lighten spots. You'll mix colors both on your palette and on the base as you're working. As the paint dries, you'll see the base appears

While the toilet-papered surface is still wet and workable, use a smaller paintbrush, like this fan brush, to push the paper into interesting and variegated surface textures.

10

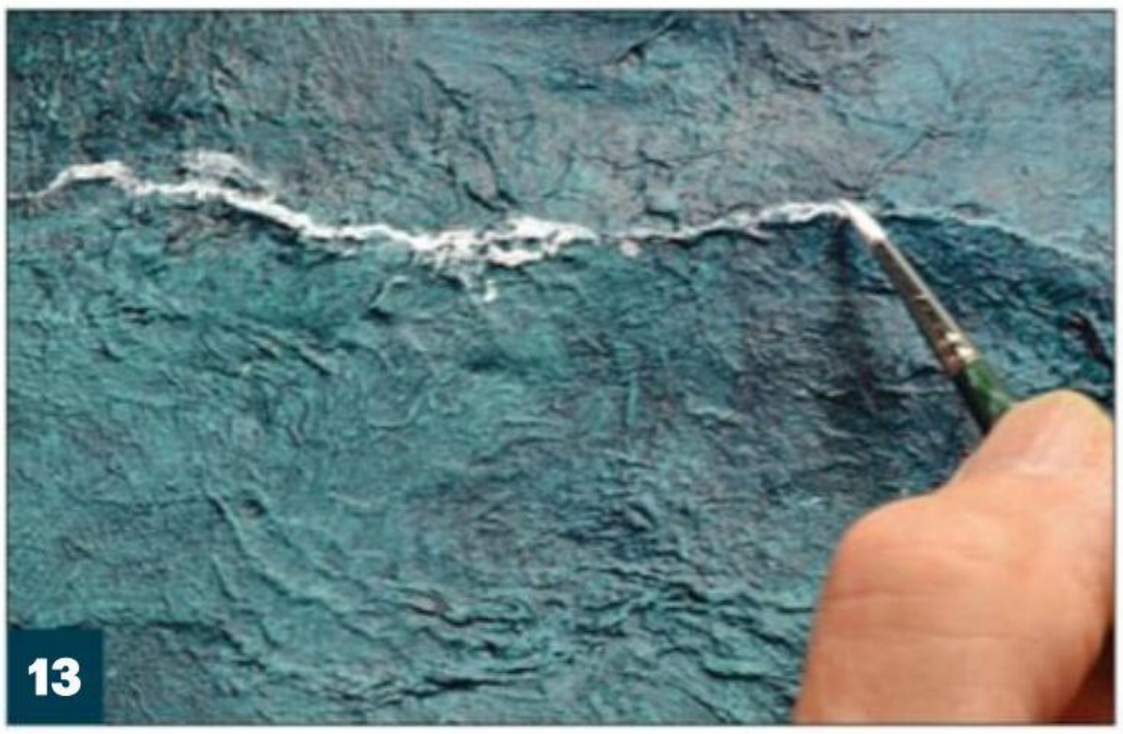
Brush a layer of gesso across the entire base before painting. This provides a surface for the paint to adhere to, as well as a solid, single color, kind of like priming a model.

11

Mix plenty of black paint into the blue and green. If done properly, the result will be random color shades, some very dark, others light. Make the troughs between waves a little darker than the crests.

12

With the base colors complete and fully dried, sketch out the crests of the waves and the wake around the ship's hull with a white pencil. This will help guide you on the final steps when creating convincing white and foamy crests across the entire base.



13

The acrylic Woodland Scenics Flex Paste is a viscous medium that dries glossy, hard, opaque white. Like the initial steps with the joint compound, do not be afraid to use your fingertips to apply this to get the shape you want.

14

After building-up the churning foam atop the wave crests with Flex Paste, paint transition colors to blend the stark white foam crests into the darker water surrounding them.

15

After all the wave crests and foam details have been finished, the entire surface receives a coat of Liquitex Gloss Medium acrylic. I applied two to achieve a greater reflectance.

predominantly deep blue, but in places you'll have a greenish hue depending on the angle of the light, just like the real ocean.

On the second pass, you'll adjust and touch up the work you did on the first pass. Concentrate on creating a sense of depth to the water.

After the paint has dried and you're satisfied with the final tonalities of the colors overall, sketch the shapes of the wave crests, churning, and random foam with a white artist's pencil, **12**. Many of the swells will be happy accidents of the base and paper layering.

Pay attention to the direction of the diorama's wind that you decided upon at the very beginning to keep your accenting consistent.

After sketching in the whitecaps and foam with white pencil guidelines, apply opaque, white acrylic Woodland Scenics Flex Paste (No. C1205) with a small paintbrush, **13**. This acrylic material dries glossy and opaque and works well to model foam and whitecaps. This step is critical for creating the appearance of motion on the surface and build-up foam and moving water.

Let the Flex Paste dry and then come back to touch it up with lighter acrylic paint hues, **14**. These small brush strokes fall behind the foamy crests and will lend smoother-looking visual transitions to the wave tops. This step is tedious but important to simulate realistic water.

Lastly, brush Liquitex Gloss Medium gel over all of the water, **15**. It dries glossy and transparent. Do not hesitate to use multiple coats to get the appearance you want.

FINAL THOUGHTS

AFTER YOU SET YOUR MODEL in its recess and have it positioned correctly, apply the Flex Paste where the hull meets the surrounding water. Shape the paste around the cutwater (bow) and the rudder with a paintbrush. Several coats will probably be necessary to achieve your desired movement effects. Let each application dry before adding additional Flex Paste layers.

You can also use the gloss medium to simulate water splashing on the hull, especially at the stem, stern, and along the wales. **FSM**

SWIFT

A Virginia pilot boat of 1805

Finish a double-planked hull and overcome challenges of an older kit

BY GILBERT McARDLE

Swift was a fast-sailing vessel, precursor to the Baltimore clippers that harassed the English before and during the War of 1812. The basis for my model is the Artesania Latina 1/50 scale Virginia Pilot Boat *Swift* of 1805 wooden kit. This one was purchased by a friend from Model Shipways many years ago when the company was still in Bogota, New Jersey, and given to me. However, Artesania Latina still produces the kit as U.S. Pilot Boat *Swift*.

1

There are differences between building one plank-on-bulkhead ship kit and another, but they all build similarly at the beginning. Here, I've assembled the bulkheads and backbone of the ship.

2

Balsawood is easy to shape and that makes it a good material for filler blocks at the bow, midships, and stern. These blocks reinforce these spots and provide a bit more area for planks to adhere to.

3

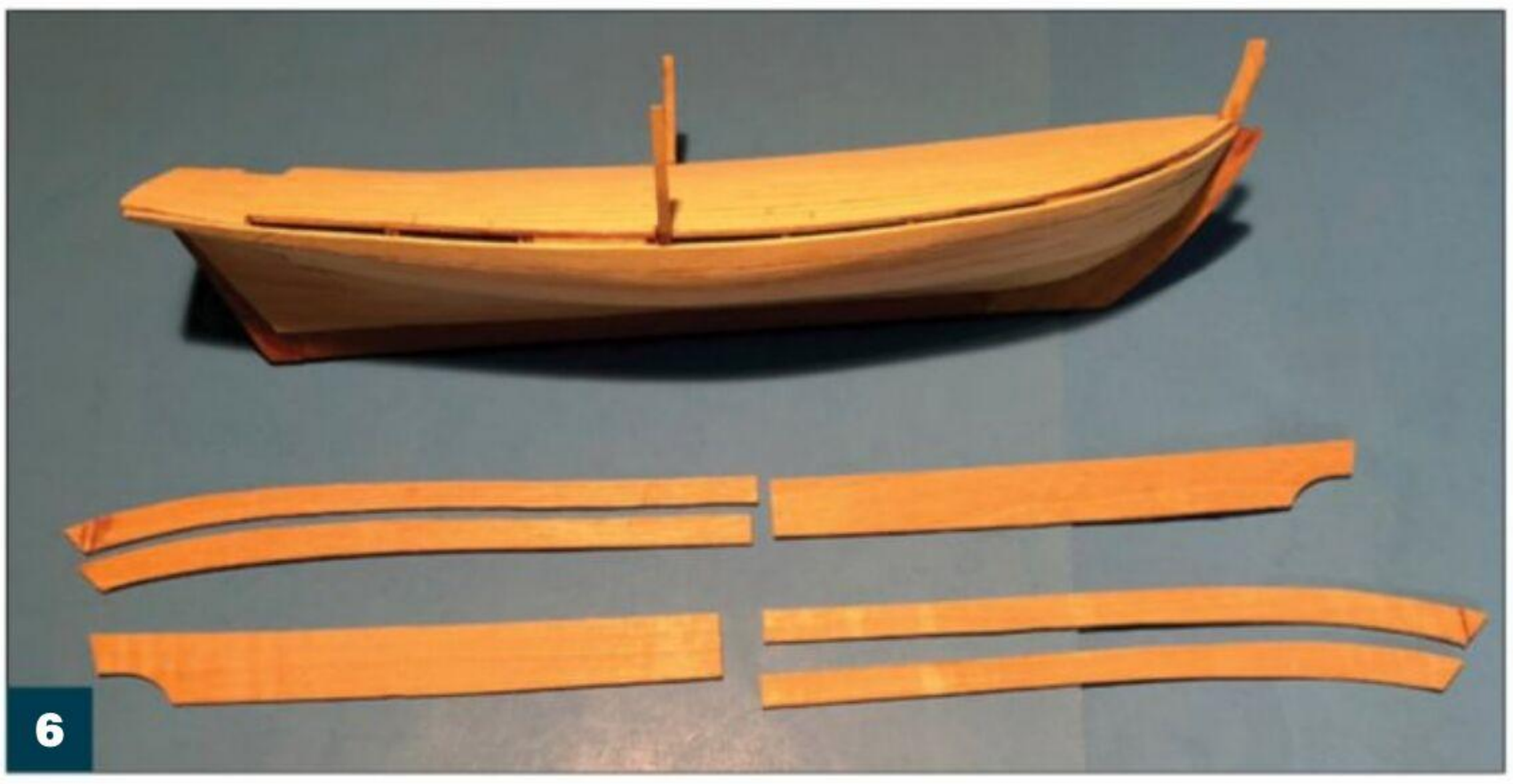
I've placed the mahogany keel and begun the first layer of planking. Add planks to both the starboard and port sides at the same time to keep the planks symmetrical and avoid twisting the hull.

4

The first layer of planks is complete. Note the areas where I turned to narrower basswood strips instead of the lemonwood because the wider planks proved brittle and hard to work with.

5

I applied the wood strips provided in the kit to plank the plywood deck.



6

This is what the thin, plywood bulwarks looked like before they were attached to the deck.

Basic hull

The hull follows conventional bulkhead construction. I attached the laser-cut bulkheads and spine to the underside of the plywood deck, **1**. I used balsawood filler blocks to strength the bow, stern, and mast locations before fitting the mahogany keel, **2**.

The kit directions advise attaching the keel section after completing all of the outboard hull double planking. However, in my experience, I have found it advisable to place the keel first and then tailor the hull planking to fit against it. So, I attached the keel and then began planking the hull, **3**. When applying the first layer of planks, it's important to alternate, laying a plank on one side and then installing the identical plank on the other side. This helps avoid twisting the hull and makes it easier to keep the port and starboard sides symmetrical.

After completing the first layer of planking, I sanded it down before continuing construction. The lemonwood planking provided in the kit was particularly wide and, perhaps because of the kit's age, extremely brittle. This precluded attaching the planking to the hull bulkheads satisfactorily, so I abandoned its use and employed lengths of ⅛-inch and 1/16-inch square basswood to complete the process, **4**.

The kit provided anigre for planking the deck. A soft, African hardwood, it has an attractive light lemon color and is easy to cut and use. In my opinion, it has a nice, slightly ribboned grain pattern reminiscent of quarter-sawn sycamore, **5**.

With the deck planked, it was time to attach the thin, plywood bulwarks to the hull, **6**. However, the kit does not include any actual support timbers for these bulwarks. I fashioned strong, boxwood upper extensions for several of the midships bulkheads and the stem to strengthen the bulwarks, **7**.

With the bulwarks in place, I turned my attention to the

The kit provided no stanchions to attach the bulwarks to. So, I made my own from boxwood and then glued the bulwarks in place.

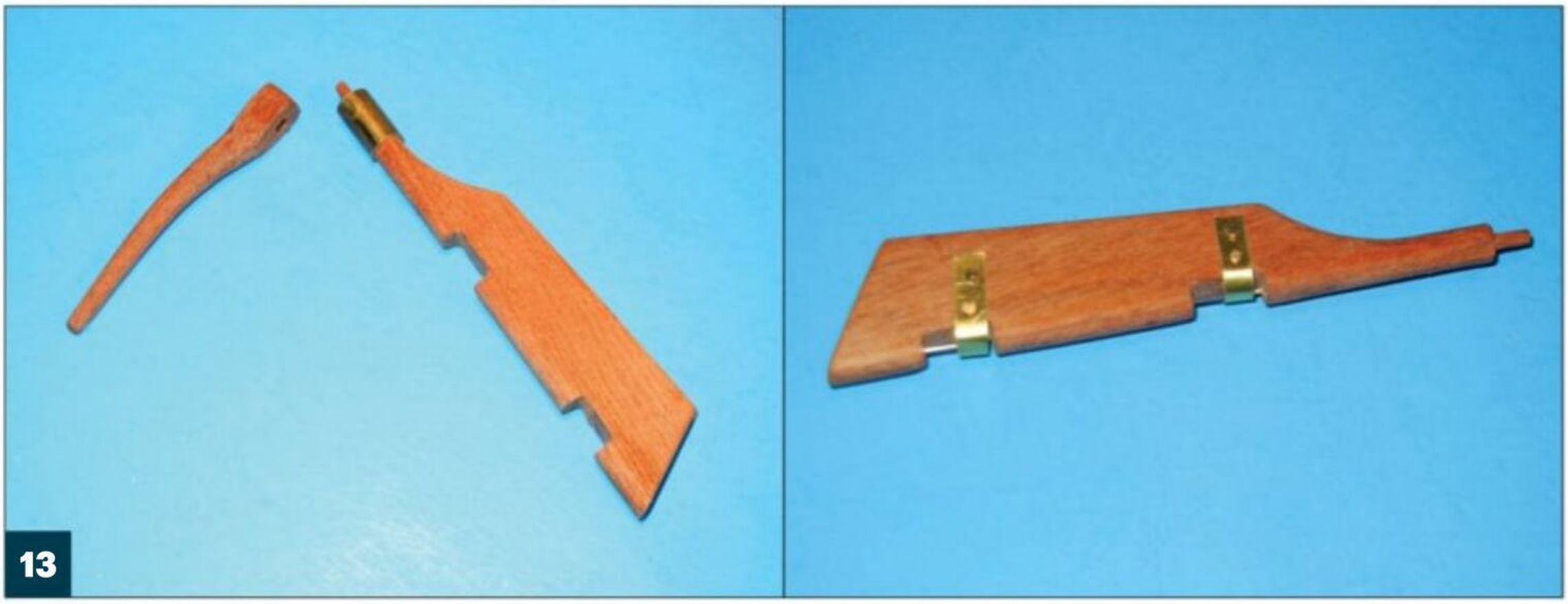
The wood supplied in the kit was not ideal, so I turned to strips of black walnut that I milled. You can find lumber of the same dimensions online made specifically for use with model ships.

After sanding the hull smooth to rid it of superglue residue, I glued the mahogany wales to the hull and clamped them to allow them to dry properly.

Mahogany stanchions were added along the inside of the bulwark. These not only provide more strength to the bulwarks but also reflect what you'd see on a real ship.

The cap rail is made from mahogany strips. At the bow, the kit provides a pre-shaped piece to make it easier to model.

The stern of the ship has a lot going on, including the cap rail, transom, seats, belaying pin racks, and a brass tube to allow the rudder to fit through the hull from below.

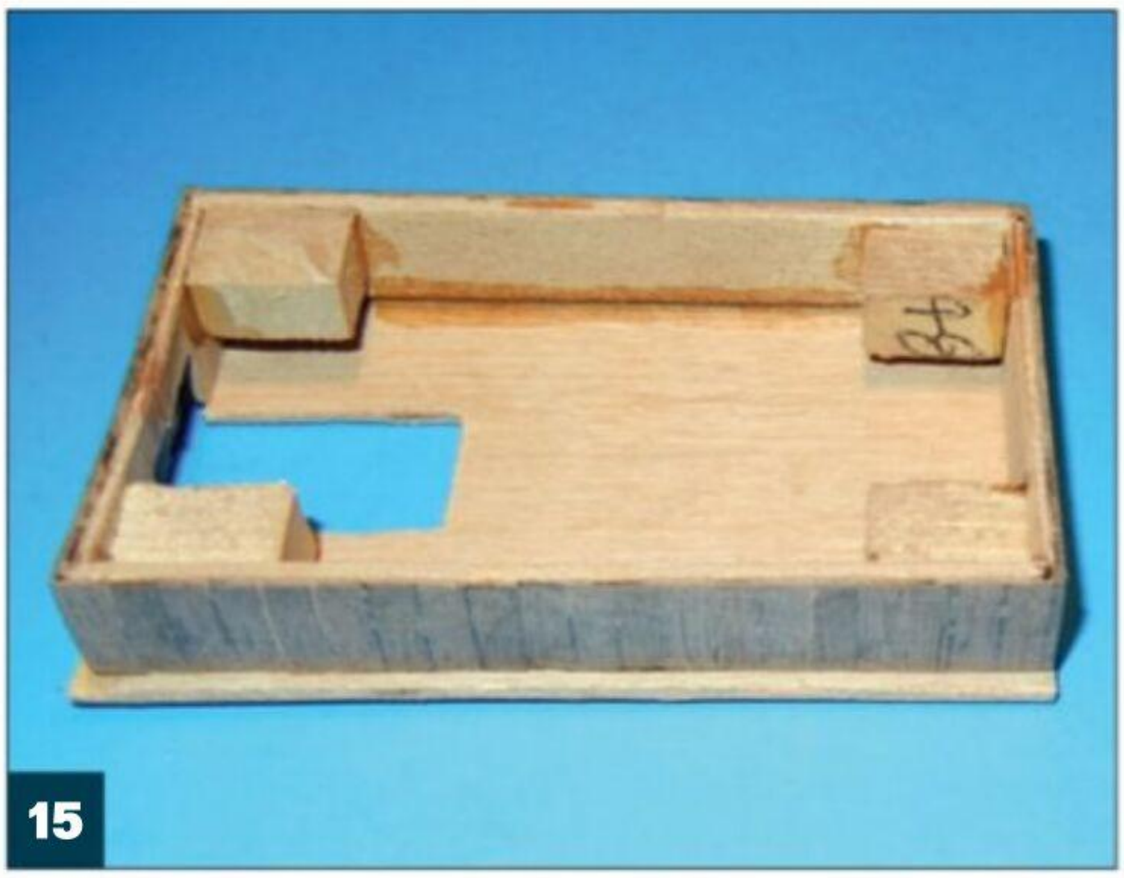


13

The rudder's gudgeon and pintles are replicated in brass, and the tiller is a separate part that will be added after the rudder has been installed. Like just about everything else in a wooden ship kit, they do need sanding and shaping.

14

The finished bow with stem, wales, and brass hawse pipes. Notice how the hull planks terminate snuggly up against the keel and stem.

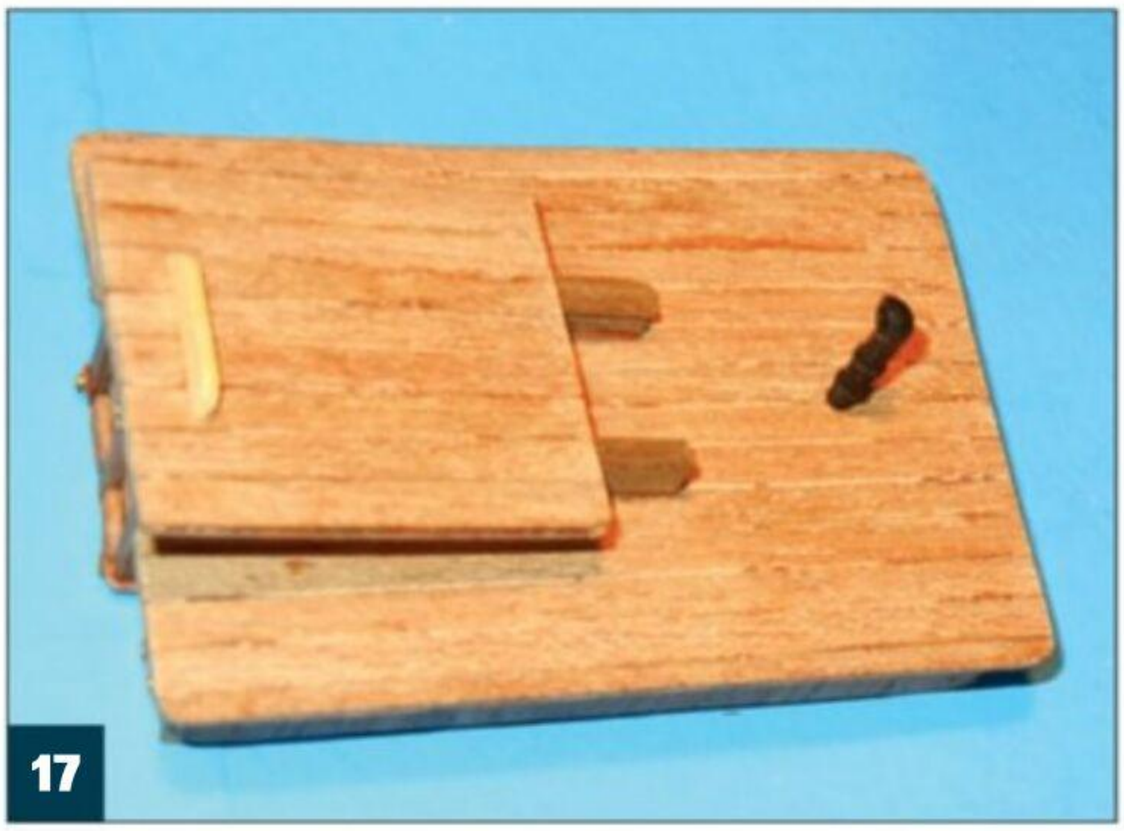


15

I built the deck houses out of lumber provided in the kit and covered the exterior with black walnut strips. At the corners are basswood blocks to keep the walls square and strong.

16

Flipping the deck houses over, I built the companion ways. The doors were hung with brass hinges and nails.



17

Planking the roofs and adding vents completed the houses. I set them aside to place them on deck after all the other deck details but before rigging.

second layer of planking. You'll find that some wooden kits will provide strips for a second layer of hardwood planks, usually for modelers who plan to finish their model as natural wood rather than paint it. The kit came with thin strips of mansonia, a dark wood that has been found to have many toxic properties. I attempted to use several pieces but found them too fragile. Instead, I milled my own walnut planks 3/64-inch thick by 1/8-inch wide (1mm x 3mm), a size you can find available online. I superglued the walnut planks over the underlying hull. You can see obvious remnants of the glue, but it was easily cleaned up during final sanding, **8**.

After sanding the outer layer of planking to a smooth finish, I used several lengths of mahogany strips to build the upper and lower wales, **9**.

Turning my attention back to the deck, I added mahogany stanchions to the inboard sides of the plywood bulwarks, **10**. More mahogany strips made up the rails on top of the bulwarks and stanchions. A shaped piece formed the bow cap rail, **11**.

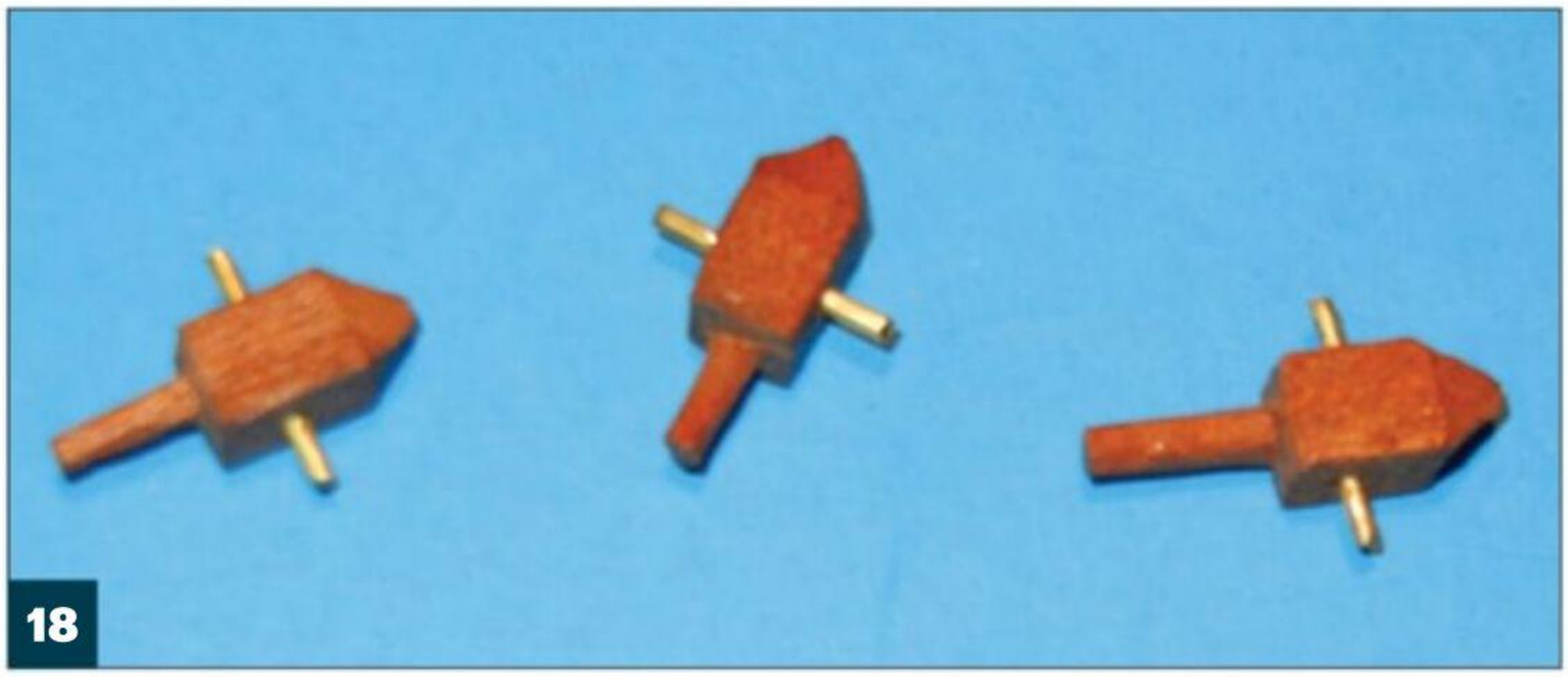
At the stern, I fitted the transom frames, seats, bulwarks, belaying pin rack, and a brass tube to accommodate the rudder head, **12**. The kit provided a part from which to shape the rudder, and I also made a tiller, too, **13**. Brass gudgeons and pintles were also supplied in the kit.

The bow came together well, with the wale, hawse timbers, stem, and hawsehole with a metal fitting, **14**.

On deck

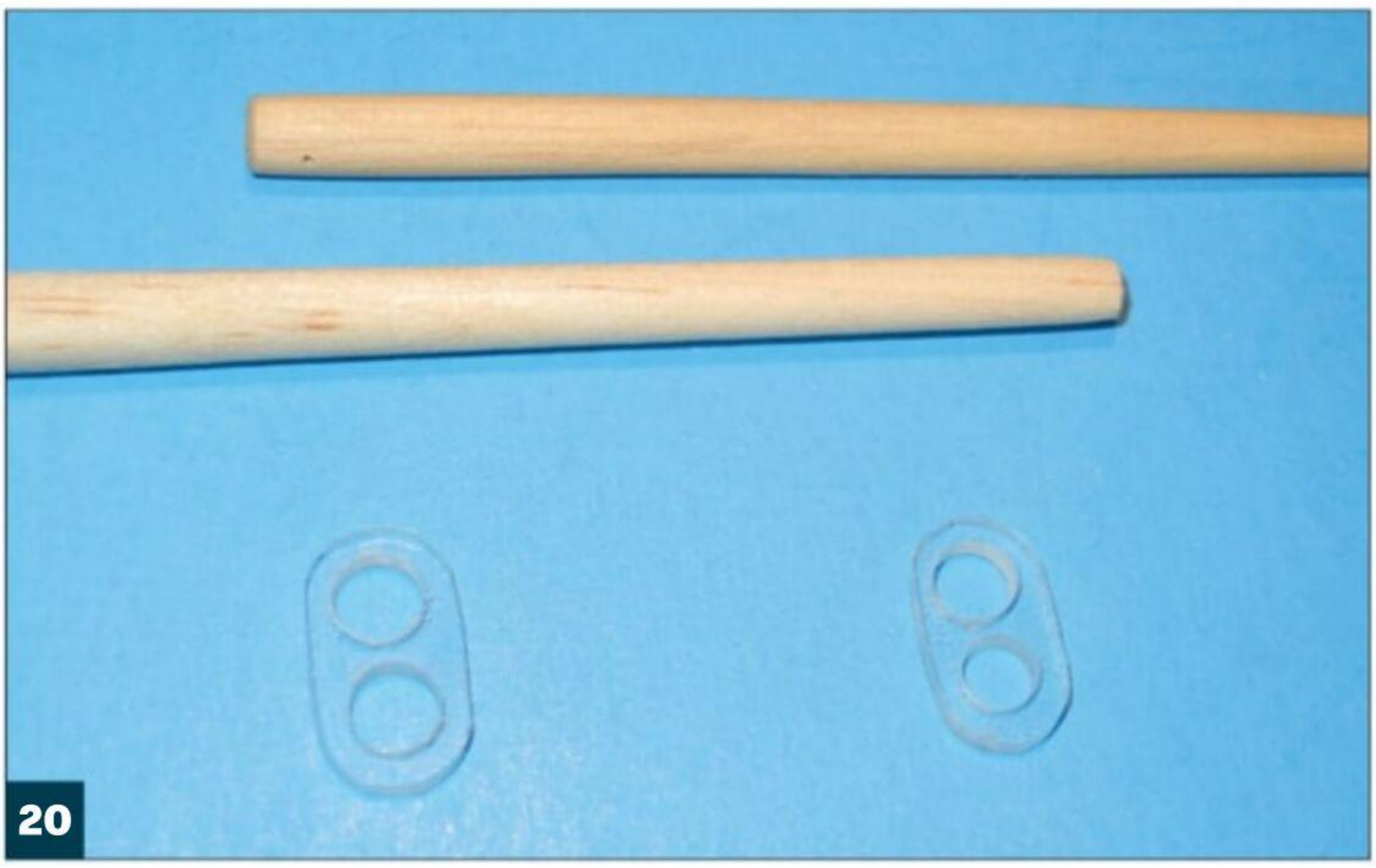
I built the forward and aft deck houses and added black walnut to the exterior. Inside, I attached square basswood blocks at the corners to provide support and strength, **15**.

Mahogany strips, 1/32-inch thick and 1/8-inch wide, went on the house roofs before making the companion ways. I made the doors from short lengths of mahogany glued to a thin sheet



Speaking of details, I made bitts from mahogany and drilled a hole through them to accept a length of brass rod.

Following the kit plans closely, I cut scuppers in the bulwarks at midships and placed all of the minor fittings on the deck, including cleats and eyebolts around the hole for the main mast.



The brass fittings for the topmast were brittle with age, so I made new ones from 1/16-inch Plexiglas and that I later covered with brass strip.

Before rigging, I attached the hull to the base that came in the kit. It had a pair of turned-brass pedestals with a notch to accommodate the ship's keel and fastened with a screw. Then I set the main mast.

The boom, gaff, and topmast have been fitted to the main mast. Two cleats were fitted to the midpoint of the main boom and the eyebolts to the top mast for the blocks.

of holly and attached with copper hinges nailed in place, **16**.

Black iron vents and roofs to the companion ways completed the deck houses. I waited to glue them to the deck until after other fittings were already in place, **17**.

I shaped the bitts from ⅛-inch square mahogany and inserted 3⁄64-inch-diameter brass crosspieces through them, **18**. I drilled and cut out the ⅛-inch by ½-inch scuppers between several of the bulwark stanchions and used black walnut to fabricate deck cleats and placed eyebolts where indicated by the plans, **19**.

Masts and rigging

I made the masts and booms matching the dimensions on the kit plans. The pre-cut parts in the kit were made from bokapi wood. What should have been a soft red color had turned dull and dark, maybe because of spending 30 years in a kit box. I replaced them with maple stained them a light tan.

The instructions indicated the attachments for the main topmast should be clinched pieces of brass. The material in the kit was too fragile and fractured when I attempted to use it. Instead, I made the fittings from 1⁄16-inch Plexiglas and later covered them with thin brass strips after assembling the masts, **20**.

Before adding masts and rigging, I attached the hull to the display base included in the kit. I finished the base with several coats of satin, polyurethane varnish. The hull was attached to the base using brass stanchions with slots cut to fit the keel. Screws went through the keel and firmly fastened the model to the base.

I glued the mainmast in place and made sure to add its mast coat at the foot. A circular wooden platform around the mast supports the main boom, and the kit provided brass for the boom and gaff parrels. While it supplied brass hoops for the sails, I replaced them

23

I surrounded the deadeyes with brass wire and hooked them to the supplied chainplates. I made chainplate channels for the sides of the ship from mahogany.

24

Before going any further with the rigging, I attached the two deck houses because they would be difficult to position once all the rigging lines had been run.

25

With all of the deck fittings and housings placed, it was time to do the bulk of the rigging. The standing rigging (dark ropes) were easy enough, while the running rigging was more complicated. However, all the rigging was shown on the ship plans, so it's a matter of being deliberate when reading the rigging plans.

with wooden ones to preserve aesthetics and authenticity, **21**.

The main boom and gaff were outfitted with their necessary blocks. Two cleats were attached at the midpoint of the boom, and two eyebolts were fitted to the topmast for two single blocks, **22**.

The instructions said to encircle the deadeyes with the upper segment of the provided brass chainplate. Once again, the brass was too brittle; I employed a brass ring around the deadeye and attached it to the bent, upper end of the chainplate. The channels for the chainplates and deadeyes were made from ⅛-inch x 1¼-inch mahogany, **23**.

Installing the foremast went similarly to installing the mainmast.

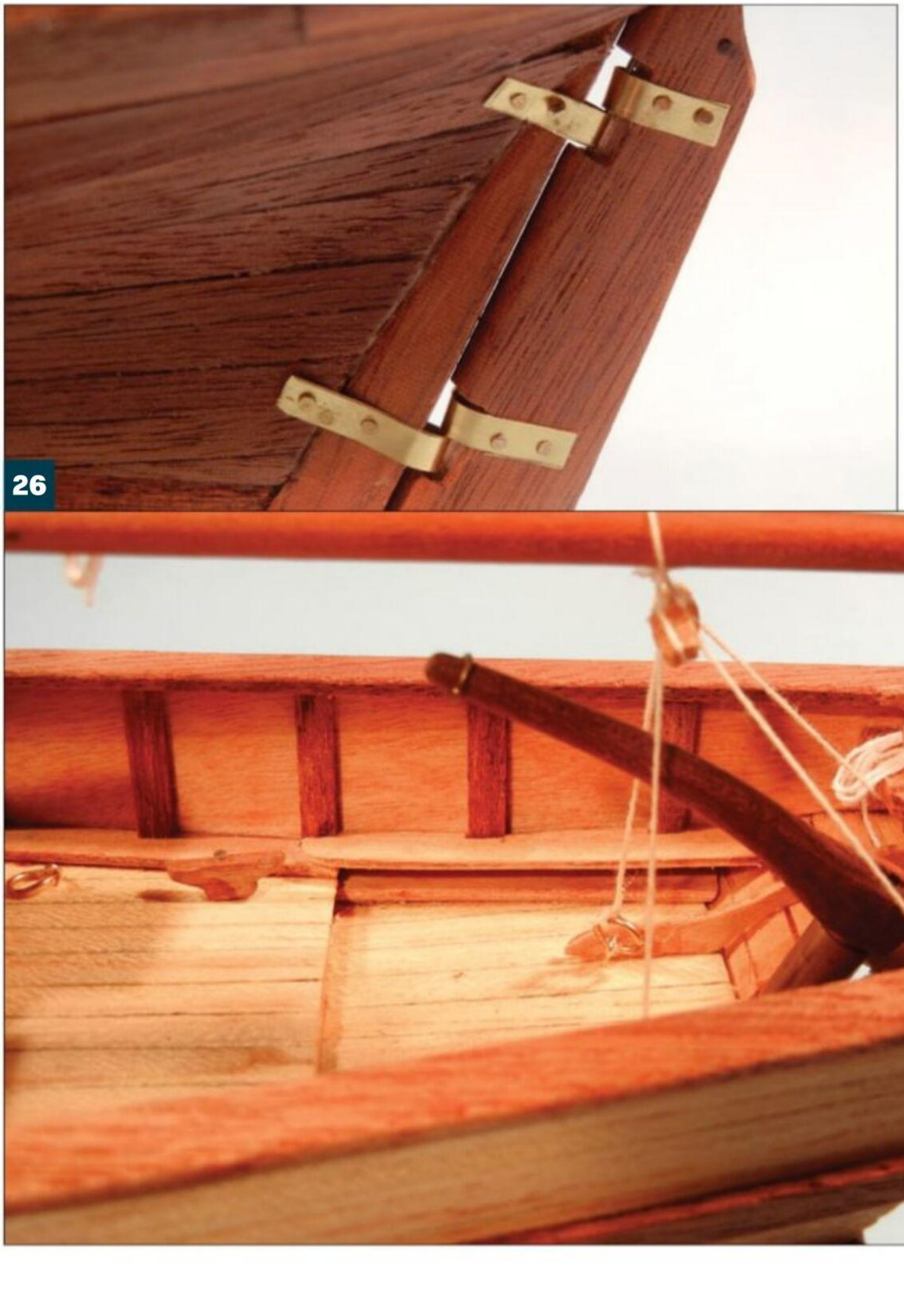
Before rigging, I installed the houses, built the bilge pump, and added a water barrel and bucket, **24**.

I fitted the bowsprit and held it down with a brass gammoning strap.

Then it was time to rig the model. The two shrouds were added on each side of both masts. Then I fitted the stay between the two masts and the forestay to the tip of the bowsprit. That completed the standing rigging. As expected, the running rigging was a bit more complicated, but not terribly so while following the ship plans, **25**.

After rigging, all that was left to do was add the rudder — sliding the headstock through the brass tube installed earlier and setting it on its gudgeons and pintles — and then set the tiller on the rudder head, **26**.

A period-correct flag completed the model. **FSM**



At last, I slipped the rudder up through the brass tube and hung it from its gudgeon and pintles. Then I pushed the tiller into position on the rudder head, and my *Swift* was finished.

26

Dutch schooner *Eendracht*, 1/100 scale, published by JSC (Poland). *Eendracht* was built in 1989 in the Netherlands and sails as a charter and a training ship to introduce young people to the sea. The kit includes 1,520 parts and instructions in English and Polish.

Photograph courtesy of JSC

Chart a different course

You can achieve museum-quality results with paper

BY DAVID SAKRISON

Flower-class corvette, 1/250 scale, published by HMV. This printed waterline model features plenty of detail, including bridge interior and guns and depth-charge launcher. Laser-cut and metal detail parts are available from HMV. The model here is of the Canadian HMCS *Battleford*. Model and photographs by Garth Nicholson

Paper ship models have come a long way in the past 20 years, from rough, hand-drawn kits to today's highly accurate, extremely detailed maritime paper models. In Europe, scale model exhibitions include many museum-quality ship models made from paper kits. Publishers in Poland, Russia, Germany, and other Eastern European countries produce printed kits for paper ship models that stand up well against the best plastic and wooden models.

The first paper models were printed in Germany in the 1700s, and the first commercial paper models appeared in France in the early 1800s. In the early 20th-century, cast iron, tinplate, and balsa dominated the toy industry, and paper models faded in popularity. World War II brought a boom in paper modeling because paper was one of the few materials that was not tightly regulated. But the ship models printed in newspapers and on cereal boxes during the war were simple and toy-like.

The 1950s brought plastic models of increasing detail and accuracy, and paper modeling mostly died out in the West. Behind the Iron Curtain, plastic models were expensive and hard to get, and most scale

WHERE TO FIND PAPER MODELS

There's plenty to see from paper ship model publishers. Check out these online offerings:

GPM (Poland)
Website: gpm.pl/en
Publishes a wide variety of civil and military ships in several scales. The GPM online store also distributes paper ship-model kits by several other publishers.

Halinski (Poland)
Website: halinski.com.pl
Primarily makes 20th-century warships. Its kits published after 2000 are best.

HMV (Germany)
Website: h-m-v.de/en/models/
Publishes a wide variety of highly detailed civil and military ships.

JSC (Poland)
Website: jsc.pl/en/3-modele
Offers a wide range of civilian and military ships in several scales, but mostly in 1/400 scale. Not all of its large catalog is in print at any one time, so it may be necessary to search online retail paper-model stores to locate specific items.

Models n' Moore (U.S.)
Website: modelsnmoore.com
Offers free digital kits, mainly of American Civil War gunships.

Orel (Ukraine)
Website: papermodeling.net
Publishes kits primarily for warships from the Age of Sail to the 21st-century.

Paper Shipwright (UK)
Website: papershipwright.co.uk
Publishes warships, merchantmen, lighthouses, and maritime-related buildings. It also offers a few free, downloadable models.

Scaldis Model Club (the Netherlands)
Website: scaldismodelclub.nl
Makes kits of a wide variety of Dutch merchantmen and warships and offers kits by other publishers through its online store.

Schreiber (Germany)
Website: schreiber-bogen.com
Publishes a varied range of paper ship-model kits.

Shipyard (Poland)
Website: model-shipyard.com/gb/
Makes beautifully detailed sailing ships and harbor dioramas. Its products are available from Ages of Sail (agesofsail.com) in the U.S.

Wilhelmshavener Modelbaubogen (Germany)
Website: www.papermod.com
Publishes kits for both warships and merchantmen, primarily German, and almost all in 1/250 scale.

World of Paperships (the Netherlands)
Website: worldofpapership**s**.nl
Offers some unusual subjects, including European canal boats and Australian river steamers.

Additionally, several retailers concentrate on paper models, most notably Fentens (papermodel.com) and Kartonmodellbau (kartonmodellbau.de) in Germany, Marcle Models (marcle.co.uk) in the UK, Papel3D (papel3d.com/en) in Spain, and Ecardmodels (ecardmodels.com) in the U.S. Other websites that offer paper ship models include many scale-model retailers and Amazon.com. Also, kits from many of the publishers often show up on eBay. Remember that shipping from Europe to other countries can be expensive.

modelers built printed, paper models. The kits were hand-drawn, and papers and inks were often of poor quality. Nevertheless, some of those Soviet-era kits produced good-looking models.

In the early 2000s, several factors came together to fuel a surge in the popularity of paper modeling. Affordable software for designing paper models and the growth of the internet made it much easier to create and distribute paper model kits. Publishers and individual designers could produce detailed, accurate paper models that would be far more expensive to create in plastic. A cottage industry arose of hobbyist-designers turning out high-quality, downloadable paper models, while European publishers like Halinski, GPM, HMV, and Shipyard continued to print quality, maritime kits that yield superb results.

The basic tools of paper modeling are scissors, hobby knife, cutting mat, steel straight-edge, scriber (for crisp folds), and craft glue — Aleene's Tacky Glue is a favorite. Nearly all kits come pre-colored, and many are pre-weathered, so no paints or decals are needed. Markers or watercolor pencils are used to color the white edges of cut paper parts.

The skills required are easy to learn. Modelers can add details of laser-cut card or wood, photo-etched or cast metal, or plastic. Ship modelers can purchase tapered masts and spars and detail parts from paper ship publishers and mainstream maritime model suppliers. Serious paper ship modelers use a variety of materials to enhance their paper models.

The most common scales are 1/400, 1/250, 1/200, 1/100, and 1/50. But a paper model can be easily scaled up or down by adjusting the print size. For digital models, the standard resolution is 300 dpi, so models can be scaled up without losing fidelity. Most parts can be printed on 65-pound cardstock; decks, bulkheads, and hull formers should be laminated to .5mm (.020-inch), the thickness of a cereal box, or 1mm (.040-inch), the thickness of a legal pad backing card. Some kits have instructions in English, and all have detailed assembly drawings or photographs.

Paper models offer several advantages over wood or plastic kits, one of which is cost. For example, Trumpeter's 1/200-scale plastic model of the German battleship *Bismarck* costs around $320. GPM (a Polish publisher) offers a printed paper *Bismarck* kit in the same scale for less than $40. HMV's extraordinary paper *Bismarck* kit, at 1/250 scale with 7,545 parts, retails for about $70. Many excellent paper ship kits sell for less than $20, and there are good-quality, paper-ship models downloadable for free. With a pile of aftermarket detail parts, one could build a very accurate paper *Bismarck* in 1/200 or 1/250 scale for less than $200.

Paper models are more forgiving than wood or plastic kits. With digital paper kits, if one messes up a part, just print another copy. Printed paper kits can be scanned or photocopied to provide spare parts or to test-build tricky assemblies.

Pre-colored paper kits reduce building time and cost. The basic tools you'll need can be found readily, and you can store a lifetime supply of paper model kits on a small shelf or a computer hard drive.

Useful online resources abound. Papermodelers.com is a lively and friendly online forum that covers all aspects of paper modeling, and the Model Ship World forum (modelshipworld.com) offers a growing number of build logs for paper and card ship kits. **FSM**

◀ German tanker *Altmark* (1938), 1/250 scale, published by HMV. Germany built replenishment tankers to fuel warships at sea. *Altmark* served the pocket battleship *Admiral Graf Spee*, providing fuel and stores and taking on prisoners from war prizes. HMV is a top-line publisher of highly detailed paper model ship kits. With its optional laser-cut detail set, the *Altmark* kit has over 3,100 parts. The 1/250 floating dry dock paper model, and its detail set, also from HMV, are out of print but sometimes turn up on auction sites. Models and photograph by Lars Wahl

▲ Australian river boats, 1/100 scale, published by World of Papership. The paddle steamers *Adelaide* (1866), *Pevensey* (1910), and *Alexander Arbuthnot* (1916) have all been restored as working museum ships on Australia's Murray River. Each of these printed kits can be built in a basic version or in an advanced version that produces a detailed and accurate scale model. The *Pevensey* kit can be built as the fictional *Philadelphia* from the Australian television series *All the Rivers Run*. Models and photograph by Jeroen van den Worm, World of Paper Ships

Gallery — Paper Ship Models

◀▲ HMS *Wolf* (1742), 1/96 scale, published by Shipyard (Poland). The first of three snow-rigged sloops of the Royal Navy's *Wolf*-class, HMS *Wolf* was built for action against Spanish privateers. The sloop was captured by a French privateer in 1745 and recaptured by the British just four months later. After repairs, it sailed on patrol in the North Sea. In 1748, the ship foundered in heavy seas on the Irish Coast, with all hands lost. The kit includes printed parts, a laser-cut skeleton, and detailed instructions in English, German, and Polish. Shipyard also offers laser-cut blocks, deadeyes, sails, and tapered wooden masts and spars. Shipyard's kits include a wide range of British, French, and Spanish sailing ships, most in 1/96 scale. Model and photograph by Bartosz Kłyszyński

▶ Gokstadt ship (circa 850 AD), 1/72 scale, published by WAK (Poland). Model designed, built, and photographed by Tomasz Weremko

M.V. *Mellum*, 1/250 scale, published by HMV. The multipurpose vessel *Mellum* and its sister ship *Scharhörn* patrol the North Sea to control oil spills, fight ship fires, care for injured seamen, and other tasks. This highly accurate model includes a bridge interior, movable crane, buoys, special oil spill gear, and other details. Instructions are in English and German. Model and photograph by Garth Nicholson

▲ Cutter HMS *Fly* (1763), 1/100 scale, published in *Modelarstwo Okretowe*, a bimonthly, Polish, ship-modeling magazine (modelarstwookretowe.pl). Model designed and built by Tomasz Weremko

▲ Bathyscaphe *Trieste*, 1/50 scale, published by WAK (Poland). In 1960, the Swiss-designed, Italian-built research vessel *Trieste* made the first ever dive to the deepest known part of Earth's oceans, 11,700 feet below the surface in the Mariana Trench near Guam. In 1963, *Trieste* located the wreck of the nuclear submarine USS *Thresher* off the coast of New England at a depth of 8,600 feet. In 1980, it was put on permanent display at the National Museum of the U.S. Navy. The printed kit includes eight pages of parts, detailed assembly drawings, and English instructions. Laser-cut frames are also available from WAK. Model and photograph by Reinhard Irresberger

Modeling the Imperial Russian Navy Monitor URA

Research and paper result in a unique replica

BY MAURICE RICHARD

Once again, I have become enthusiastic about paper as a medium for modeling replicas of iron or steel warships. It is not always an easy medium with which to work, but it also is amazingly flexible and forgiving. Because of this enthusiasm and my long-standing fascination with the sometimes-bizarre vessels generated by the combination of steam power, armor protection, and iron construction, I turned to paper for this project.

USS *Monitor*, by any standards, was both enormously influential and remarkably unusual for its time. It pushed hard against traditional warship design of the time and navies all over the world seized on its features, for better or worse. One of the first non-U.S. producers of monitors (ships based on the USS *Monitor*) was Imperial Russia.

Relations between Russia and Great Britain had worsened over the Polish crisis of 1863-1864. The Russian government feared a British naval assault on St. Petersburg after its experience during the Crimean War. Impressed by USS *Monitor*'s performance at Hampton Roads during the American Civil War, the tsar sent a mission to the U.S. to further explore the capabilities of what appeared from afar to be a simple but powerful warship.

American officials provided the mission with the complete plans and specifications for the new *Passaic*-class monitors that followed on from *Monitor* itself. Rather than develop its own design, the Russian navy's Shipbuilding Technical Committee decided to use these drawings without any changes and promptly contracted for the construction of 10 near-clones of the *Passaic*-class, the first of which was *Uragan*.

The best single reference for information about these monitors is Stephen McLaughlin's article in *Warship 2012* (Naval Institute Press, ISBN 978-1-84486-156-9). However, be careful using the drawings, especially the elevation and upper deck plan, because they sometimes conflate features present at different times during these warships' lengthy careers.

Building the hull

The free, downloadable 1/250 scale USS *Lehigh* (a *Passaic*-class monitor) from modelsnmoore.com served as the basis for my model, **1**. This download also offers the option of building a model of USS *Catskill* or USS *Patapsco* of the same class and an attractive

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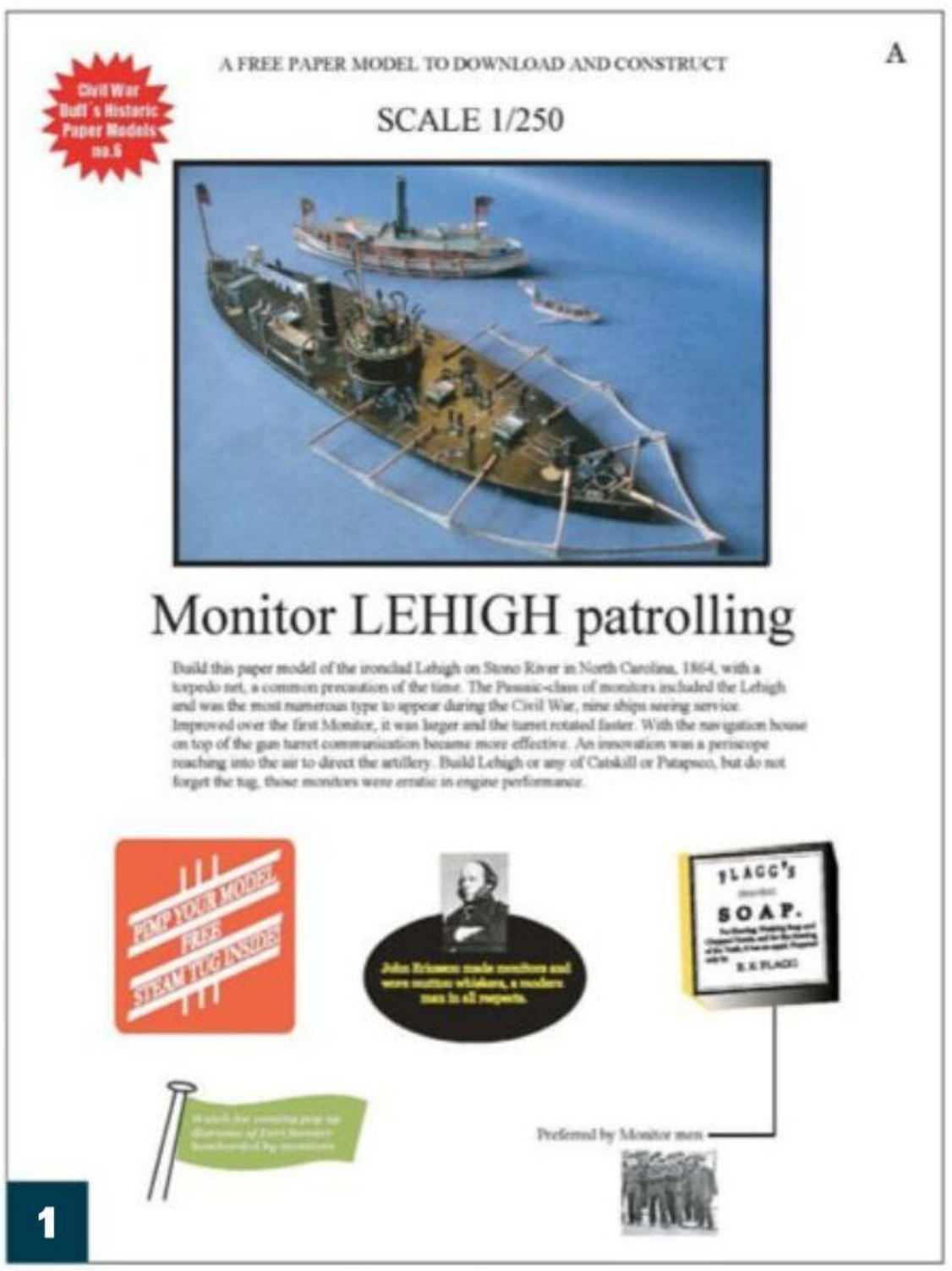
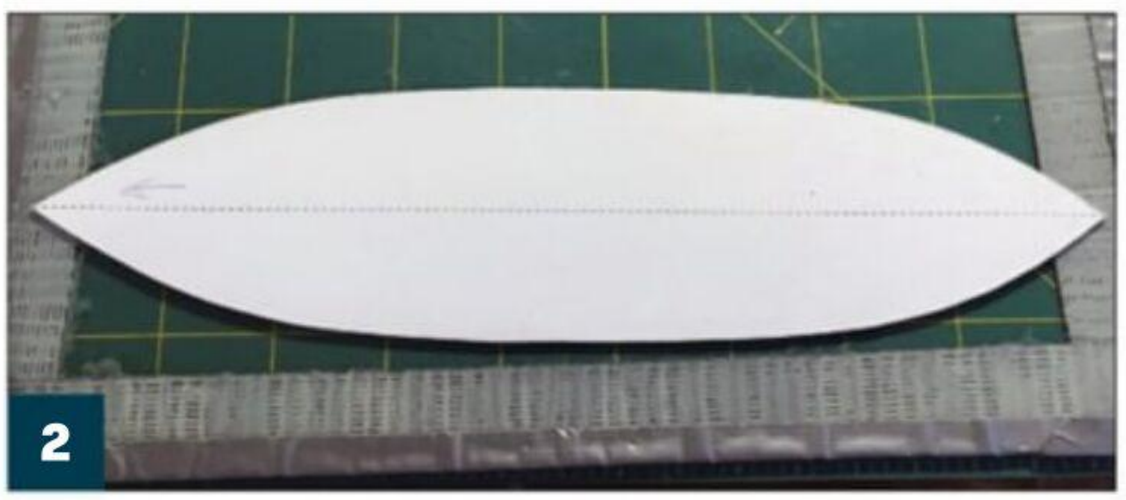
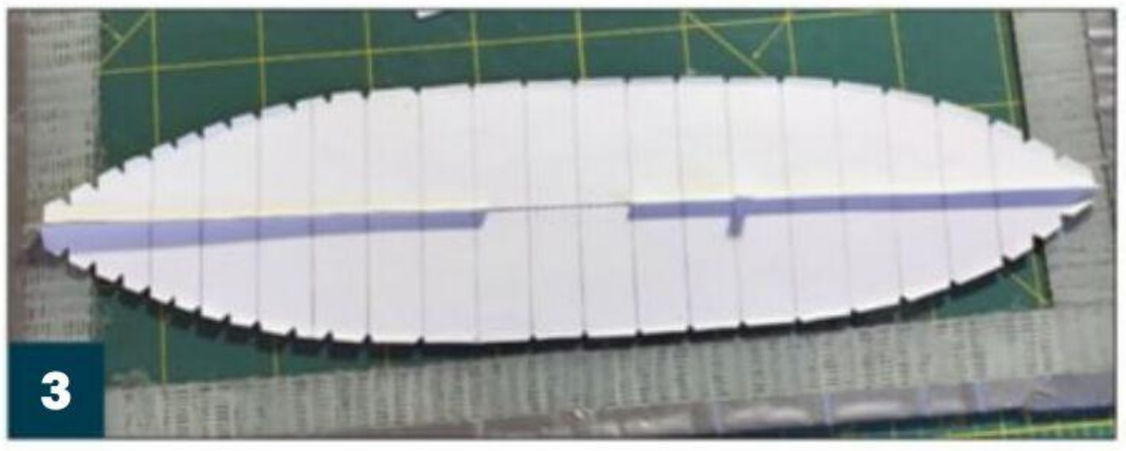


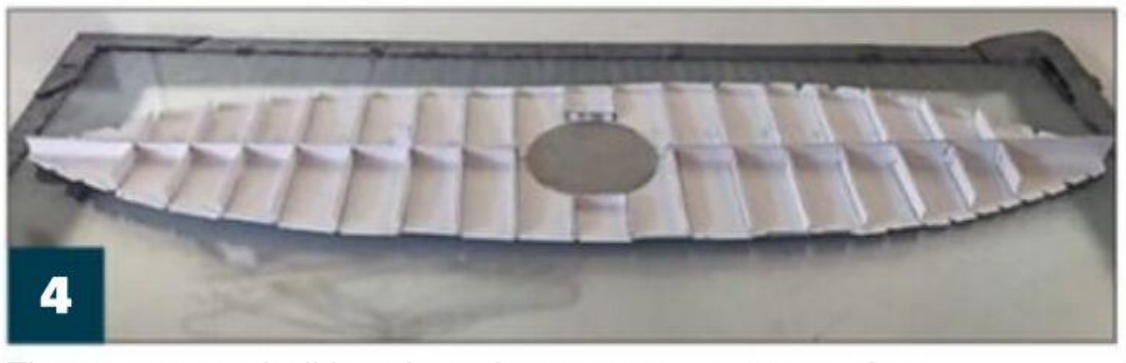
Magnus Mörk's paper kit for the USS *Lehigh*.



The ship's baseplate tacked to a section of glass sheet.



L-girders form the spine for a particularly strong construction.



The transverse bulkheads and turret support are in place.

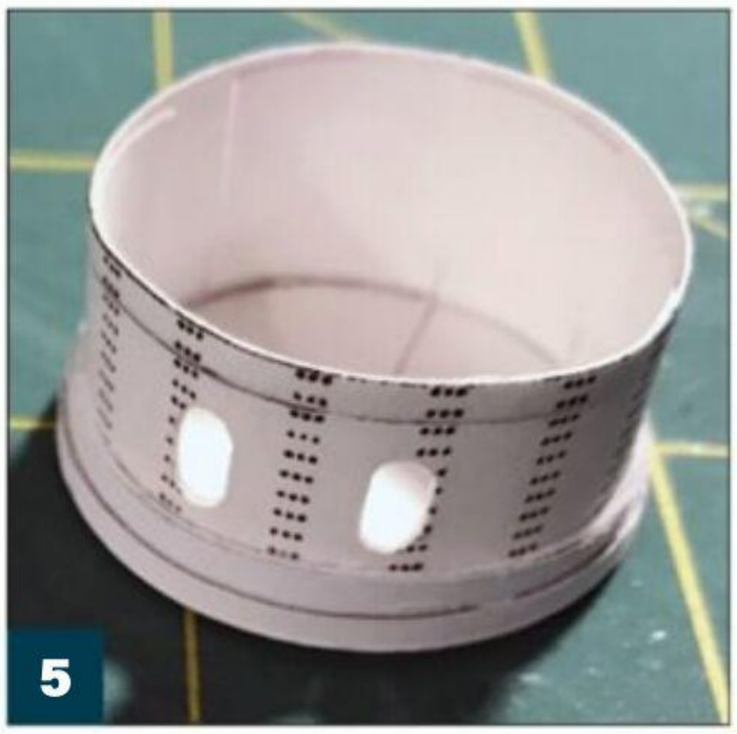
little tug to go along with them.

There were differences between American and Russian monitors. The most significant was that the Russian ships initially wore Victorian livery (white upper works and buff funnels). This required transitioning from a U.S. Navy, all-black, color scheme quite easily accomplished with photo software. The download has a black hull, and the optional parts for *Catskill* provided a white turret that would work with some tweaks. I needed a gray deck and a yellow funnel, which file folder card could provide.

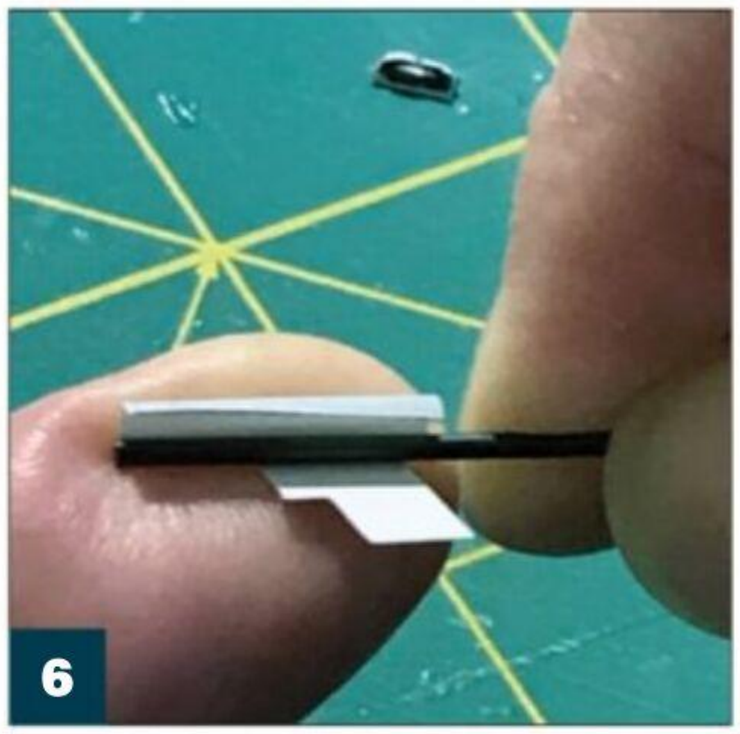
My plan was to build a waterline model set in a sea base, so I needed to make the hull to show some underwater body. I created a deeper baseplate by laminating three layers of card using dry-mounting tissue for photos because it does not buckle paper stock and the laminated material is ready for use immediately.

I tacked the baseplate to plate glass to help keep everything square and flat, **2**. After the hull has been built, it just takes a wide craft knife to remove it from the glass.

Over the years, I've identified a common problem with paper models: The central spine is designed so the tabs fold up, but the scoring guide is set up for the tabs to fold down. Rather than try to transfer the scoring guides, I simply used a needle point to mark the ends of the guides for the bulkheads to the reverse side and drew them on. After that I could cut out the spine elements and use them upside down knowing that I would be able to fit the



I formed the turret around a paint jar.



Forming gun barrels with a drill bit.

The completed turret guns.

The turret top with periscope.

The deck fitted with turret installed.

bulkheads in position with accuracy.

This kit has the builder place two L-girders on top of the base with vertical webs joined back to back to create the spine. Unique to say the least, but it guarantees an upright and accurately centered spine, **3**.

Double-thick card stock creates the transverse bulkheads. Most paper ship models interlock the bulkheads and spine like an egg crate, but this is not practical for this model because the hull is too shallow. The disc amidships is the support for the turret, **4**.

The turret and guns

The turret fits through the deck from below. The upper portion of the *Catskill* turret was black, so I cut it away and replaced it with a suitable strip of white card. I glued a wider strip of tracing paper on the back to strengthen the join, burnished the front face to minimize the join's prominence, and added the rivet detail with pencil dots. The circular turret walls were pre-formed around a small paint jar, **5**.

Russian monitors used different guns at various times (9-inch Krupp muzzle-loading smoothbore guns initially, then 15-inch Rodman muzzle-loading smoothbore guns produced under license, and finally 9-inch M1867 breech-loading rifled guns), but I defy anyone to tell the difference when looking into the gunports of a 1/250 scale model. So, I used the gun carriages and barrels provided to represent the 9-inch smoothbore guns.

Using a suitable drill shank as a mandrel, I rolled the paper around it to make the barrels — each is a single piece. Start with a drill shank smaller than the final diameter and roll it across the paper while pressing down on a somewhat yielding surface — I usually use a fingertip! After a few successive passes, the paper roll is close to the correct diameter. I transfer the piece to a drill shank of the right size and glue it, **6**.

After I completed the guns, I painted over the visible white edges. This is an important step and adds finish to your paper model that would diminish its final appearance if not done. I use brush-tipped watercolor pens or watercolor pencils that match the color of the part. Some people become obsessed with trying to get an exact match, but I find that just covering the white edges with a color that is a close match satisfactory, **7**.

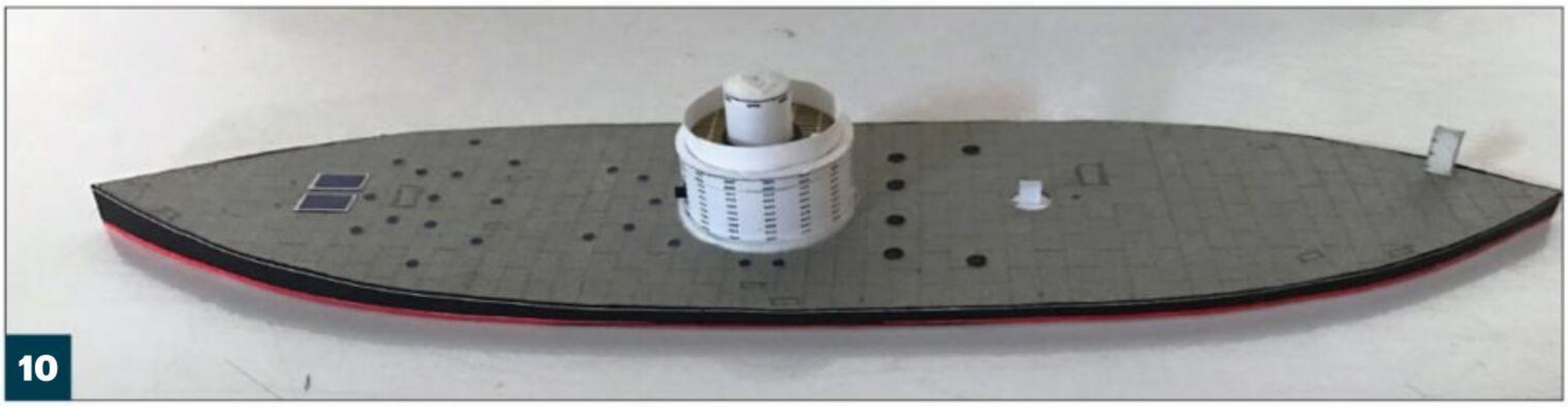
The kit provides an optional white conning tower. To achieve the domed shape of the conning tower roof, I cut tiny wedges out of the rim and pressed it into the palm of my hand using the end of an plastic, ballpoint pen. I fixed it solidly by gluing a small piece of tissue paper inside the roof, using the pen top again to maintain the shape. A periscope extends from the conning tower's roof (some researchers have suggested it is the ship's binnacle, but other documentation indicates that this is incorrect). To make it, I wrapped the inverted L-shaped around the shank of a tiny rotary-tool bit.

The kit's turret rim printed black, so I simply flipped it upside down to get a white rim. The turret top on the Russian monitors was surrounded with stowage for the crew's hammocks, which I will add later, **8**.

Laying the deck

For the deck, I used a gray file folder. I printed the deck on the obverse of my card and then transferred the arrangement of the characteristic U.S. Navy monitor deck armor to the visible side with a needle point. A hard graphite pencil delineated the armor. I printed out a copy of the deck on thin paper, punched out the deck lights and coaling scuttles, and glued them onto my gray deck. I also marked the positions of various skylights and deck fittings. Finally, I sealed everything with several light coats of clear flat lacquer — an airbrush or spray can will work. After inserting the turret from below, I installed the deck **9**.

The paper hull prints all black, so I applied a strip of Kamoi



The hull sides printed black, so I improvised and used Kabuki masking tape colored red for the antifouling.

The completed funnel.

The galley and the heads.

Anchor bitts and fairleads.

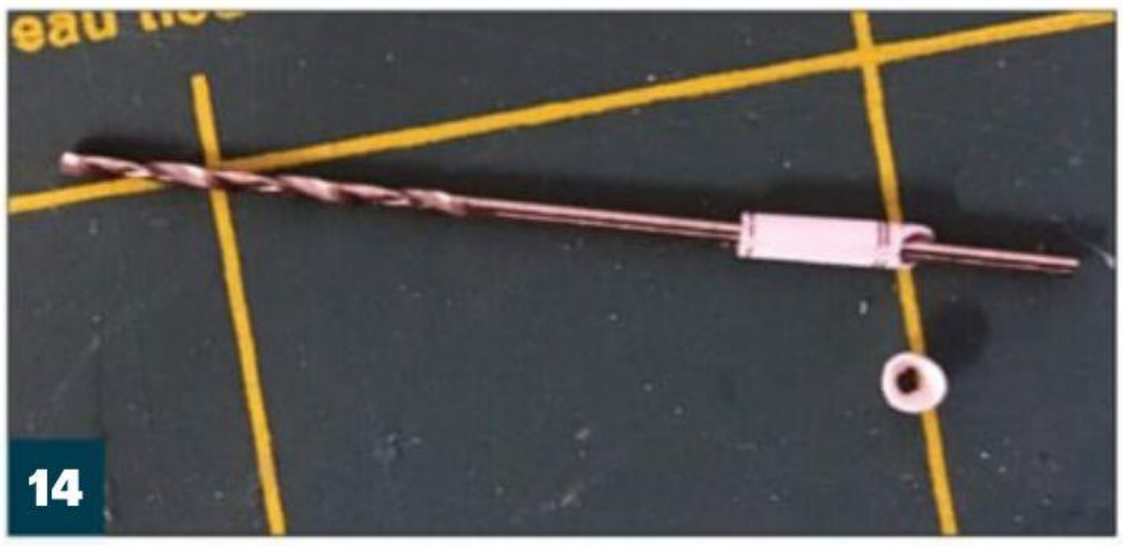
Kabuki masking tape along the bottom edge and colored it red with a permanent marker. The white sheer stripe was made with .015-inch dry-transfer striping. To protect this work, I again sealed everything with several light coats of flat clear lacquer. I then measured the height of the stem and stern using tick strips, transferred the heights to the hull sides, measuring downwards from the sheer, and cut the sides to match, which left a small amount of red antifouling visible, **10**.

Deck fittings

The funnel was the last large structure to construct, which was much taller on Russian monitors than their American counterparts (almost 29 feet tall versus less than 20 feet). I used the kit's design as a pattern, added height to match my references, and marked it out on a piece of yellow card stock. I drew the plating divisions with a hard pencil and colored the top section black using a permanent marker, masking the edge with Kabuki tape. I also painted the reverse side dark gray with a brush-tipped watercolor pen.

A layer of .040-inch card formed the basis for the armor around the bottom of the funnel, sheathed with more thin yellow card stock. A circular strip of the same card stock created the rain gutter/air intake. The steam pipe was made from a length of painted brass rod, **11**.

Russian monitors had very little in the way of superstructure when they entered service. This changed greatly later in their careers, but initially, the most prominent superstructure was a galley towards the stern. One odd feature was that the forward half of the roof was hinged to lift upwards, possibly to cool the interior in the summer. I made the galley from plain white card, adding a door and window. I painted the roof medium grey watercolor, drew in the hinge line, and attached a length of painted brass rod for the galley stack, **12**.

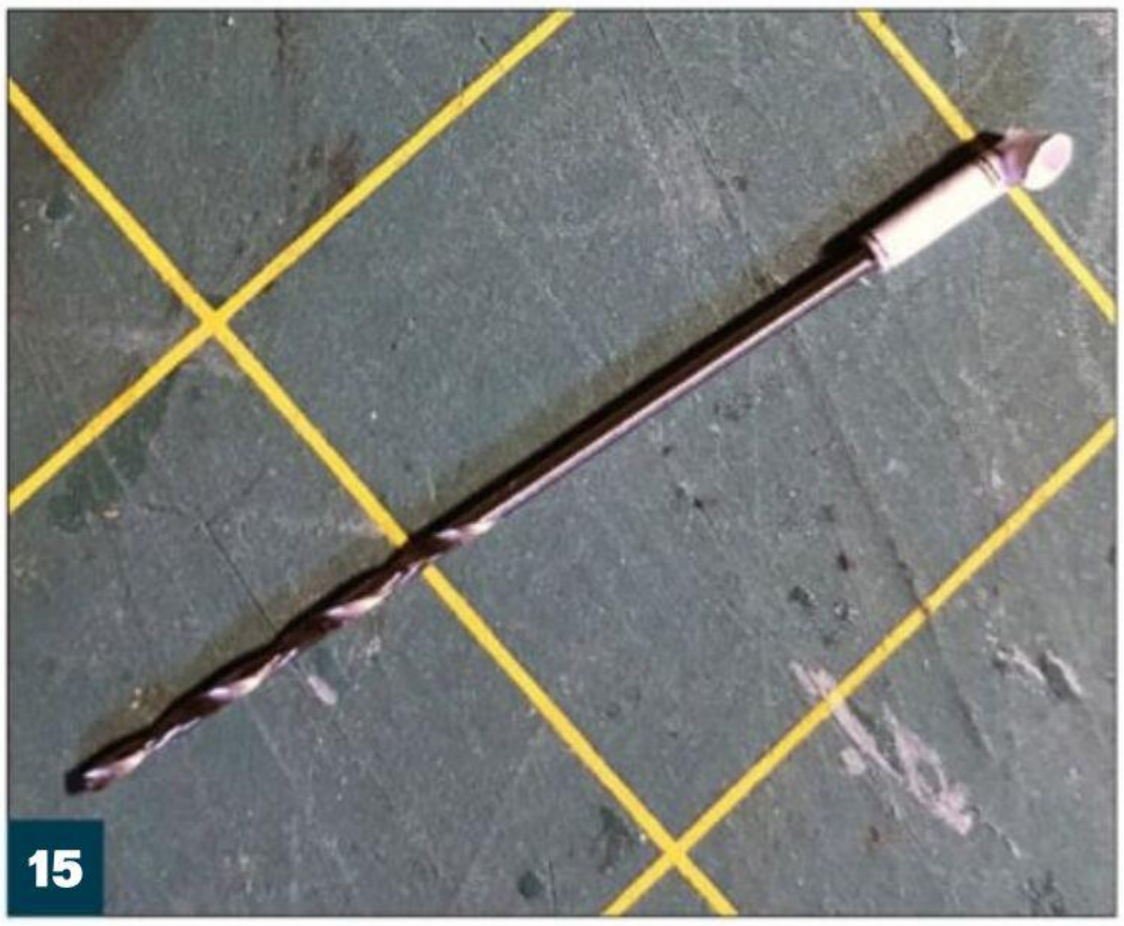


The ventilator shaft rolled and the cowl shaped.

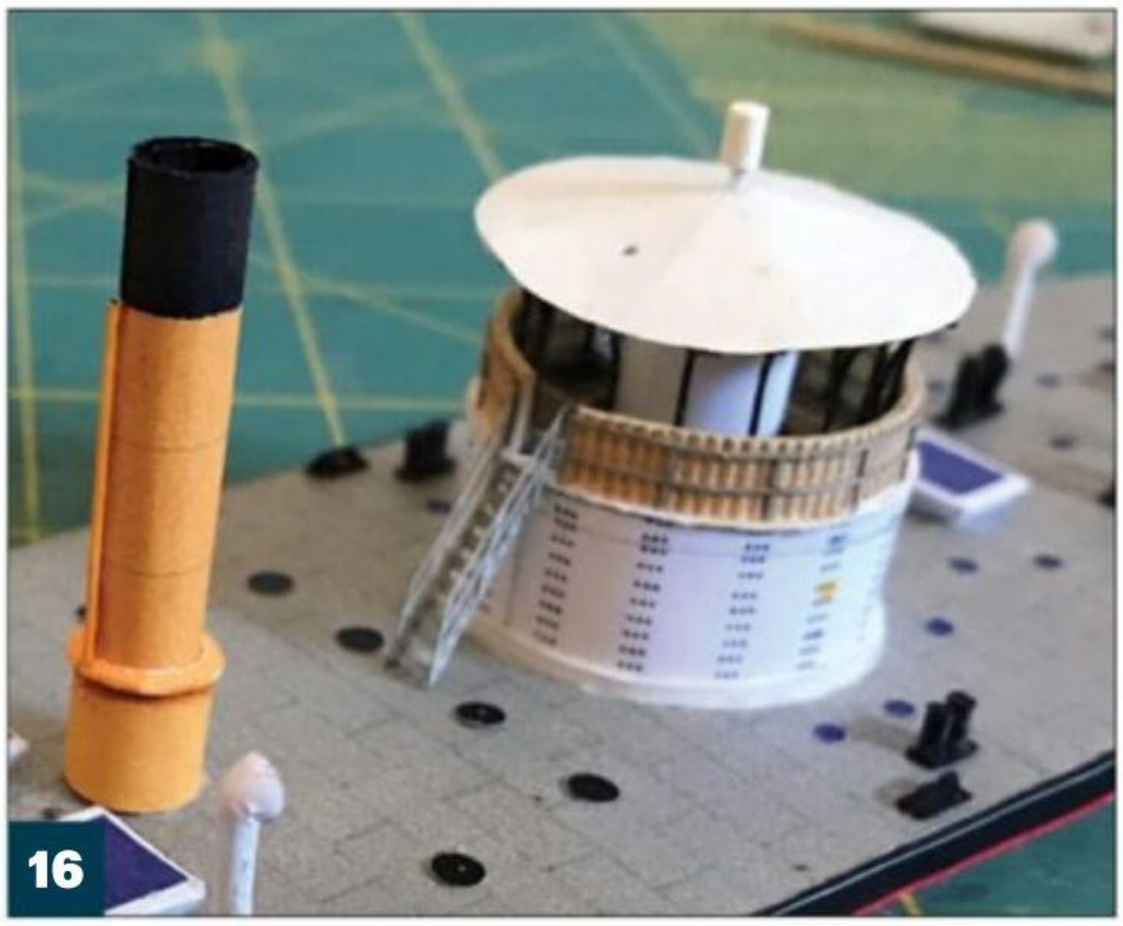
On American and Russian monitors, almost everything on the deck was detachable and stowed below when clearing for action. This included the tapered skylights and the cowl ventilators. Even the bollards were detachable so that they would not become shot traps.

First came the skylights, which needed to be white, so I made them from the kit parts supplied but assembled inside out. Dark, blue-gray paper that matched the deck lights replicated the glazing. My spare parts collection was the source for the two canvas-covered heads which, despite their name, are aft.

The anchor bitts, two sizes of bollards, and the fairleads were all kit parts. The bitts and bollards were not difficult to make, but monotonous — rolling a dozen or so tiny paper tubes and capping them with punched discs. The fairleads, however, were very small and with narrow sections, so I added a tiny amount of superglue to each one as I completed it. This stiffened them and allowed me to use a small file for final shaping before painting them dark gray. Even using this technique, my wastage rate was quite high — I had to attempt eleven fairleads in order to end up with the six I needed for the model, **13**.



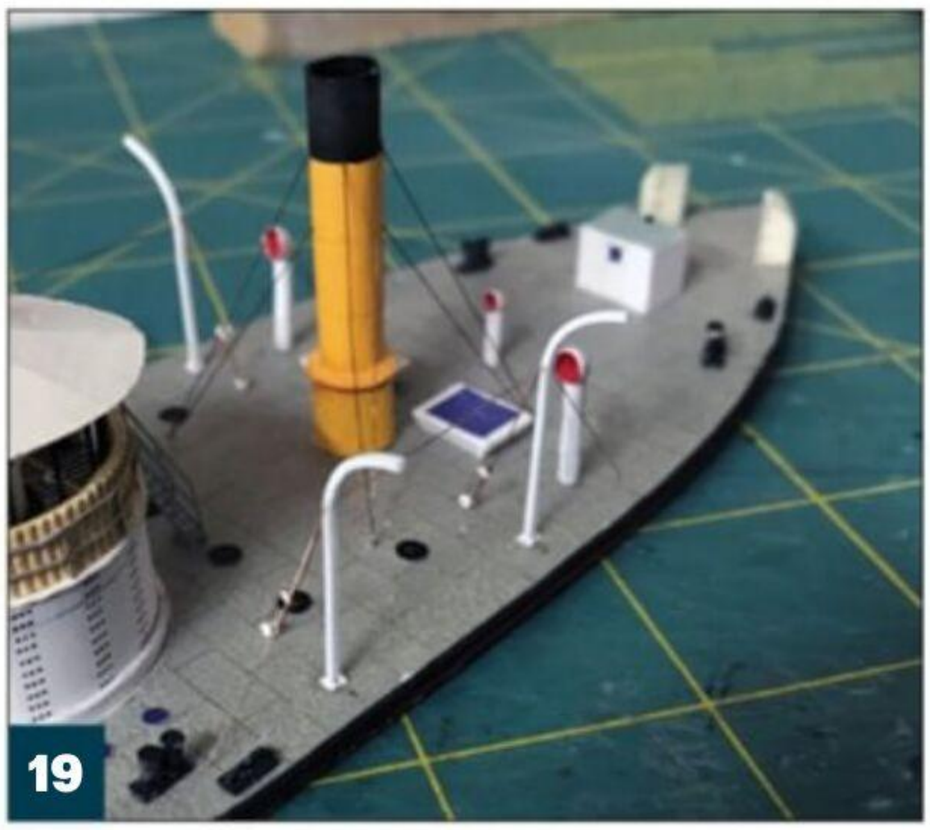
An assembled ventilator.



The turret completed. Note the access ladder (from laser-cut paper), the hammocks in their stowage, the awning, and the awning stanchions.

Funnel stays made from fine copper wire.

The two ship's boats completed.



The davits have been installed and rigged.

For the cowl ventilators, I started by rolling the shaft. After cutting out the cowl part, I used a domed hardwood tool to simultaneously roll the cowl part into a conical shape and dish the paper as I rolled it by pressing it onto a semi-resilient pad (a folded paper towel worked well, as did the palm of my hand). I found that if I persisted with this process, the paper formed itself into quite a reasonable approximation of a bowl, **14**.

After butt joining the small ends of the cowl and letting it dry thoroughly, I glued it to the shaft. When everything had dried, I carefully used the dome tool to press the assembly into the semi-resilient pad. The end result was quite satisfactory. The inside of the cowl I painted red watercolor and attached them to the deck with pins for better stability, **15**.

Detailing the turret and funnel

Back to the turret, I removed the "rifle proof" palisade around the top because I had learned these were not fitted until later. I marked the positions for the 16 awning stanchions, made them from .020-inch brass rod, and used lacquer thinner to degrease and chemically blackened them.

Evergreen .040-inch corrugated siding with lines scribed across it modeled the hammock stowage. It was painted light tan and dry-brushed a lighter color to delineate individual hammocks. After gluing the hammocks to the stanchions, I glued laser-cut paper railings to represent the cagework. The semi-permanent access stairway was also made from laser-cut paper.

For the awning, I cut a circle of cream-colored paper and drew pencil lines on the bottom for the stays running to the stanchion heads. This also made a slight crease that gave the optical illusion of sag between the stays. I also cut a narrow wedge so that the finished awning was very slightly conical instead of completely flat. Finally, I made a small hole in the center of the awning and installed the periscope from earlier. Another hole in the awning allowed the mast stepped on the turret top to poke through, **16**.

Before making and installing the boats and their davits, I fitted the funnel stays — which would have been difficult to fit with the davits in place — using very fine chemically blackened copper wire, **17**.

Making the davits and ship's boats

The boats from this kit weren't appropriate for a Russian monitor. Luckily, I was able to replace them with two boats from a Paper Shipwright kit of the monitor *Smerch*. The challenge with making small boats from paper is to give them a proper shape. Often what

is provided makes a V-shape from the sheer to the keel, which is not very prototypical.

For these boats, after I cut out the hull part, I rolled it fore and aft to give it a curve from the keel to the sheer. Then I used the round end of a paintbrush and pressed the part on a pad of paper towels to introduce a convex shape into the bow area. I glued the thwarts into one side first. After it had dried, I brought up the other side and glued it to the thwarts.

To maintain the curvature of the cross section, after I had cut the bottom board into two pieces, I inserted the forward section through the thwarts, pressed it into place, and glued it from underneath using a length of fine wire as an applicator. When that was dry, I inserted the after section of floorboards and glued this the same way. Finally, I added the transom and rub rails before fitting the oars and rudder. The finished boats are a little over an inch long, **18**.

Davits on Russian ships at this time were not of the radial type. Instead, they pivoted at the heel near the deck directly outboard with control coming from an inboard tackle. The Russian designers also thought the davits should be abnormally tall to carry the boats above the level of the turret top to give the guns an unobstructed field of fire. Whether it worked or not is debatable.

I made new davits from square brass rod bent to shape on a custom jig. I made them a little long so I could insert the feet into holes in the deck for more stability. The dummy pivots are tiny card triangles.

The tackles that lower the davits outboard were made from fine copper wire and discs punched from card stock. Because the davits were so tall, they required stays to brace them, which I modeled with more copper wire, **19**.

The tackles to lower the boats are also fine copper wire and punched-card discs, **20**.

20
The boats hung from their davits.

Final details

After setting *Uragan* in its sea base, I added the final details: mast, jack staff, ensign staff, railings, and flags. The railings were laser-cut paper; the flags were made from tissue paper; and everything else from brass rod.

I also scratchbuilt a small local boat to add to the scene. A friend in Riga, Latvia, sent me information about the local boats. It is sprit-rigged, and I have depicted it working as a long-line fishing boat, **21**. **FSM**

21
The finished model with railings, masts, and flags set in its sea base. In the foreground is a small local fishing boat long-lining.

STRATEGIC DETAILING for ships

Focus on little things to make your model stand out from the fleet

BY CHUCK BAUER

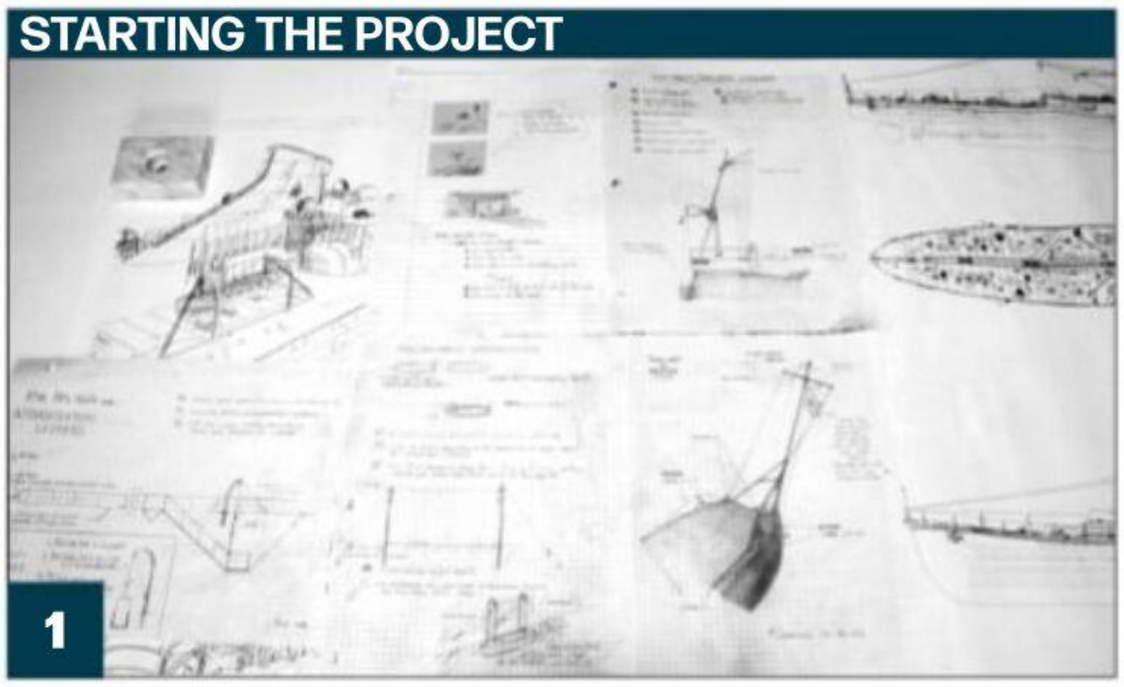
How many of you have built a model of RMS *Titanic*? How about USS *Arizona*, *PT-109*, *Bismarck,* or USS *Missouri*? Yep, a lot of these kits are being purchased, built, and posted online. This creates a struggle if you want to differentiate your model from the many others that have been built already or will be built in the future.

I started serious model building late in life, and thus I am always trying to make my models look different from others built from the same box. I have developed several techniques to make my models both historically accurate and simultaneously improve their quality. This process, which I call "strategic detailing," helps set my models apart from others built from the same kits. Although I build plastic and resin models, the same techniques can be adapted to wood and paper models.

Picking the subject

When choosing my next project, I look for something that is visually appealing, historically interesting, and requires skills that are not too far out of my comfort zone. If I'm unsure about something, I will practice a skill I may need on scrap parts before committing to a project. In addition, I gravitate to subjects on which the things I do best will be noticeable.

STARTING THE PROJECT



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The first thing I do on a new project is identify those areas I want to strategically detail. I have been known to create schematics and drawings of these spots.

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These plans and diagrams go into a project journal housed in a three-ring binder that I use during the build. The journal also records paints I have used along the way, notes add-on parts I have used to enhance the model, and the time I have put into building it.

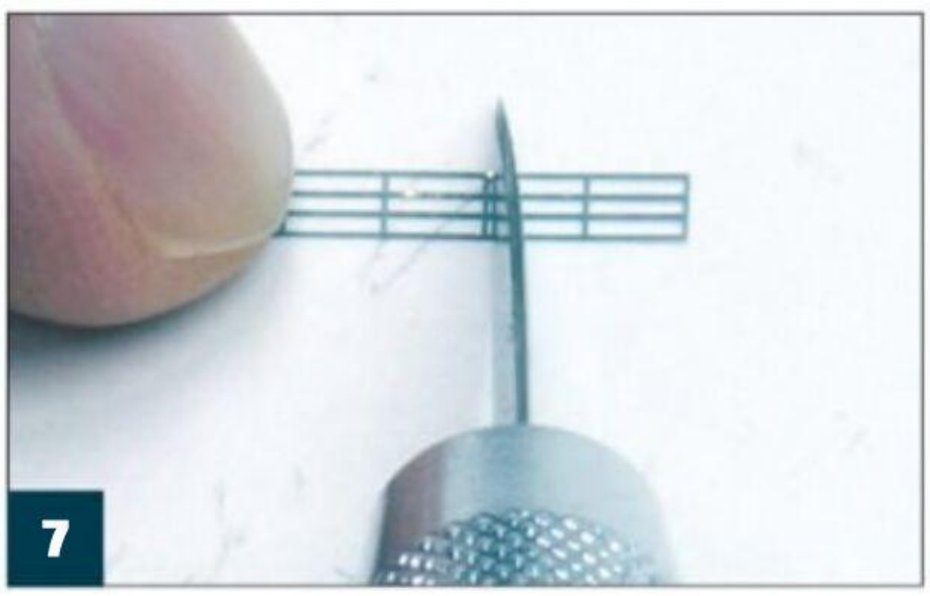
Next, I set up my digital camera to take inspection photographs throughout the project. I shoot them right on my modeling desk because they will not be seen by anyone but me. The assembly here is the mainmast for my 1/350 scale Italian heavy cruiser *Fiume*.

ENHANCING WITH PHOTO-ETCHED METAL

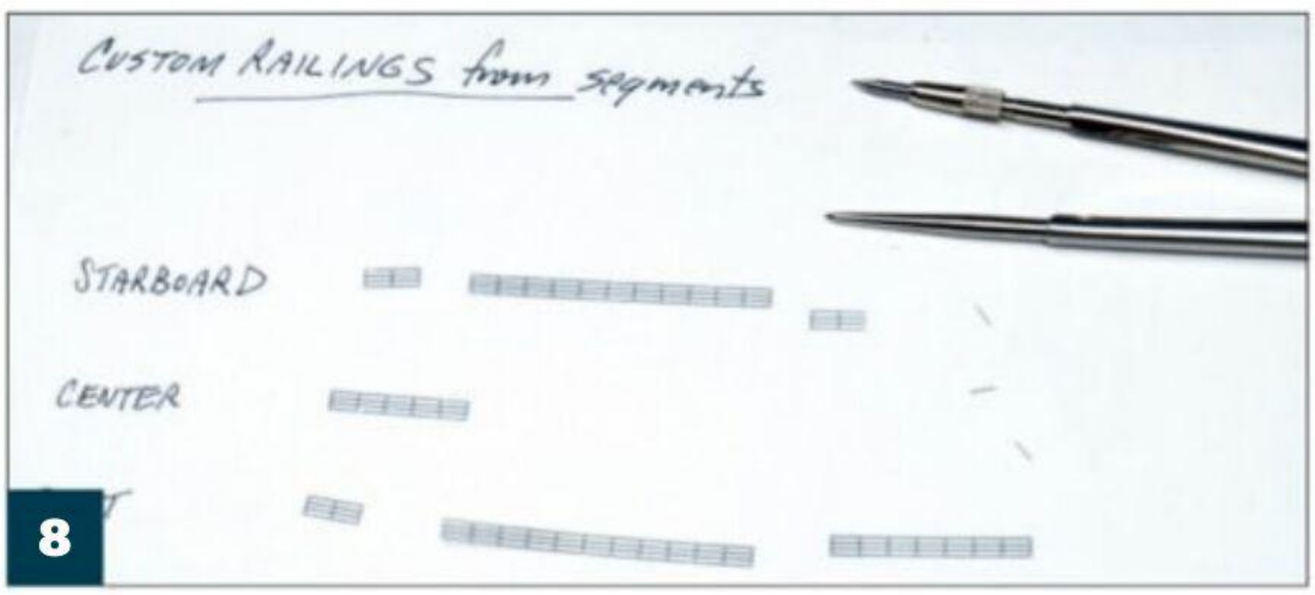
Prior to using photo-etched metal (PE), thoroughly clean it. I use a sequence of hot water and blue Dawn dish detergent, original Windex, a hot water rinse, and air drying. This process removes any residue left over from the etching process, thus making it possible for glue and paint to adhere to the metal.

To remove PE parts, lay the fret on a relatively hard surface such as a bathroom tile covered with thin poster board. Using a new, sharp, curved No. 23 blade in a rocking motion, I slice the attachment point. This avoids deforming the part.

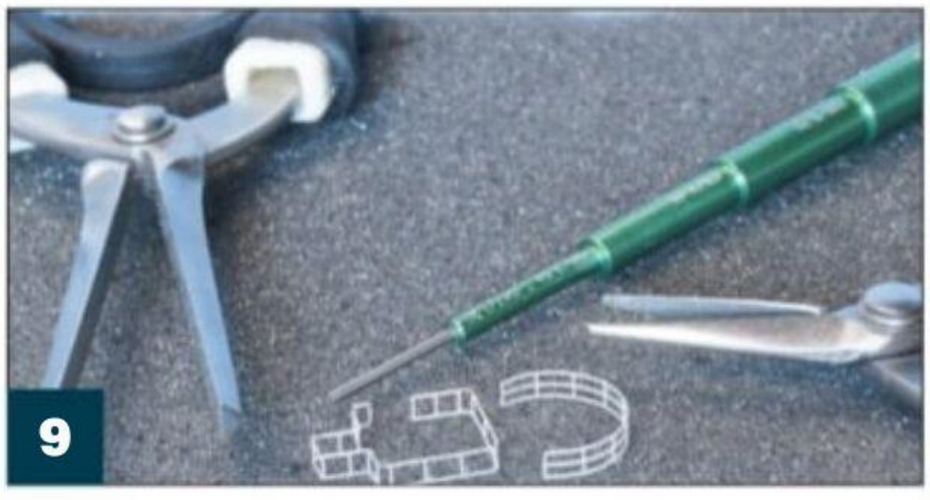
Railings are critical parts for any model ship, and they need to look good. I pre-paint the frets with the hull color for solid railings or natural metal if they are stanchions and cables.



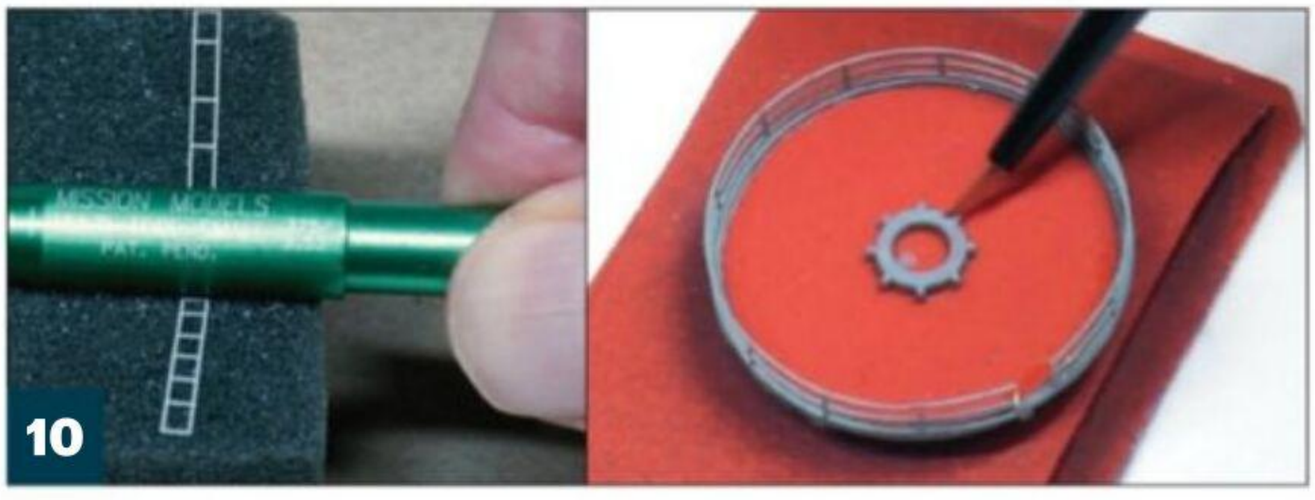
If necessary, I trim the parts to fit exactly where they need to go, using a No. 23 blade and a rocking motion as shown above.



Sometimes, I custom cut PE railings from my spares and ignore the supplied parts entirely. A student compass is perfect for measuring needed lengths. I save all the scraps because they come in handy as connectors.



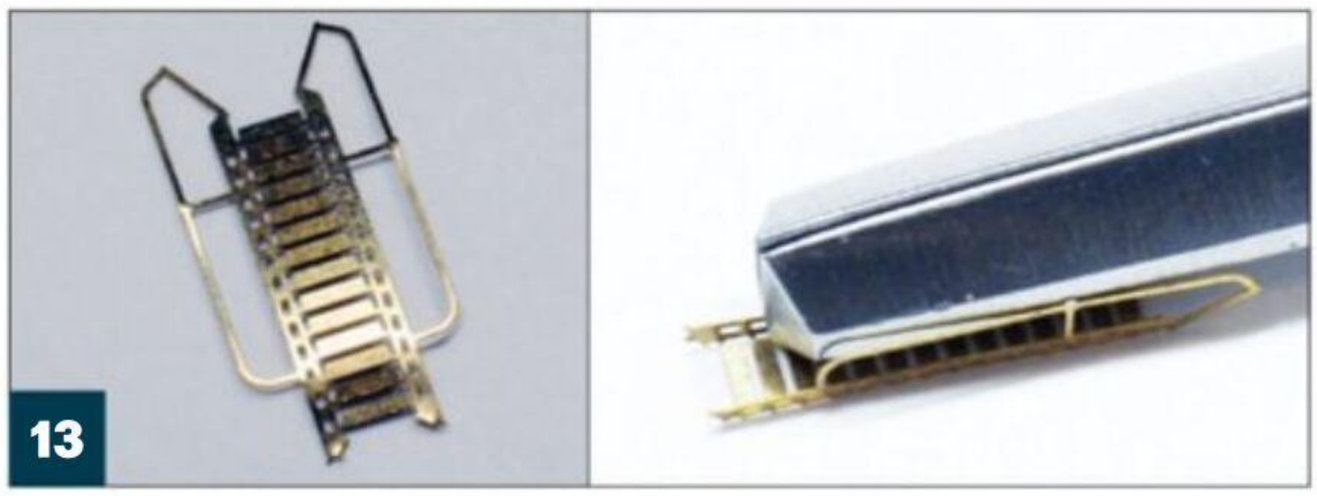
I use Tamiya PE bending pliers and a Mission Models Multi-Tool for bending my railings. Commercially produced bending tools, such as The Bug and the Etch Buddy, can be useful for making sharp corners.



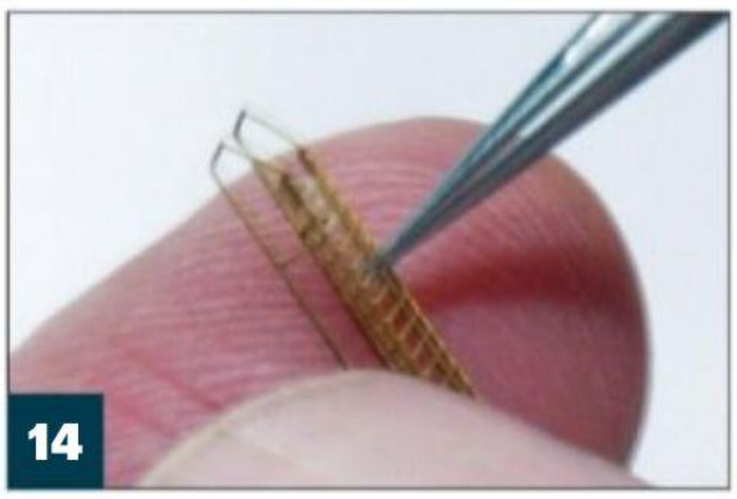
Curves can be formed to any radius using a piece of stiff foam in conjunction with a bending mandrel. The radius of the bending tool and the depth you press it into the foam will define the resulting shape.

I use Tamiya tape to position the railings and hold them upright when I attach them to the deck of the ship. Rather than superglue, I use white glue thinned with water for railings. It is more forgiving and won't affect painted surfaces. Once the glue dries, I carefully remove the tape and add glue where the tape had been. After that glue sets, I paint the bottom edge of the railing and the deck to which it is attached.

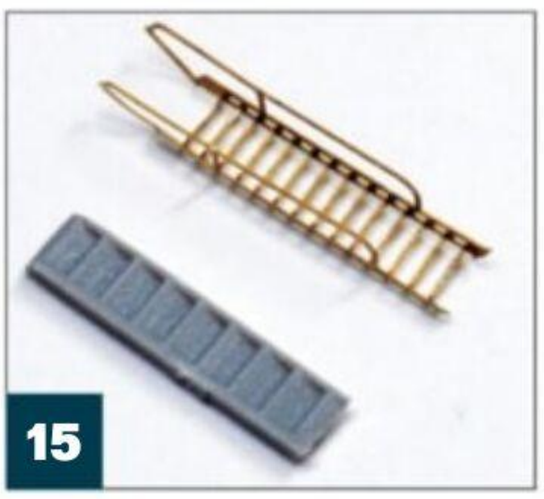
As mentioned earlier, I airbrush the railing cables a natural-metal color. Then I hand-paint each individual stanchion the same color as the hull it is attached to. This photograph illustrates the difference between the cabled main deck railings and the solid sections installed on the upper decks.



Replace plastic stairways with PE parts. If the kit does not contain them, look for aftermarket sets that are either specifically designed for your model or are generic and can be adapted. I am especially fond of the type that features rotatable steps. First, bend the side rails at right angles to the steps. I use a Tamiya bending tool to capture the entire railing. If done correctly, there is no need to straighten the railings after bending them.

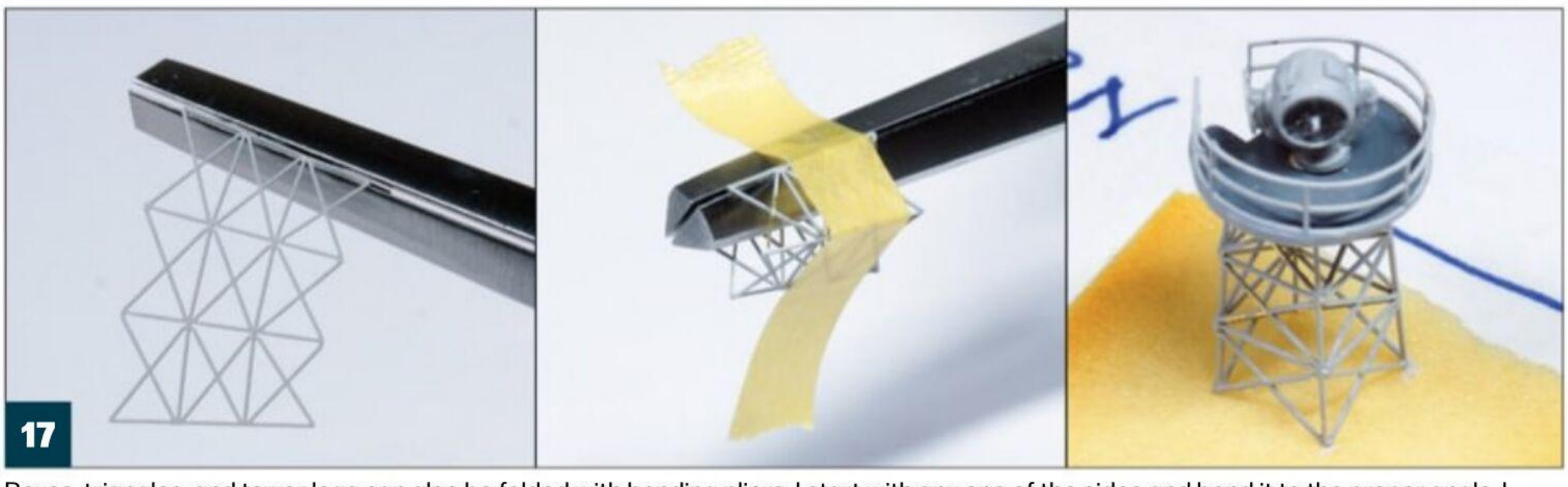


After bending the railing, you should be able to hold the stairway and rotate each step with fine-pointed tweezers. The steps need to be rotated so their flats are parallel with the decks the stairway connects.



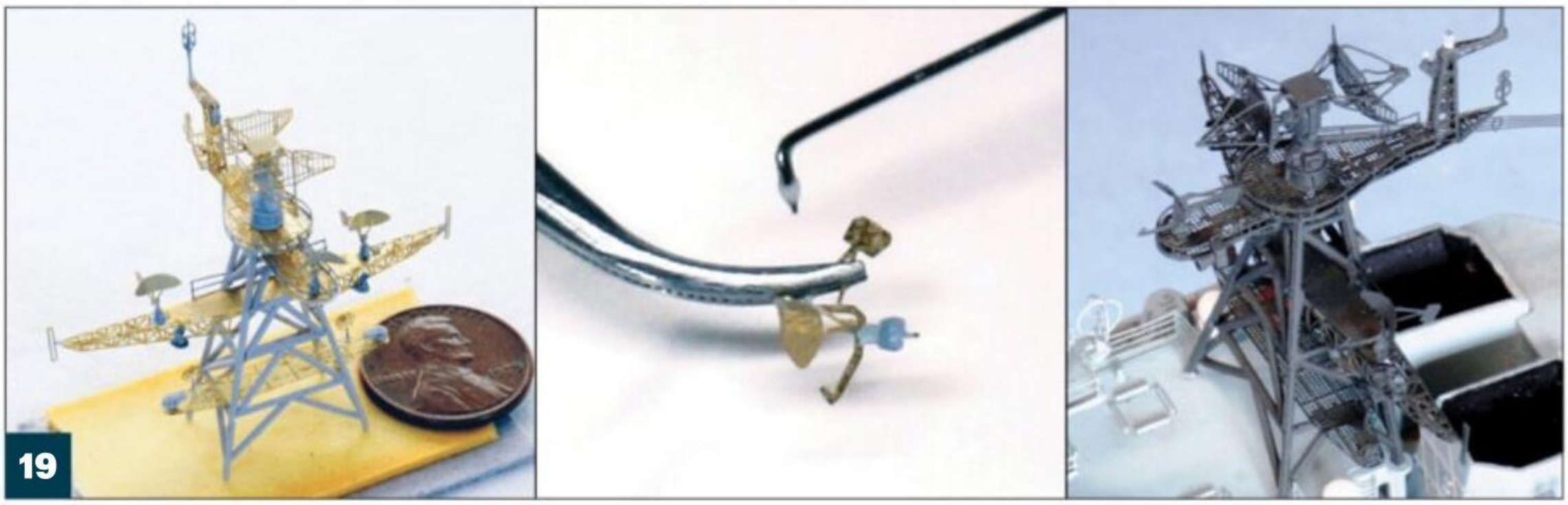
There's no comparison between a plastic kit part and a nicely formed PE stairway.

The objective is a unified stairway and deck railing system with no spaces between the pieces. This railing system is composed of fourteen individual PE segments.



Boxes, triangles, and tower legs can also be folded with bending pliers. I start with any one of the sides and bend it to the proper angle. I repeat this process until the last bend is made and then tape the edges together. I secure the join with thin white glue and let it dry before removing the tape. The result is a tower that looks much better than one made with plastic kit parts.

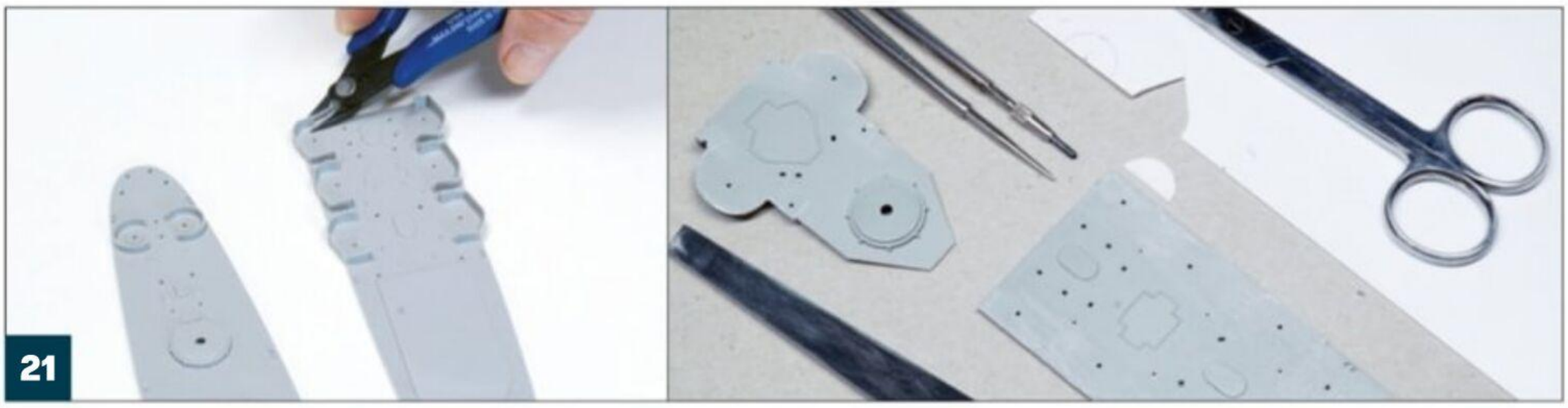
Irregular shapes can be folded using the same procedure. After folding the crane arms, I inserted styrene rods for the pulleys and drums and added cables with fine wire. This 14-piece crane with PE arms is much more realistic than what would have resulted from gluing together the two solid plastic pieces that came in the kit.



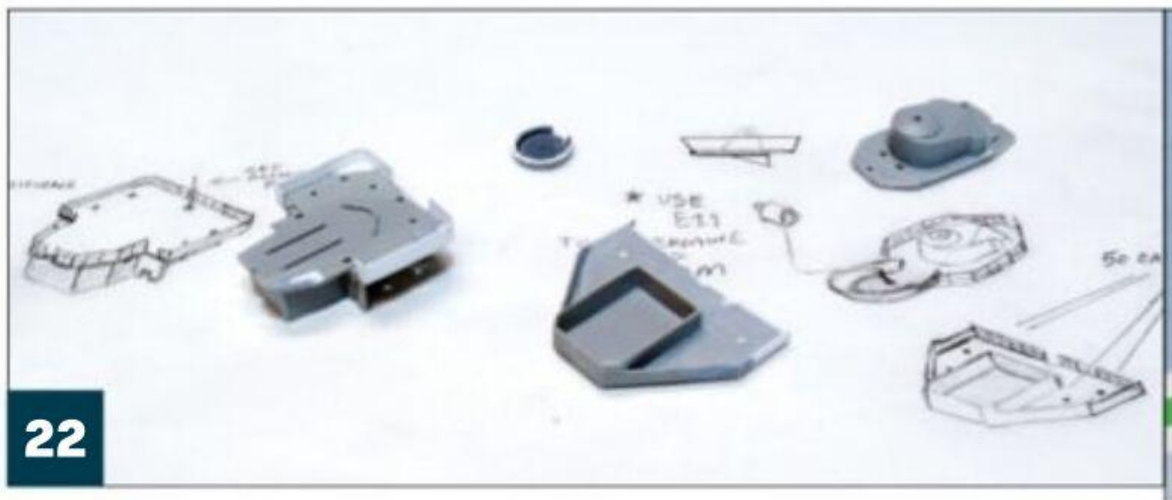
Here is an excellent example of using PE as a strategic detailing tool. This destroyer's mainmast contains more than 25 PE parts, and it is one of the reasons I chose to build a 1/350 scale *Admiral Chabanenko*. The radar screens were formed using the same technique as the curved railings and glued to their mating parts with thin white glue. After painting, the complex mast looks right at home on the model. I made the running and truck lights from scrap clear styrene.

USING STYRENE AND OTHER MATERIALS

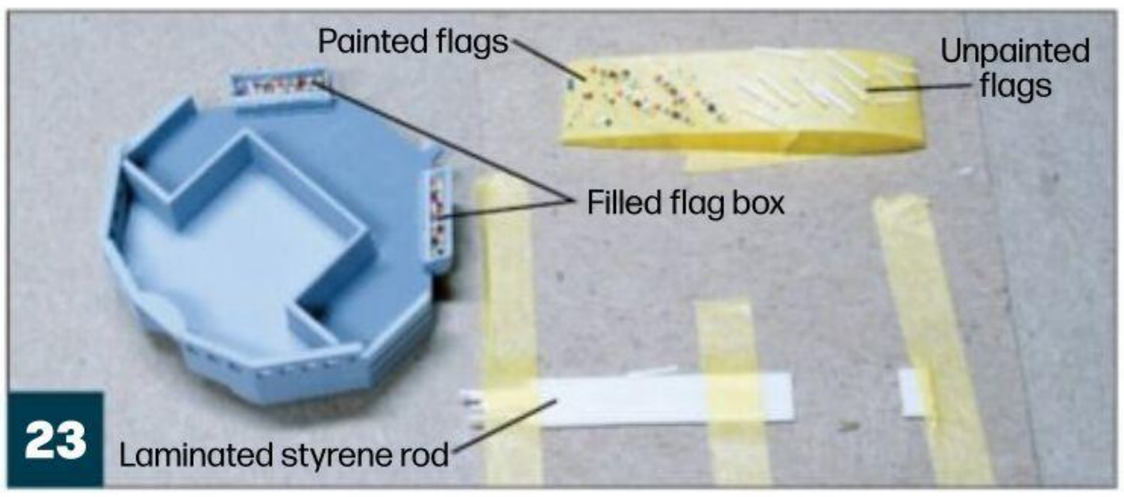
I frequently use Evergreen styrene to enhance models. For example, when I built a 1/200 scale USS *Arizona*, I used half-round styrene strip to add hull ribs and round stock for the avgas refueling line. The resulting 40-inch-long hull is a lot more interesting than if I had left it alone with its straight, featureless sides.



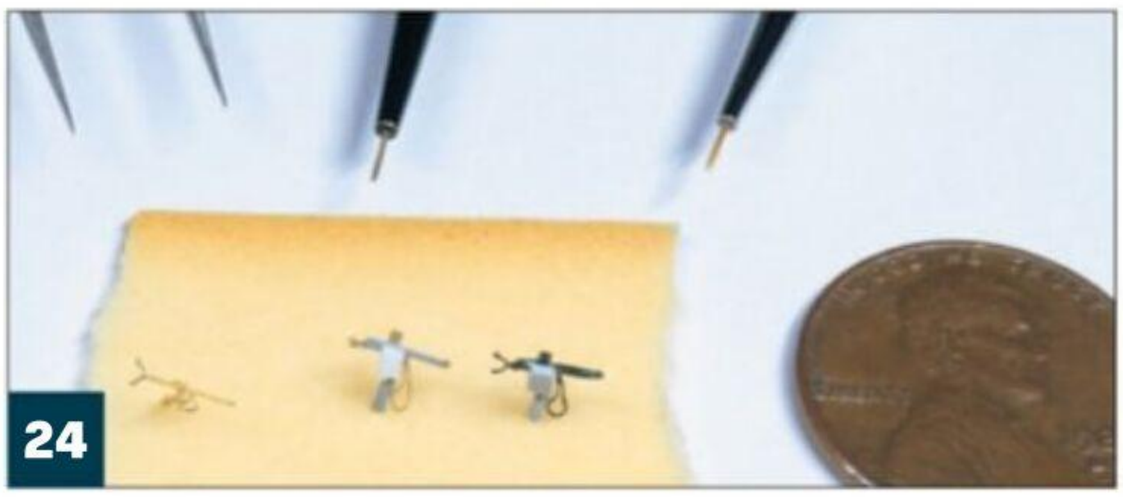
I use sheet styrene for decks and modifying superstructures. For example, to backdate Trumpeter's 1/350 scale 1942 USS *San Francisco*, I removed splinter shields with a sprue cutter. The kit's angular deck extensions were replaced with curved pieces cut from Evergreen sheet stock; Tamiya and Testors liquid cements work well with these materials



I cut and reshaped the forward superstructure and its decks. The rounded corners required tape and superglue; everything else was done with liquid cement. The result converted the model to a pre-World War II fit and a unique 1/350 scale USS *San Francisco*.



One of the uses of styrene I enjoy most is making rolled-up signal flag ends. I glue several styrene rods together, slice off segments, and paint each section the colors of signal flags. I glue the segments into the flag boxes with thin white glue.

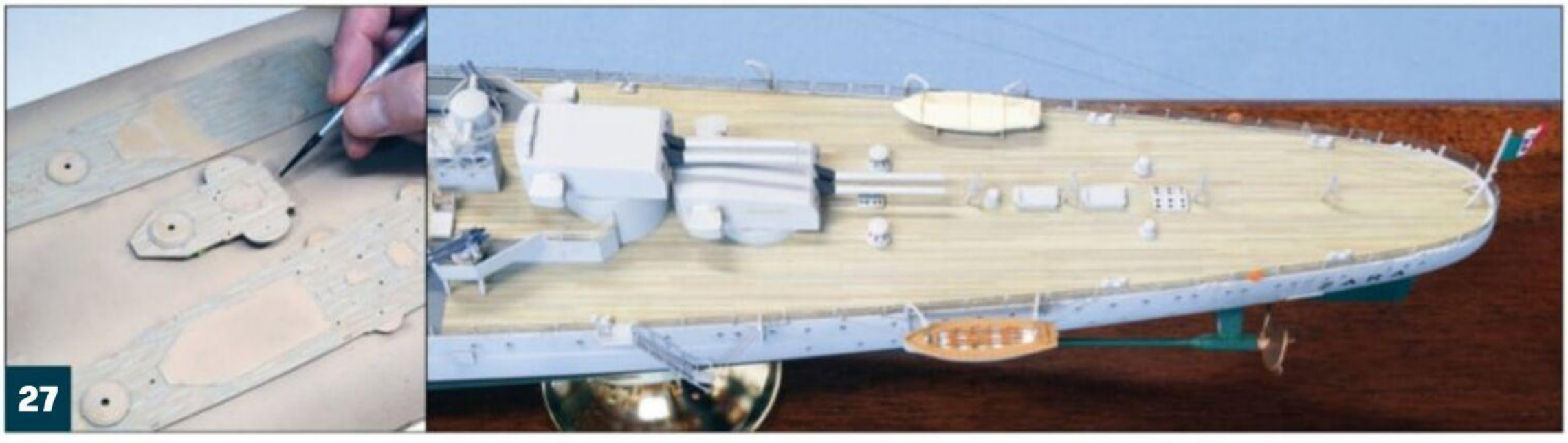


To enhance PE weapons like these .50-caliber machine guns, I added styrene blocks for cartridge boxes. Before painting the weapons, I painted them with Mr. Hobby Mr. Surfacer 500, which bulked up the guns for a better, three-dimensional appearance.

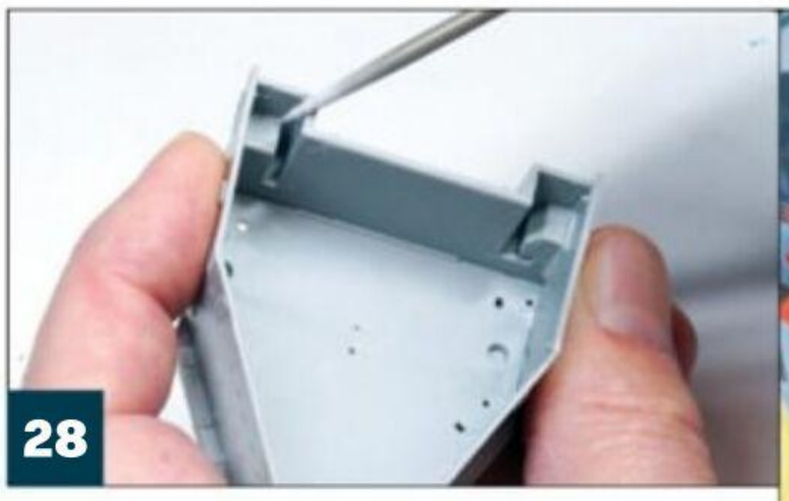
PAINTING AND FINISHING TECHNIQUES

Although self-adhesive wooden decks are available, I prefer painting the plastic parts. I think the aftermarket parts look artificial and the thickness of the wood reduces the height of deck fittings, affecting the realism. I start by masking as many of the molded planks as I want and airbrushing a tan color.

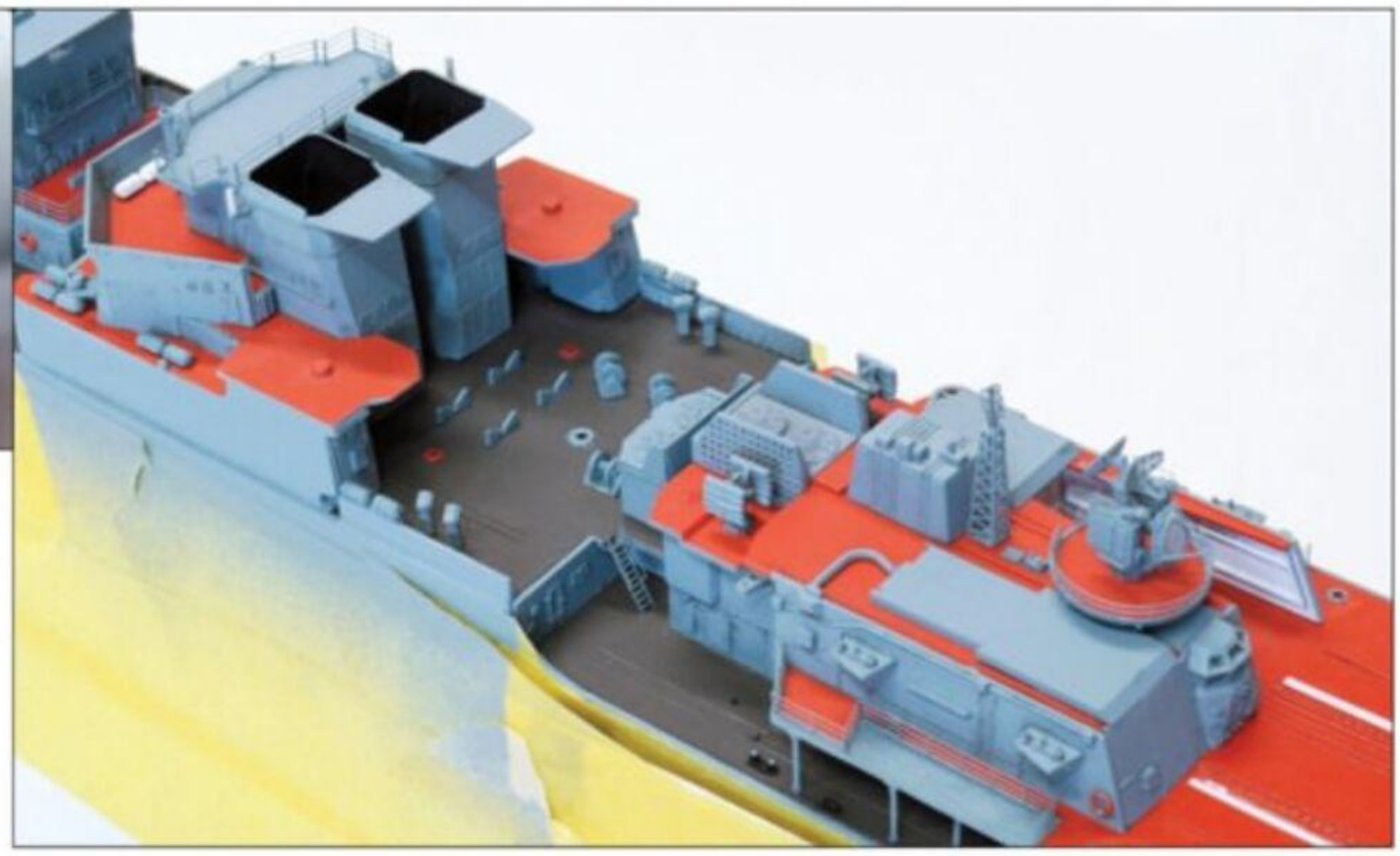
I remask the deck multiple times and spray it with different shades of tan until the entire deck area is filled. In this case, I applied the paint over the course of 15 mask and spray sessions.



As a final step, I apply a wash of olive or dark gray artist oils thinned with mineral spirits. Capillary action draws the thin liquid along the plank edges so you don't have to outline them. The result is a realistic deck that is to-scale from any viewing distance – it even looks good under magnification.

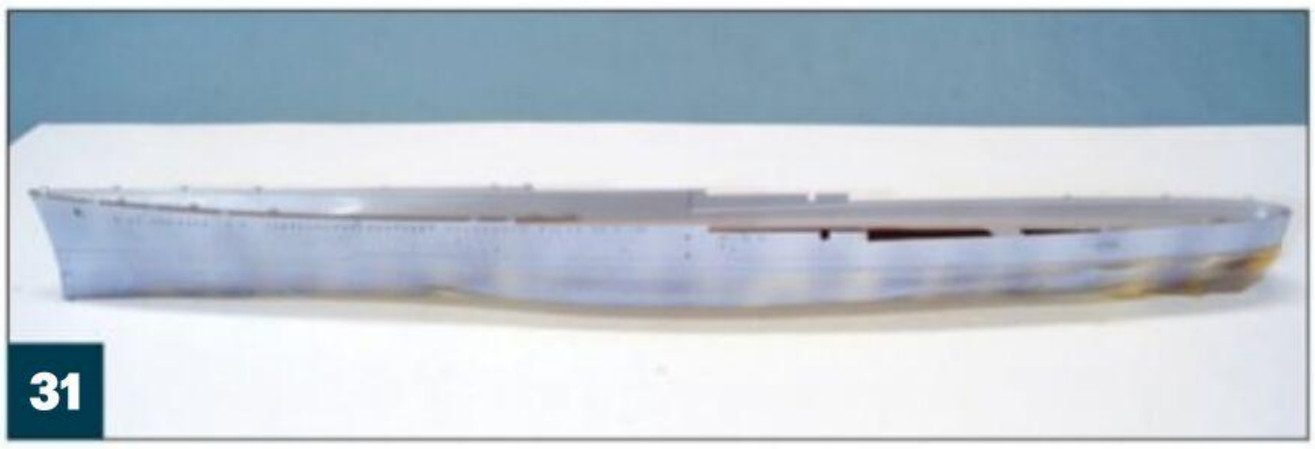


I paint superstructures as they are assembled and then turn them upside down and bevel their undersides. This makes them easy to glue to the decks. Pre-painting the decks and the superstructures results in a nice, crisp color demarcation between mating surfaces that are not the same color.



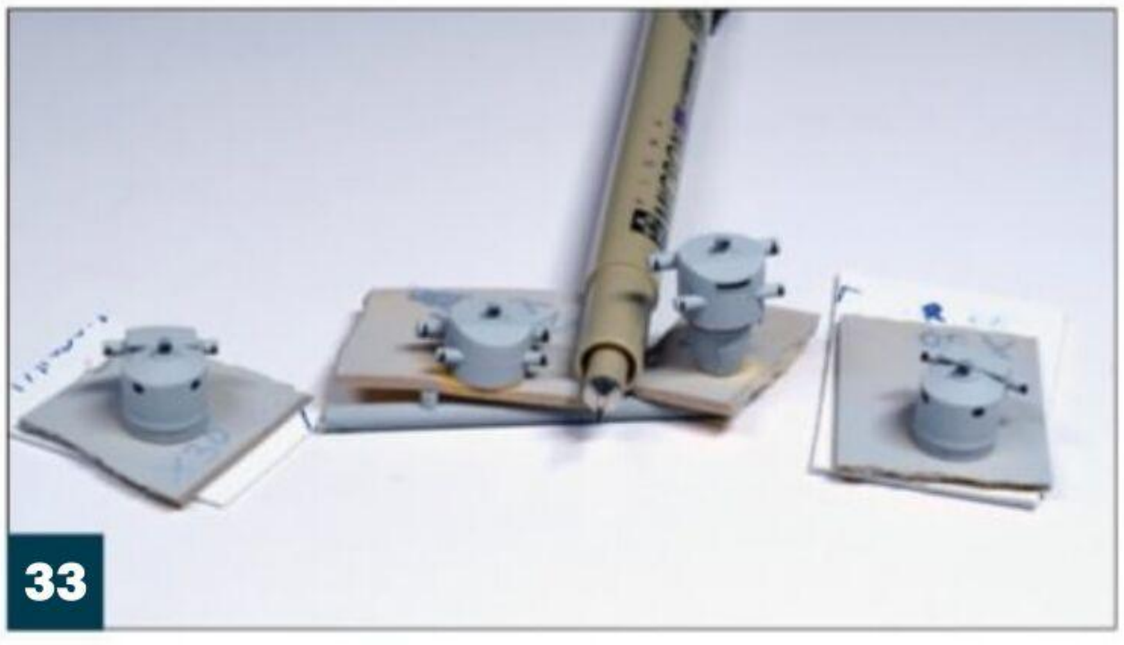
The interface between superstructure legs and a wooden deck is a good example of what would have been a masking nightmare. My solution was to pre-paint everything and then apply glue to the undersides of the superstructure in areas which are hidden by the arches.

When painting hulls, I use a simple technique to suggest the oil canning of steel hulls and break up the monotony of a straight-sided surface. First, I pre-shade with a dark gray or black, using an airbrush to spray vertical stripes at random intervals.

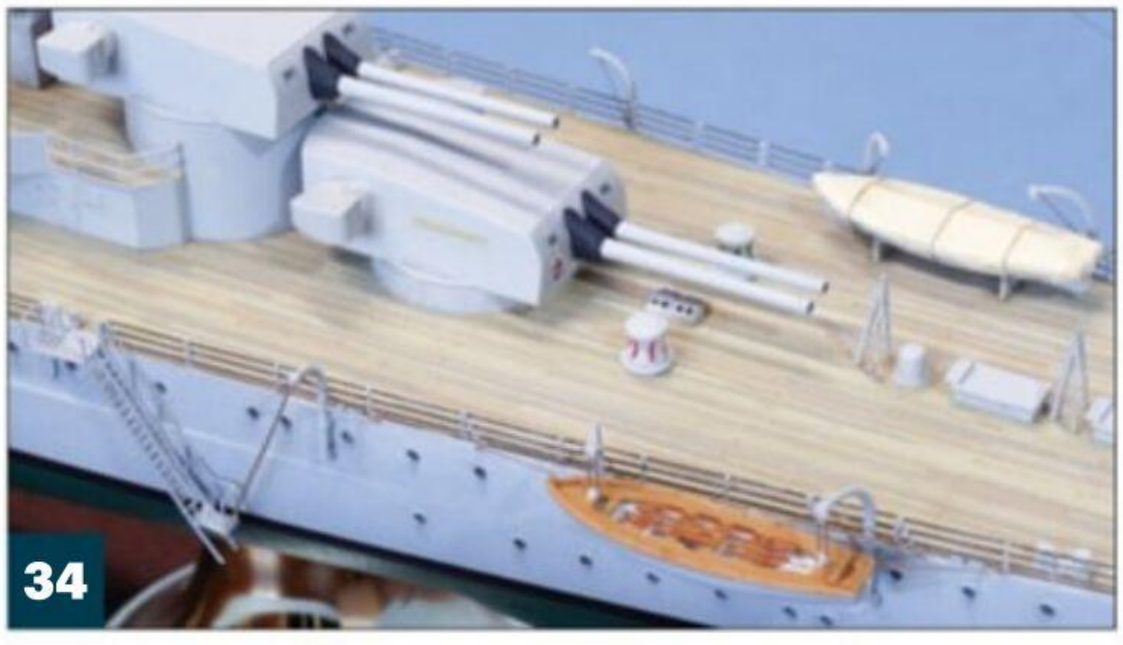


Next, I apply light coats of the hull color until the pre-shading is barely visible. I feel that the mere suggestion of oil canning creates a realistic and interesting look. I do not try to create indentations at specific hull frames to match photographs. For me, less is more.

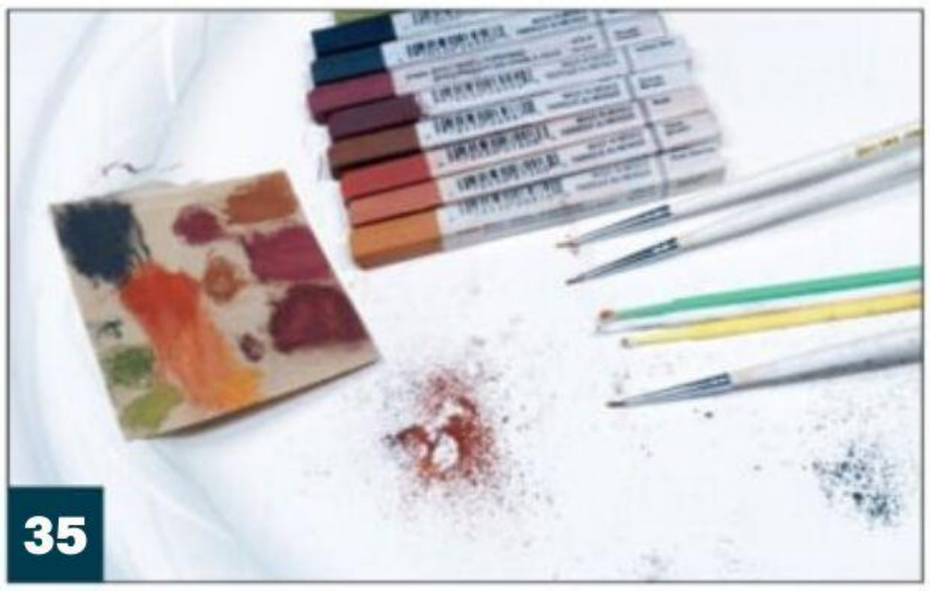
Details such as gun-director ports can be darkened with Portland gray or lamp black artist-oil washes. After two or three applications, the recess fills in and there is rarely a need to touch up its outline.



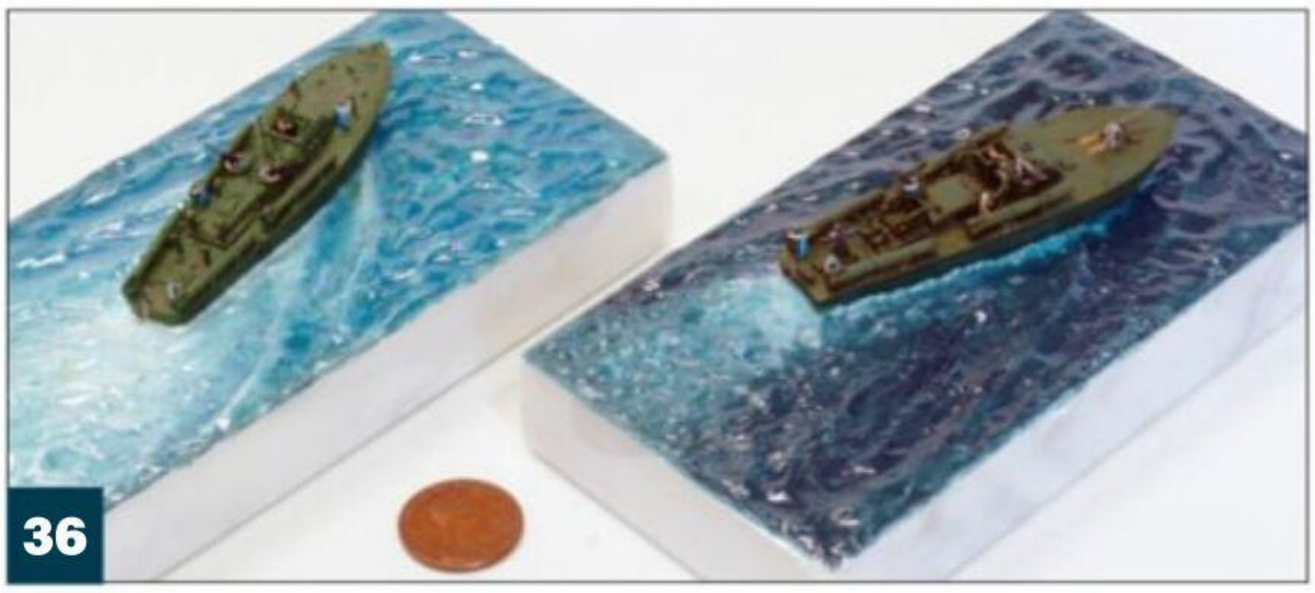
For especially small features, I use Sakura Pigma Micron 02 and 005 archival ink pens, touching up with the hull color if needed to cover mistakes.



I finish painting with two thin coats of Testors Dullcote airbrushed over everything. This seemingly magical product unifies and evens out the finish and makes details more apparent.



I do not do a lot weathering, but when I do, I apply artist pastels with a fine-tipped paintbrush.



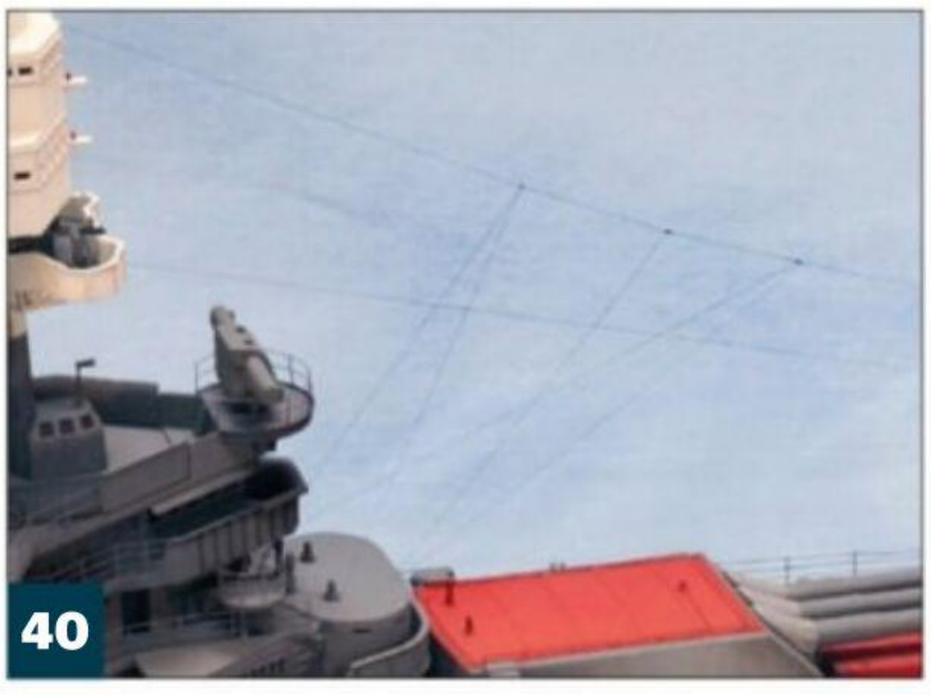
For fun, I tried my hand at painting a couple of seascapes. I used artist's gesso for the waves and various enamels and acrylics for the water. Here, *PT-109* (right) is posed on a moonless night, while *PT-34* (left) fights off a Japanese air attack during daylight. The PT boats are resin and PE kits with plastic figures.

REALISTIC RIGGING

No matter what type of ship you are building, it is important to use rigging that looks realistic and in scale. The products I use work nicely in 1/350 and 1/200 scales, but you may find them useful for larger and smaller scales, as well. The two large spools are Modelkasten nickel titanium rigging wire. The smaller spool is Uni Caenis 20 denier fly-tying thread. The Ngineering wire is a stainless-steel model railroading product with a thickness slightly under .004 inch.

I use the Uni Caenis line for long runs where there would be too much sag for the wire products. I glue the lines in place and tighten them up with a hot match head. The heat of the match head not only shrinks the line but also pushes it away a little. So, by moving the match head around the diameters of the lines, I can get them parallel to each other.

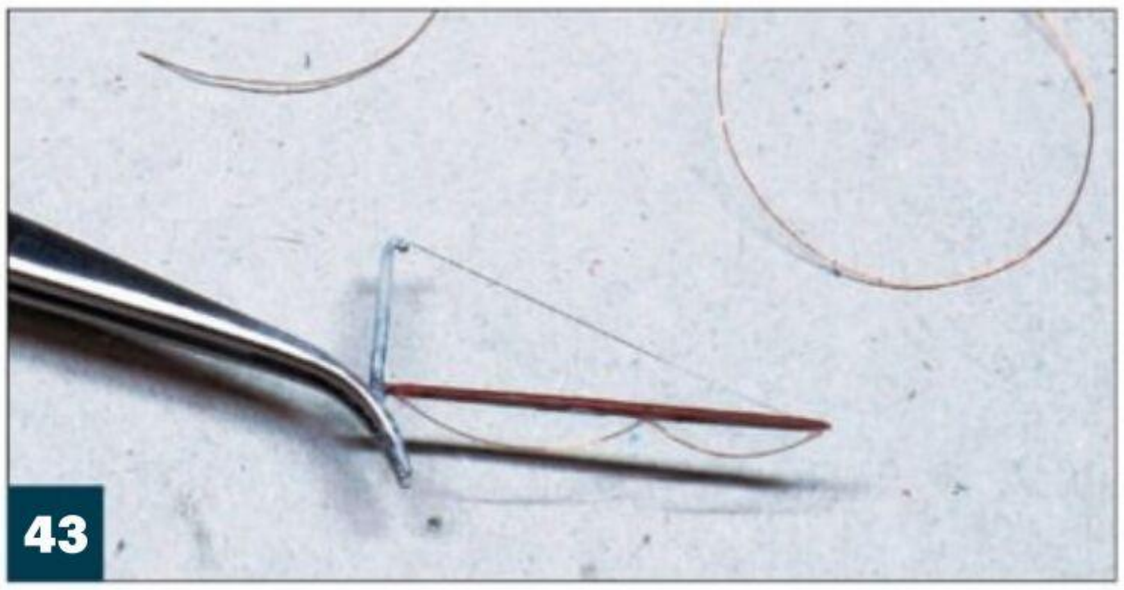
I use wooden clothespins to pull Caenis line taut while the glue dries. I prefer to use thin white glue for this because it shrinks as it dries and is practically colorless.



One of the tougher rigging challenges is gluing two pieces of rigging together. For this interesting configuration, I glued each vertical line at its lower end and hoisting the other end attached to my workbench light. I rotated the entire ship until the two lines intersected and then applied a speck of white glue to fuse the lines together.

Modelkasten wire is ideal for short segments of line that need to look taut and where it is difficult to thread. It is simple to paint the wire a rope color, cut it to length, and glue it in place.

The Nngineering wire comes in handy for mast stays and standing rigging. I glue it in place with white glue applied with a map pin.

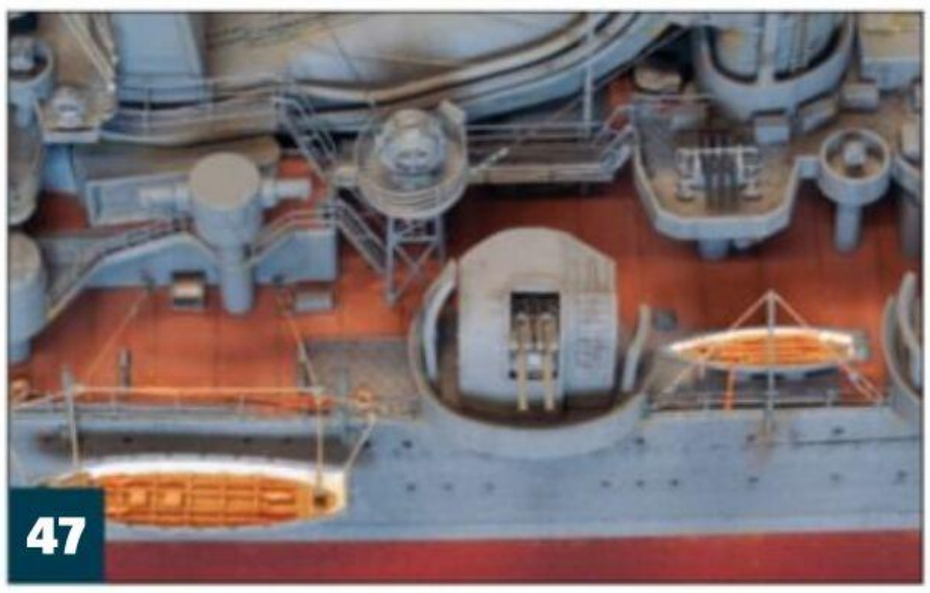


I use single strands of unraveled copper speaker wire to make catenaries, such as the hanging ropes attached to this scratchbuilt boat boom.

Speaker wire can also be used to make curved flag halyards. This 1/200 scale national ensign is attached to a piece of curved wire that is attached to a second piece of coiled wire, giving the appearance of a continuous rope tied off at its lower end

Another view of the flag halyard illustrates how I tie rigging lines without using knots. The cables on the crane were made from the Ngineering wire as were the antenna lines on the Kingfisher aircraft.

The weight of the Modelkasten wire makes it perfect to replicate the sag found in rigging lines. The curved lines in this image were made by cutting the segments a tad longer than a straight length would require.



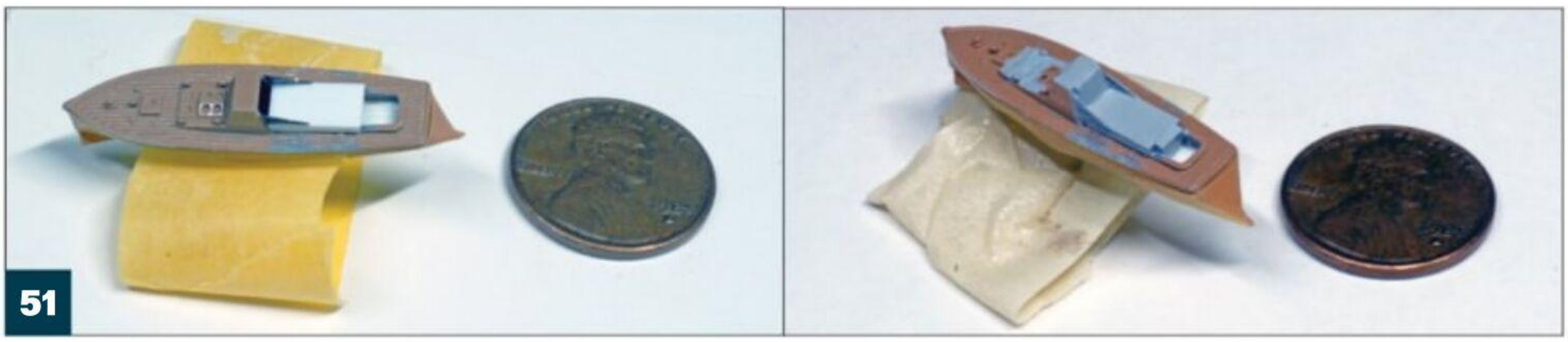
PE turnbuckles and pulleys can be glued to rigging lines prior to attaching them to the ship.

DETAILING SHIPBOARD UTILITY BOATS

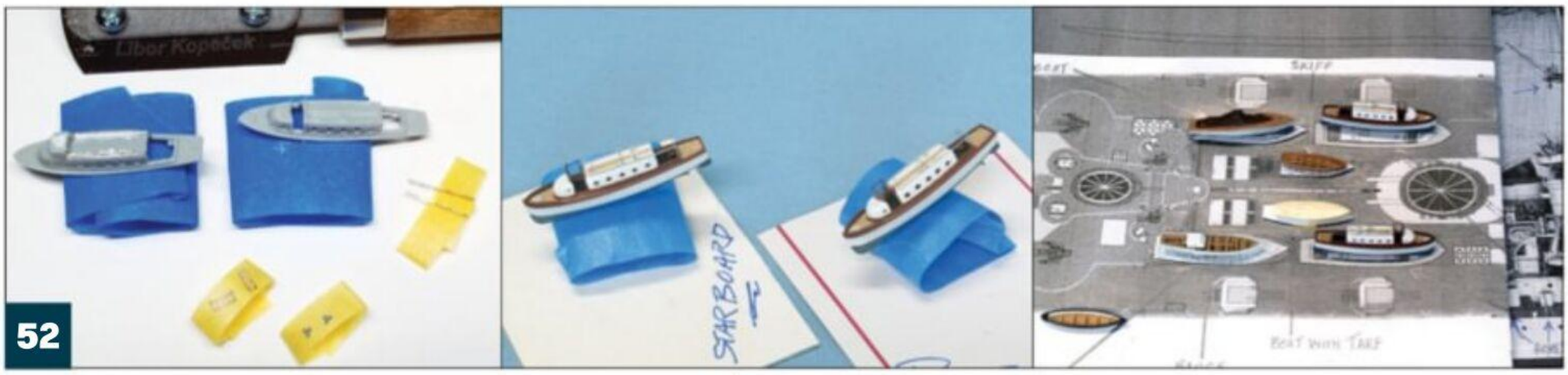
I find detailing utility boats is an enjoyable and worthwhile process. Rarely are the kit parts adequate, so they cry out for detailing, and I treat them as standalone models and create my own instructions, like these for USS *Arizona*'s admiral's barges. The portholes have been drilled out, PE railings applied, and scratchbuilt navigation lights added.

I add rope coils made from speaker wire to the boats before attaching them to their cradles with white glue; PE oars painted a wood color add to the overall effect.

This sporty looking craft was made by coating the kit parts in thin putty and sanding it to this correct shape. The fins on the rear deck are separate pieces of thin styrene cut and attached with liquid cement. I hand-painted the model to match photographs.

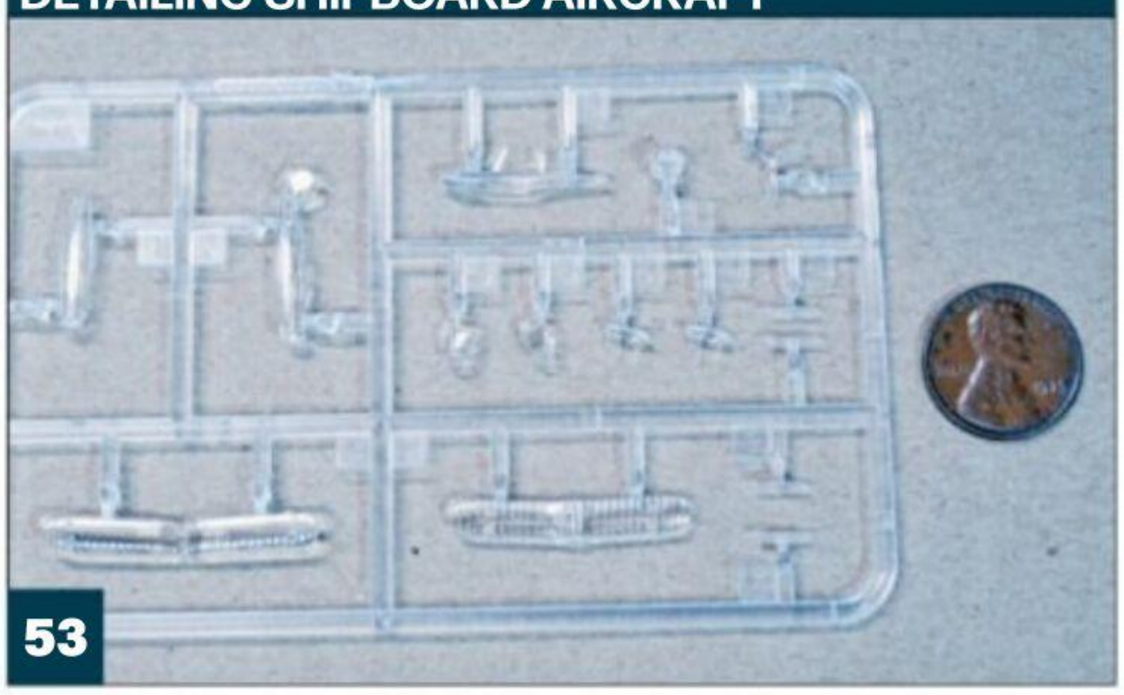


Never throw anything away. The hull on this boat for the Italian cruiser *Fiume* is left over from a Japanese cruiser. First, I cut and attached the styrene and PE needed to change the boat's identity. The shape of the forward cabin was changed with layers of Mr. Surfacer. The PE and styrene pieces were primed to blend the disparate materials together and provide a nice base for the final paint.

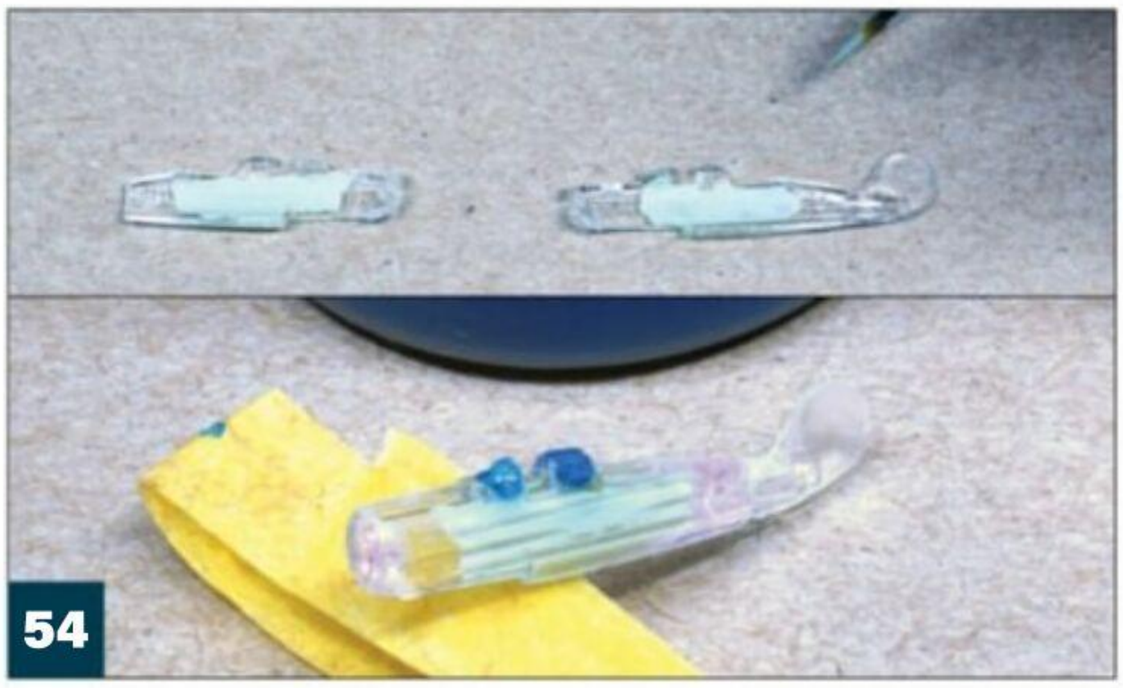


For the *Fiume*'s motor launches, I found PE for the windscreens, cut out the cabins, and opened the portholes with a drill bit in a pin vise. Next, I made canopy supports and railings from spare PE and glazed the windshields and portholes with Microscale Micro Kristal Klear. These along with the other boats detailed according to photos help set my *Fiume* apart.

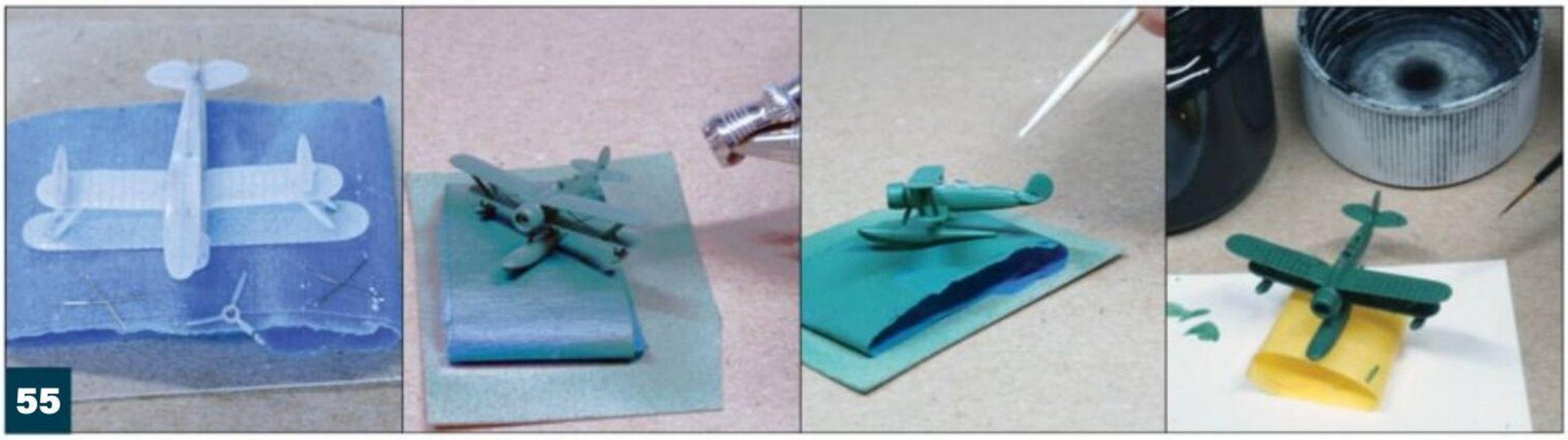
DETAILING SHIPBOARD AIRCRAFT



Another golden opportunity for strategic detailing lies with the aircraft that are mounted to the model. Just like boats, I treat the aircraft as if they were stand-alone models. Kit manufacturers often mold the airplanes in clear styrene. This creates extra steps as we shall see.



If the plane has an open cockpit, the first step in dealing with the clear styrene body is to hand-paint the interior. Next, I mask the canopies with tiny blobs of Microscale Micro Mask, a thick liquid that dries to the consistency of rubber cement.



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It is absolutely necessary to prime the clear fuselage so the exterior color will adhere. With the wing braces installed – I was fortunate to find some X-shaped PE, so I avoided having to attach individual struts – I airbrushed the exterior color. I masked the cockpits with wet tissue. After the fuselage was painted, I pulled off the liquid mask, cleaned up the windscreens, and applied Microscale Kristal Klear for a glassy shine. A wash of thin lamp black artist oil paint helped pop the panel lines.

56

Before applying decals, coat the models with clear gloss to prevent silvering. I use out-of-production Pledge Floor Gloss, but there are several good options available from model paint manufacturers. Microscale Micro Set and Micro Sol helped settle the decals. I painted the scratchbuilt guns with Vallejo Model Color Gunmetal Gray (No. 70.863).

57

After rigging the plane using the procedures described previously, I attach the plane to its final position on the model with white glue. This IMAM Ro 43 occupies a footprint of only 1¾-inches square.

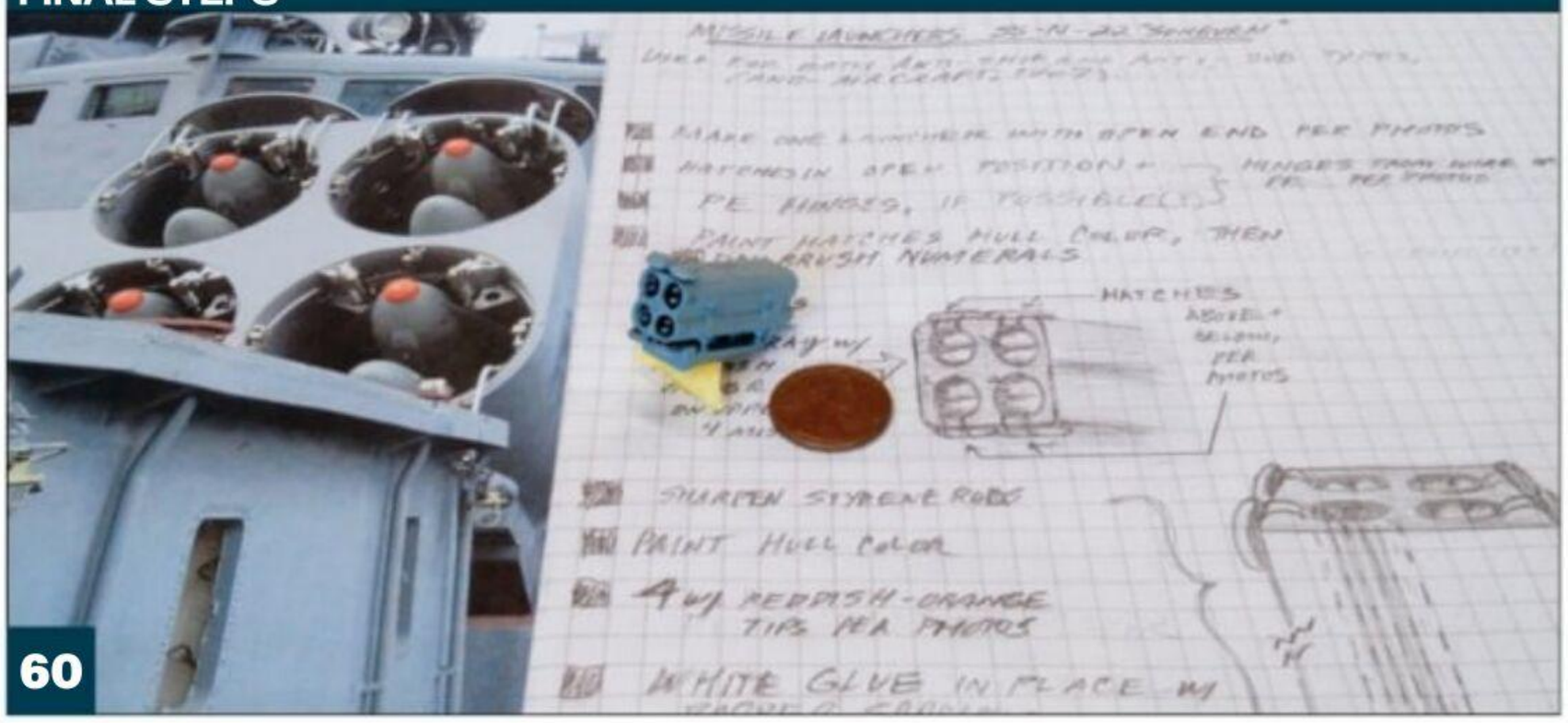
58

Even clunky-looking kit planes can be improved. These 1/350 scale OS2U Kingfishers were molded in gray plastic, so I hand-painted the canopies Tamiya Metallic Blue (No. X-13) to simulate a reflected sky.

59

With good references, you can detail each aircraft with its correct markings and identification codes. To fold the wings of the SOC Seagull, I cut the kit parts and reattached them to match photos.

FINAL STEPS



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As I complete subassemblies, I check them against my plans to make sure I have done what I intended to do. At the end of the project, I take photos, inspect the work revealed in them, and fix anything that needs correcting.

61

After all this work, it's vital to protect the model from dust and curious fingers. The wood and glass display case for the Russian destroyer *Admiral Chabanenko* includes two engraved nameplates: one in the Russian Cyrillic alphabet, and one in English. The case for the Italian cruiser *Zara* was made with an optical-grade clear acrylic top. It lets more light in than the wood style, but is a tad less formal.

62

When the finished model is safely in its new home, I put all my project materials into a formal presentation binder. These binders come in handy for reference and are also useful when I take my models to shows. **FSM**

Make a showpiece of SHOWBOAT

Building, modifying, and detailing a 1/350 USS *North Carolina*

BY BOB STEINBRUNN

Trumpeter's kit of USS *North Carolina* (BB-55) received less than sterling reviews. But it still struck me as the best option to build a replica of the World War II battleship. Armed with hundreds of photos I had taken during two trips to the ship, which is now a museum in Wilmington, North Carolina, as well as numerous books and plans, it was obvious I had my work cut out. A large investment in time and aftermarket accessories from various suppliers would be required.

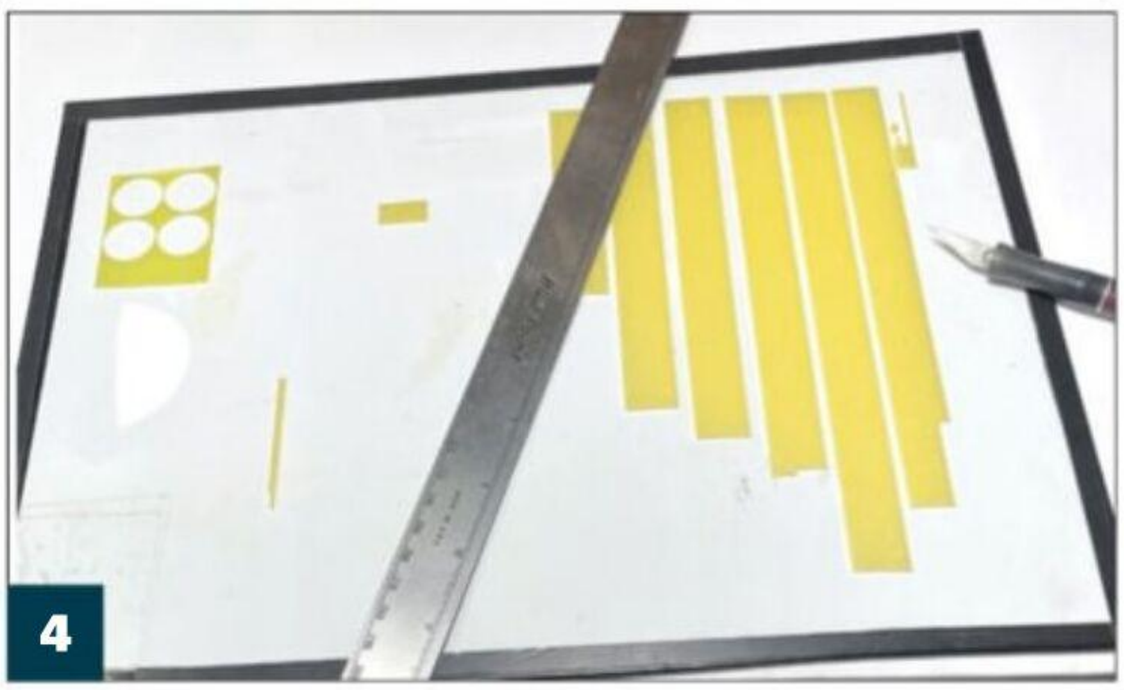
I used aftermarket photo-etched metal (PE) from Gold Medal Models and Lion Roar and cast resin from L'Arsenal. Model Monkey offers an extensive array of 3D-printed parts for many warships including *North Carolina*. It's important to look at the kit parts critically and decide what will be detailed, what will be replaced, and what will be sanded off.

The ship wears Measure 32/18d (late version) primarily an anti-submarine camouflage designed to make the ship's type, course, and speed difficult to assess from a periscope. I used out-of-production Floquil Marine paint since I had them on hand from previous projects (and lament their absence). The colors — Light Gray 5-L, Ocean Gray 5-O, Weather Deck Blue 20-B, and Oxide Red — are available from other model paint manufacturers. My model is detailed and painted to represent the USS *North Carolina*, nicknamed "Showboat," as she appeared on September 24, 1944 at the Puget Sound Navy Shipyard after an overhaul.

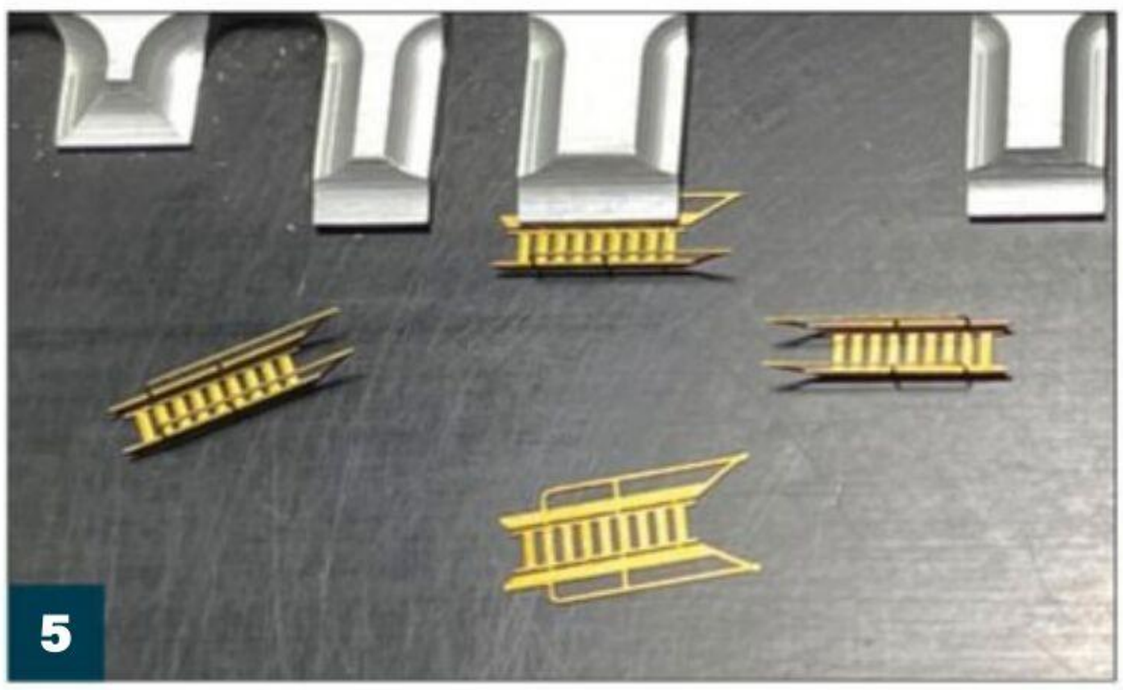
A third-hand tool – this one is made by X-acto, but there are a bunch on the market – is useful for holding parts and, in this case, a draftsman's pencil to mark a level waterline and boot stripe.

Precision dividers are essential for determining lengths to be cut and marking locations to attach parts. Here, I am taking a measurement from a ruler that will be transferred to the model.

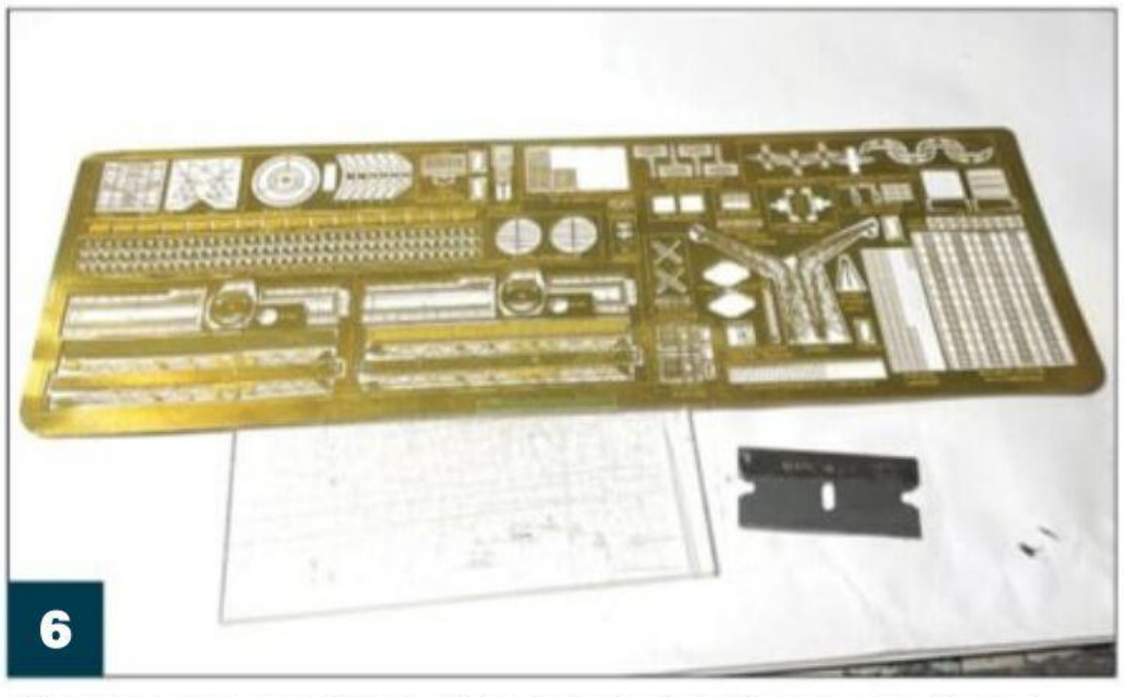
The dividers have been used to mark off the strakes of hull plating – the kit has a bare hull – which were made from .010-inch styrene sheet. The the boot stripe was marked off similarly.



If you like masking, then Measure 32/18d camouflage is for you. I laid strips of Tamiya masking tape on a sheet of glass – the sharp edges were covered with electrical tape to prevent me from getting cut. A straight edge and sharp blades make cutting thin strips easy.



The 5-Speed Hold & Fold bending tool from The Small Shop is indispensable for folding complex photo-etched metal (PE) components so they have crisp, straight, and sharp edges. The name "5-Speed" refers to at least five different operations this tool can perform.

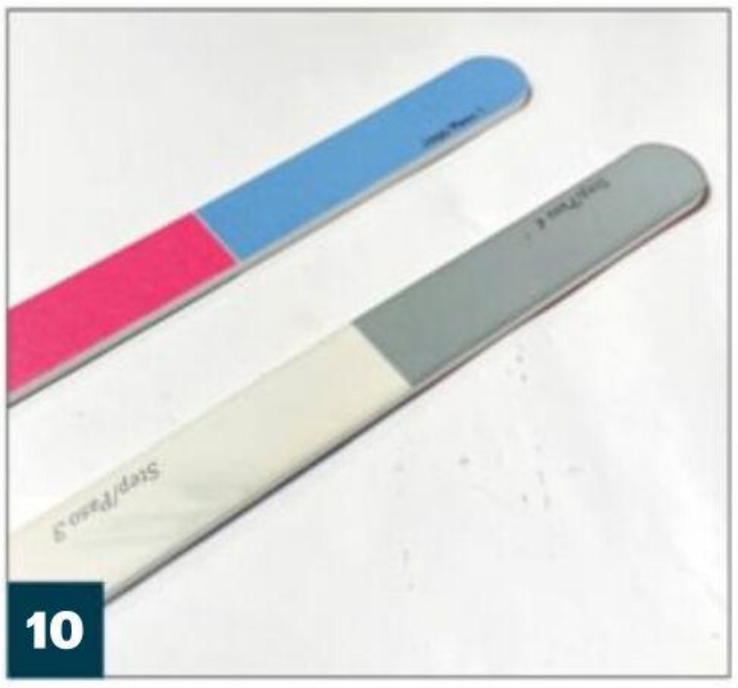


PE parts come on a brass plate called a fret. To separate them, I sever the attachments using a single-edge razor blade. Cutting on a piece of plexiglass prevents the part from being bent and helps preserve the sharp edge of the blade.

Sprue cutters are useful for trimming the brass nubs from PE parts. On the left is a set by Tamiya, on the right is a set from Zoukei-Mura.

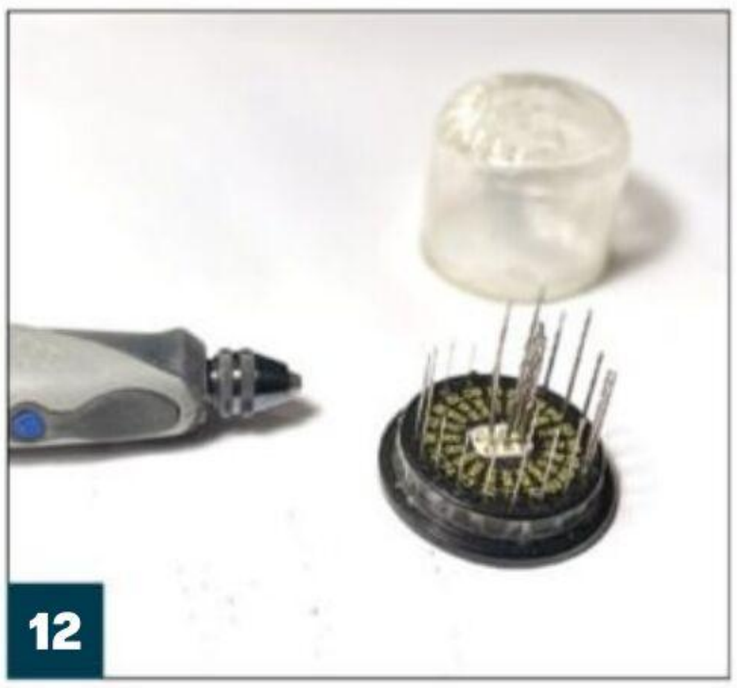
Needle-nose tweezers allow precise handling and placement of tiny parts. These come in various sizes, and this trio is made by Swiss company Grobet.

Simple PE parts don't require the tools like the Hold & Fold, but rather can be bent to shape using square-nose pliers and tweezers.



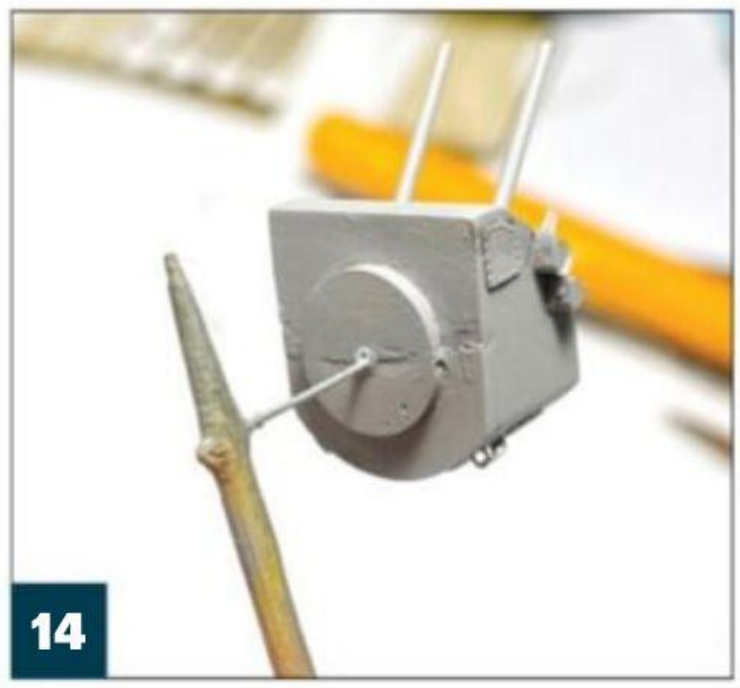
Final smoothing of the brass nubs on PE can be done with fingernail sanding sticks. This view shows two sides of the same stick that has four different grits. These are found both online and at pharmacies.

Scalpels are much sharper than hobby knife blades but are more flexible – not always desirable. These two are a No. 11 blade (top) and a curved No. 15 blade, useful for trimming clear film from around decals and scraping plastic parts.



Ship models are often improved by opening portholes and gun barrels. I use a Dremel Stylo, a lightweight rotary tool that is small and maneuverable. A drill stand containing drill bits from a size #61 down to an #80 was in constant use on *North Carolina*.

Medium viscosity superglue is ideal for joining PE parts, and it can be used to fill seams. Unlike putty, it does not shrink and can be sanded smooth almost immediately. I use Zap-A-Gap and accelerator to produce an instantaneous bond.



To hold smaller parts for airbrushing, I drill a .16-inch hole with a #76 bit in a place it won't be seen later and superglue in 1-inch piece of .016-inch steel wire. The other end is superglued into a toothpick. Dozens of these can be made in matter of minutes.

There are numerous ways to duplicate rigging. For large lines such as the *North Carolina*'s fore and main mast stays, I used white EZ Line colored with a Silver Metallic Sharpie, which makes it look like steel cable. Enamel paint is too thick for EZ Line and lacquer paints will eat it. For smaller lines, such as antenna wires, I use Uschi van der Rosten black elastic line that comes in .003-inch and .005-inch diameters. A third type is Dai-Riki .002-inch monofilament.

Where would detailers and scratchbuilders be without Evergreen Models styrene sheet, strip, and rod? Detail Associates brass wire in sizes ranging from .006-inch to ⅛-inch comes in handy, too.

A rigging tool can be made from an old paintbrush handle equipped with a .015-inch steel wire with a hook at the end. This safely allows lines to be retrieved from a tangle on the model without pulling them out.

18

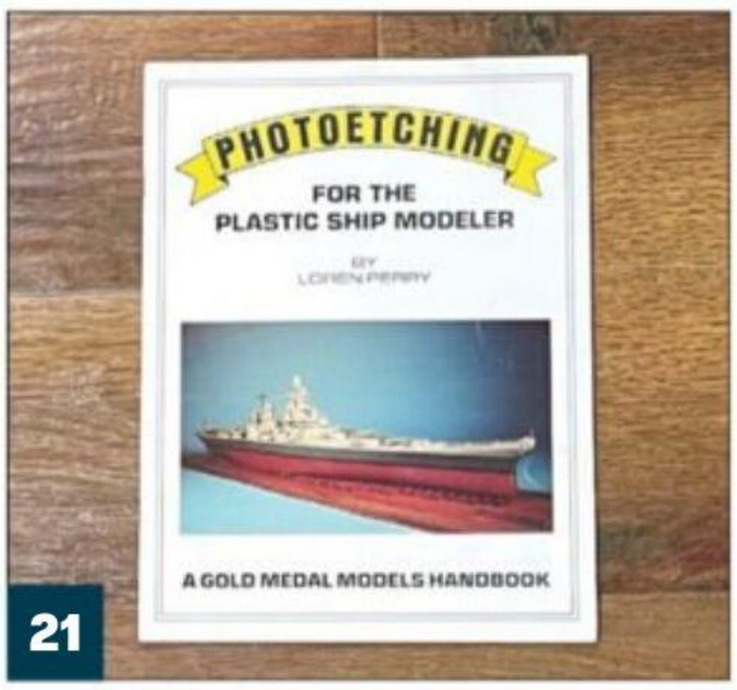
Scribers are useful for creating or repairing recessed lines in plastic. These three from UMM-USA allow both pushing and pulling to make scribed lines and are quite sharp.

19

A Waldron Model Products Precision Punch & Die Set is excellent for producing discs in various sizes from sheet styrene. All the bollard caps on this model were made in this fashion since the kit lacked them.

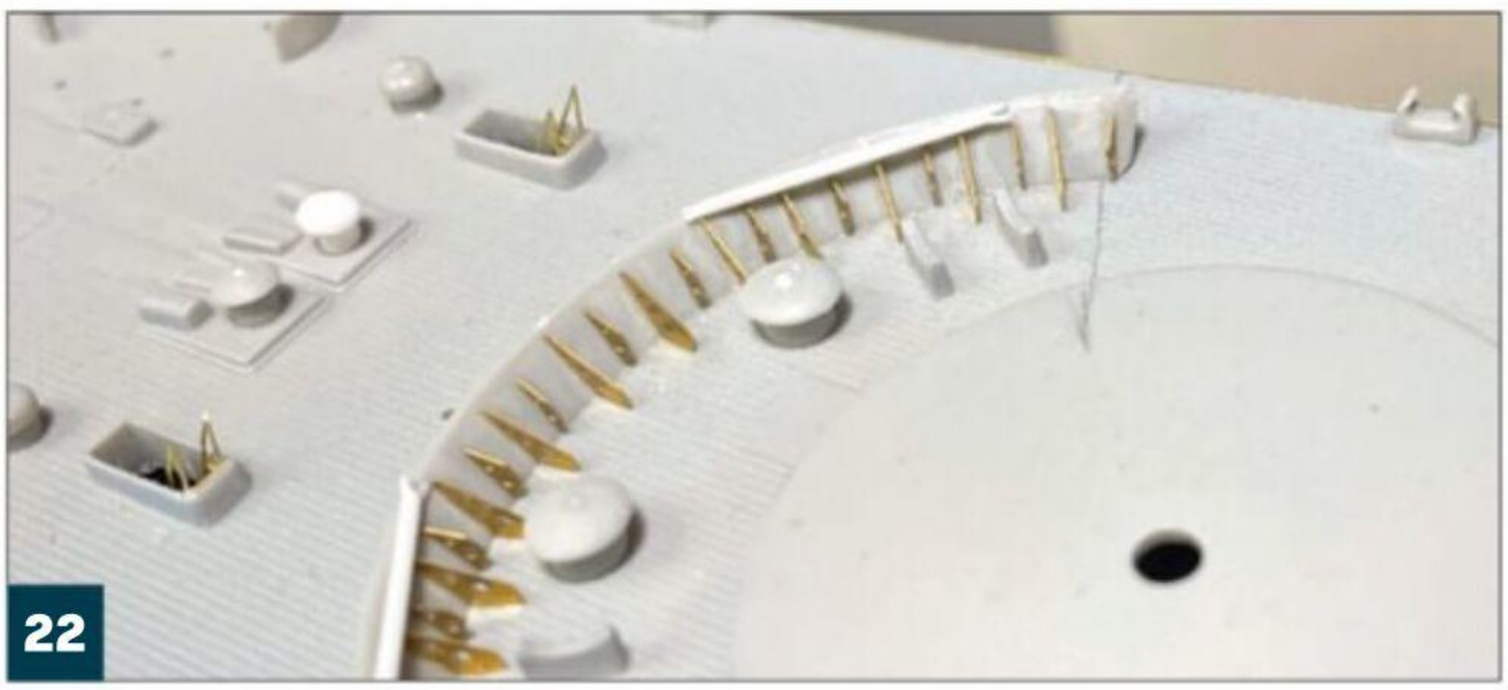
20

Every modeler in my demographic group uses some kind of magnification. I like one where the lenses are easily exchanged for one of higher or lower power. This is a 5-diopter lens that magnifies 2¼ times.



21

This excellent guide from Gold Medal Models is essential reading for those who have never dabbled in the wonderful world of PE parts.

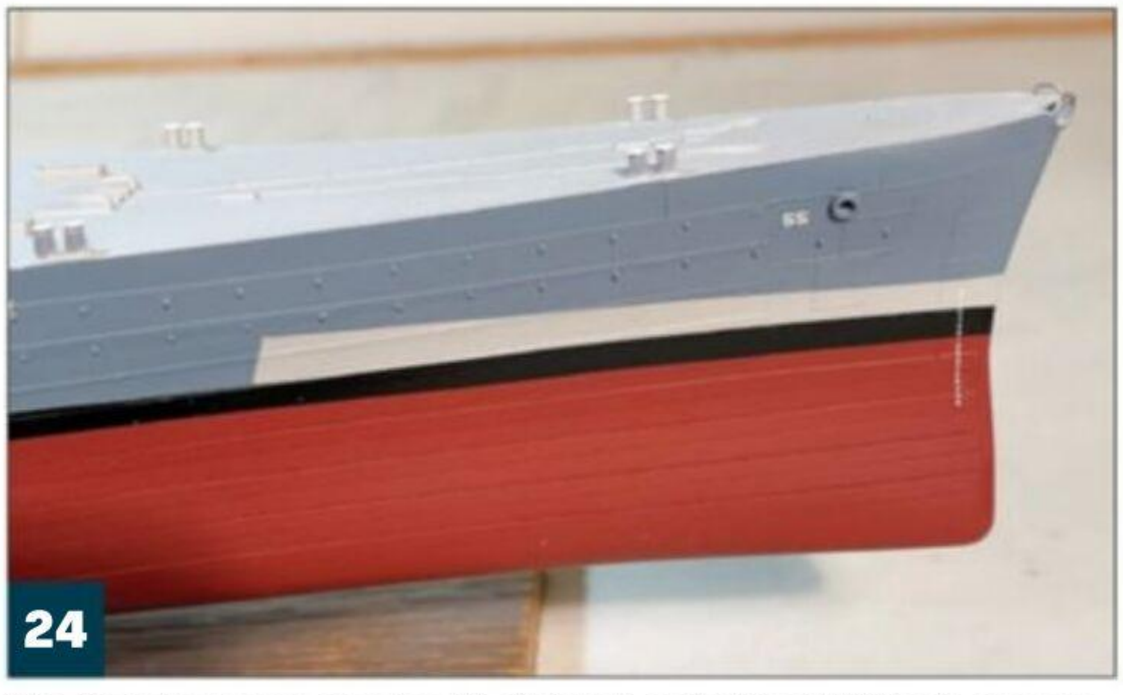


22

Here you can see the magic of PE in action with the numerous gussets attached to the breakwater. Also on the breakwater are paravane handling booms made from styrene rod. Note the opened-up deck hatches which have inclined ladders leading below and the bollards topped with punched styrene discs.

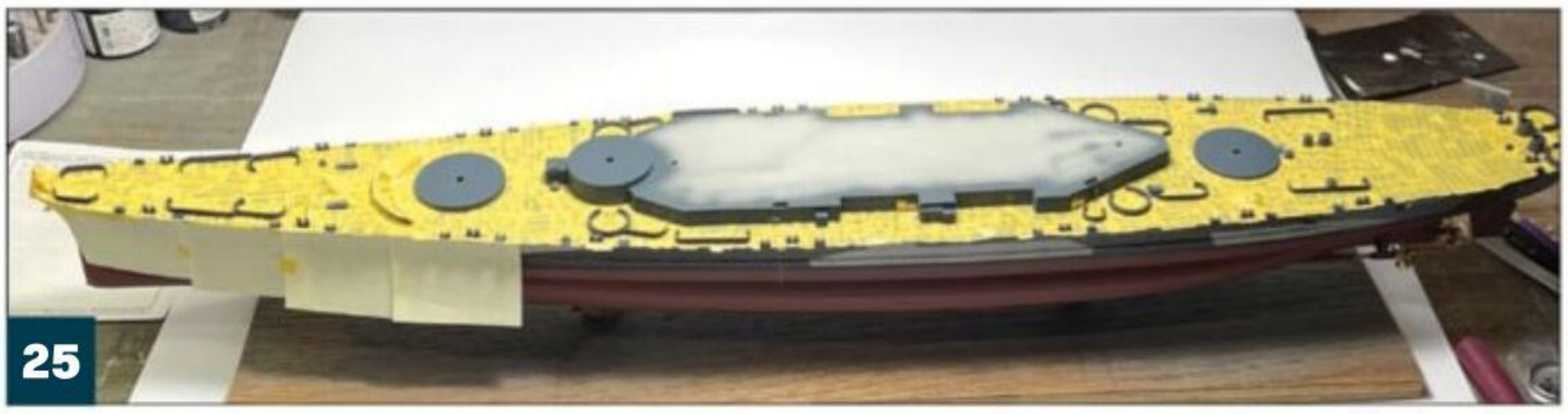
23

I carefully inserted the PE 40mm ammunition racks from Gold Medal Models (GMM) into the gun tubs before fitting the tubs to the deck.



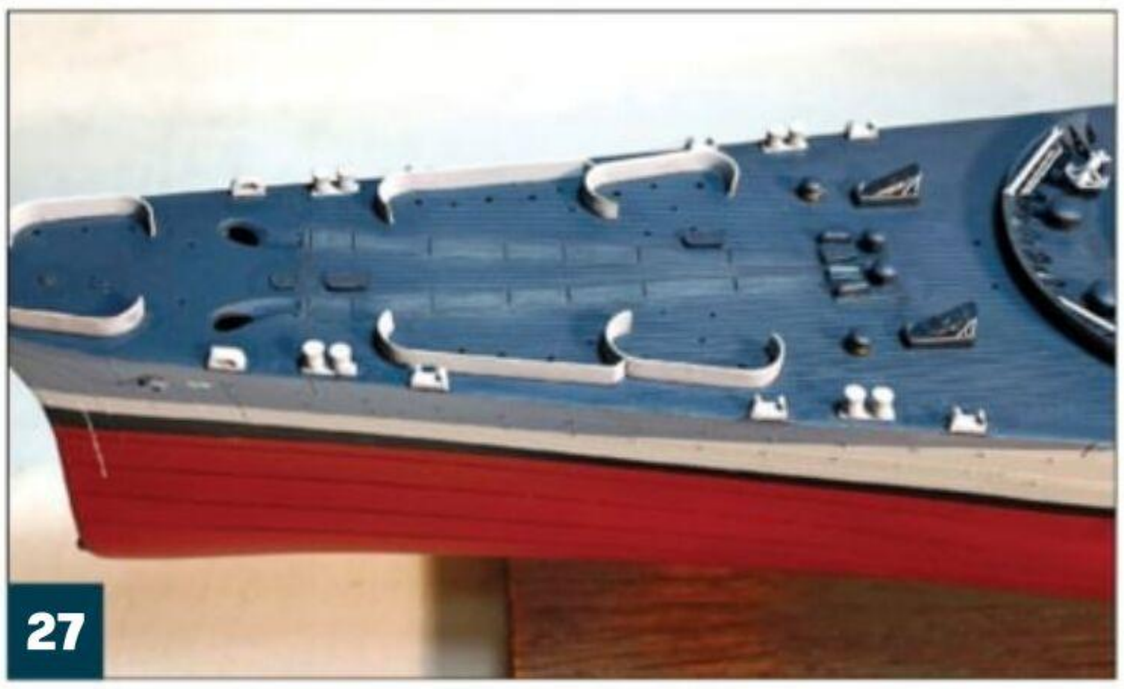
24

The kit hull was mostly devoid of detail, so I added .010-inch styrene strips for the in-and-out hull plating later painted oxide red. Tamiya masking tape was used to amplify the armor belt and overlapping strakes of hull plating on the forward upper hull. I used wire for the many hard points on the hull for painter's stages and made weld seams with .010-inch styrene rod.



After airbrushing the deck with Weather Deck Blue 20-B, I masked it to paint the splinter shields and gun tubs, a laborious process of applying thousands of strips of tape. It helped to listen to soothing music and assume a Zen-like trance.

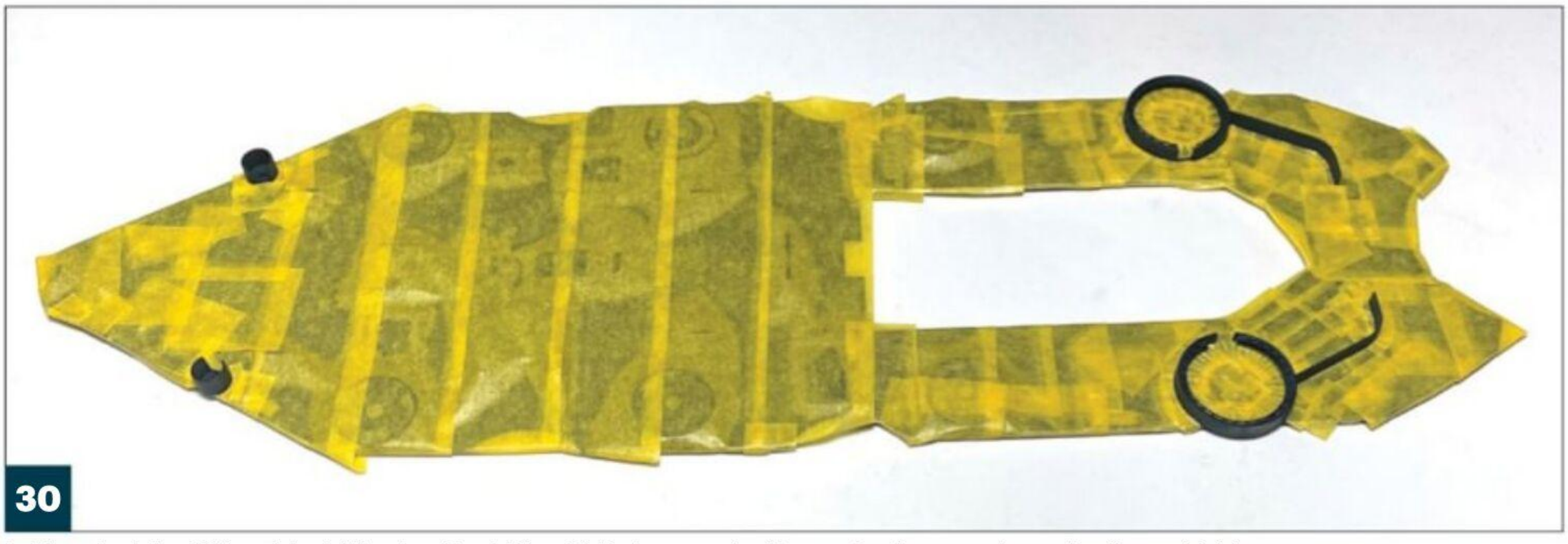
The basic camouflage requires a lot of masking. You can never have too much Tamiya tape, a thin paper tape the conforms reasonably well to curves, does not pull up paint, and leaves no sticky residue. I attached the model to a temporary base with pedestals for painting.



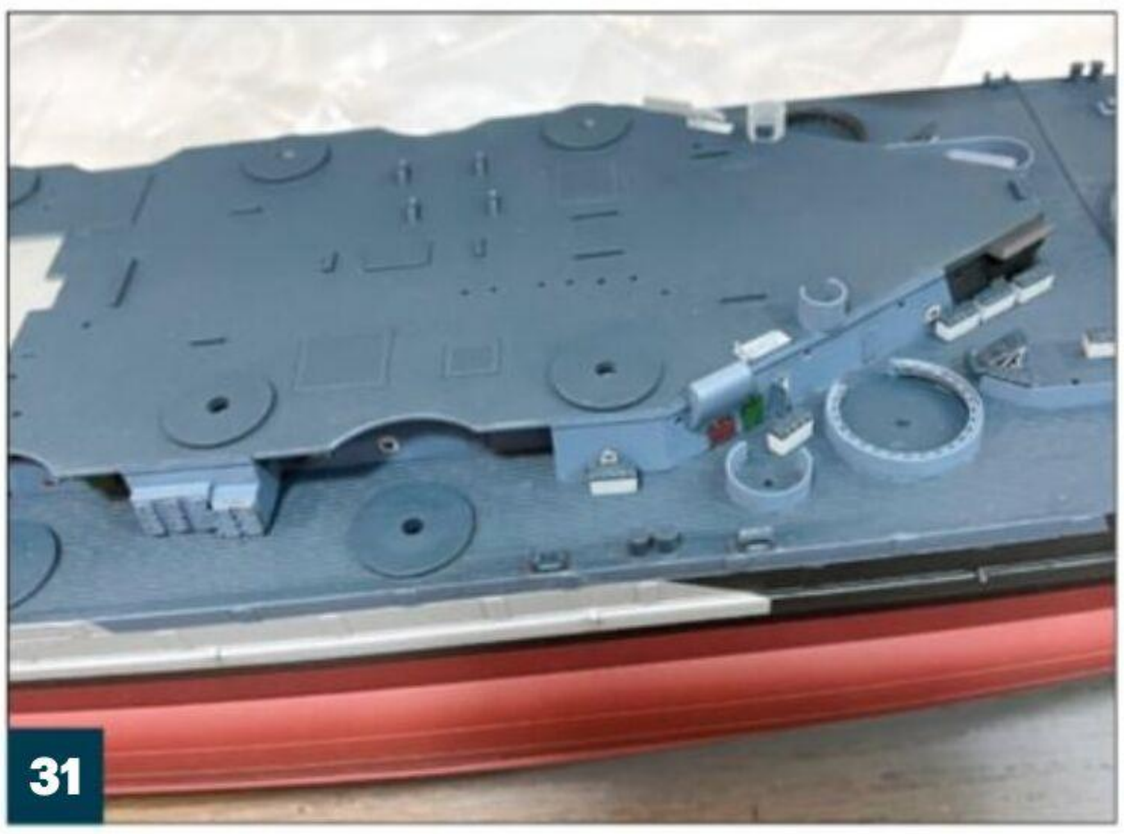
Before painting, I scraped and sanded the molded anchor chain from the foredeck, opened up the hawseholes, and detailed the bollards with punched styrene discs. After painting and removing the masks, I added the lower section of the jackstaff made using brass rod and wire and installed the hatchway covers in the open position. The paravanes are L'Arsenal resin items.

I added brass propellers from Lion Roar. The same company produced the PE letters for the ship's name across the stern.

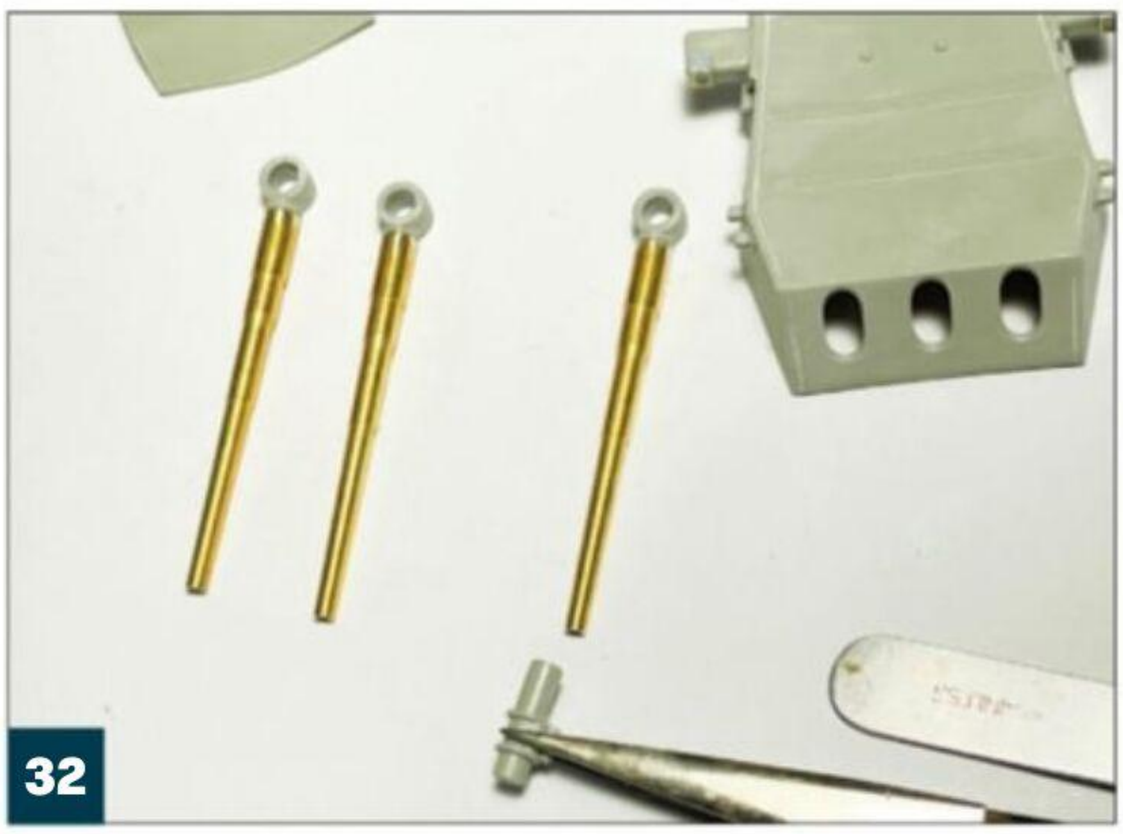
I scratchbuilt the hawsehole chain guides, including ramps and guide bollards from styrene sheet. The anchor chain is from Blue Jacket Ship Crafters, and I gently squeezed each round link with pliers to produce a rectangular shape.



I airbrushed the O2 level deck Weather Deck Blue 20-B, then masked it to paint the gun tubs and splinter shields.

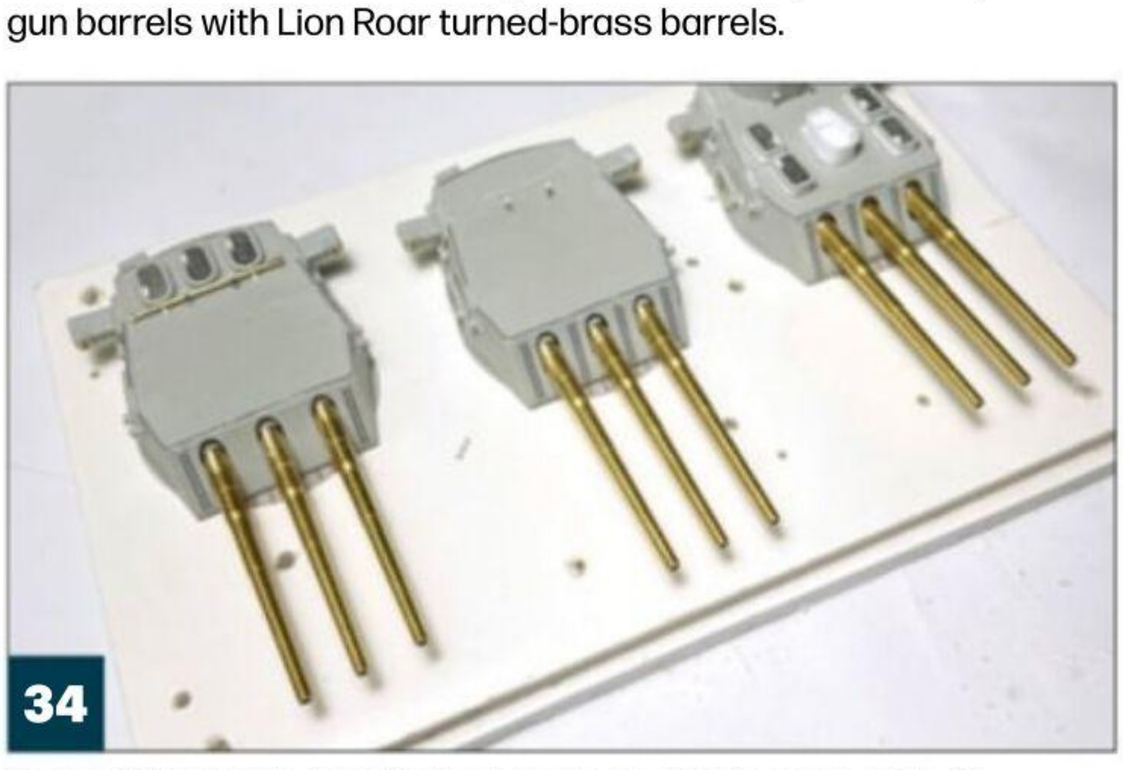


Here's is the painted O2 level deck in place. GMM provided the oxygen bottles (painted green) and acetylene bottles (painted a dull red), along with life rings and fire hoses.

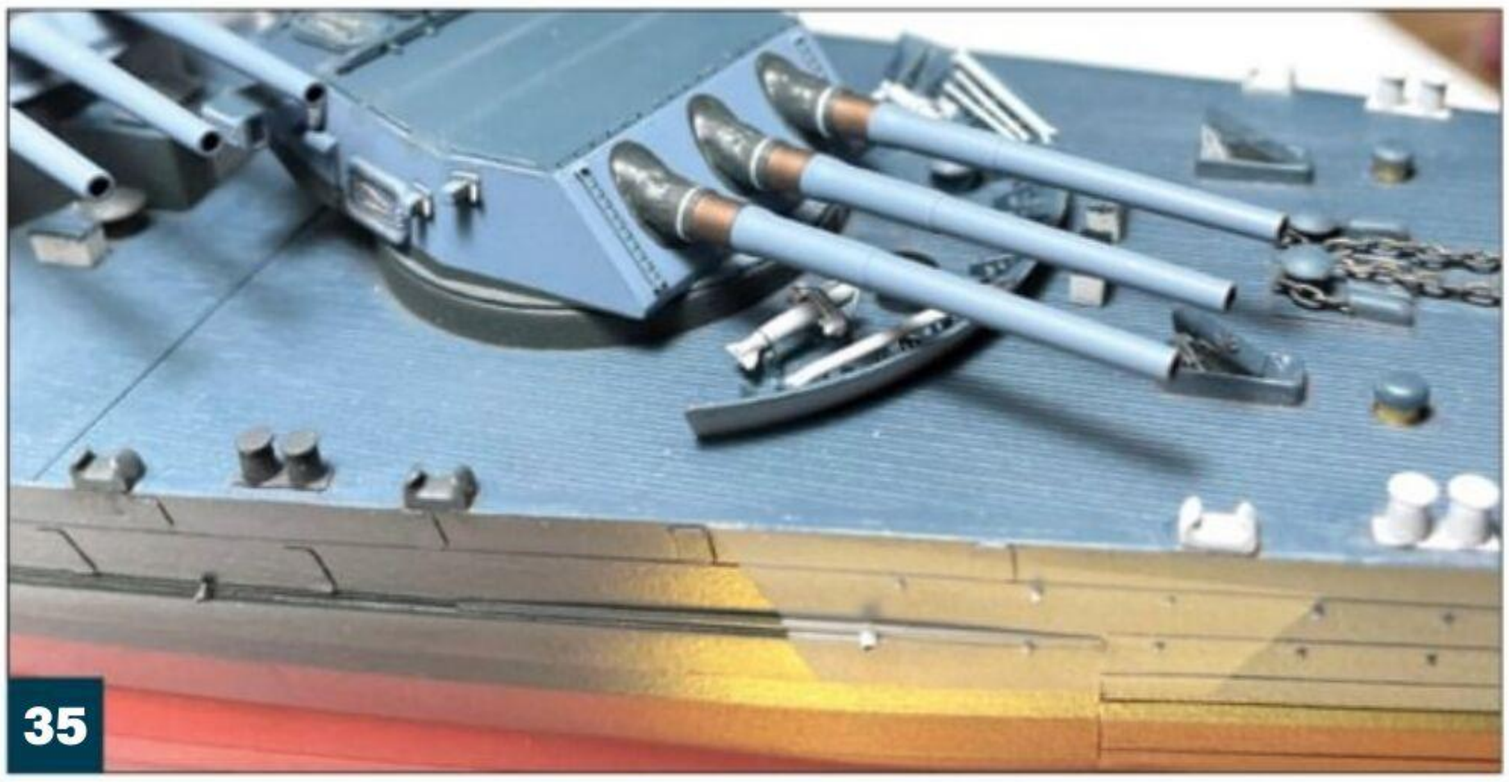


The kit's main gun turrets are unusually complex, requiring the sides to be attached and the resulting seams filled. I replaced the poor gun barrels with Lion Roar turned-brass barrels.

This gives a good look at how much PE can improve a model. This is the aft turret of the *North Carolina* with Lion Roar PE ladders, foot railings on top, and life raft webbing. I made extra life rafts from styrene strip to build stacks and scratchbuilt the 40mm gun director tub omitted in the kit. The shutters on the trainer's and pointer's telescope hoods were made from styrene and cemented open.

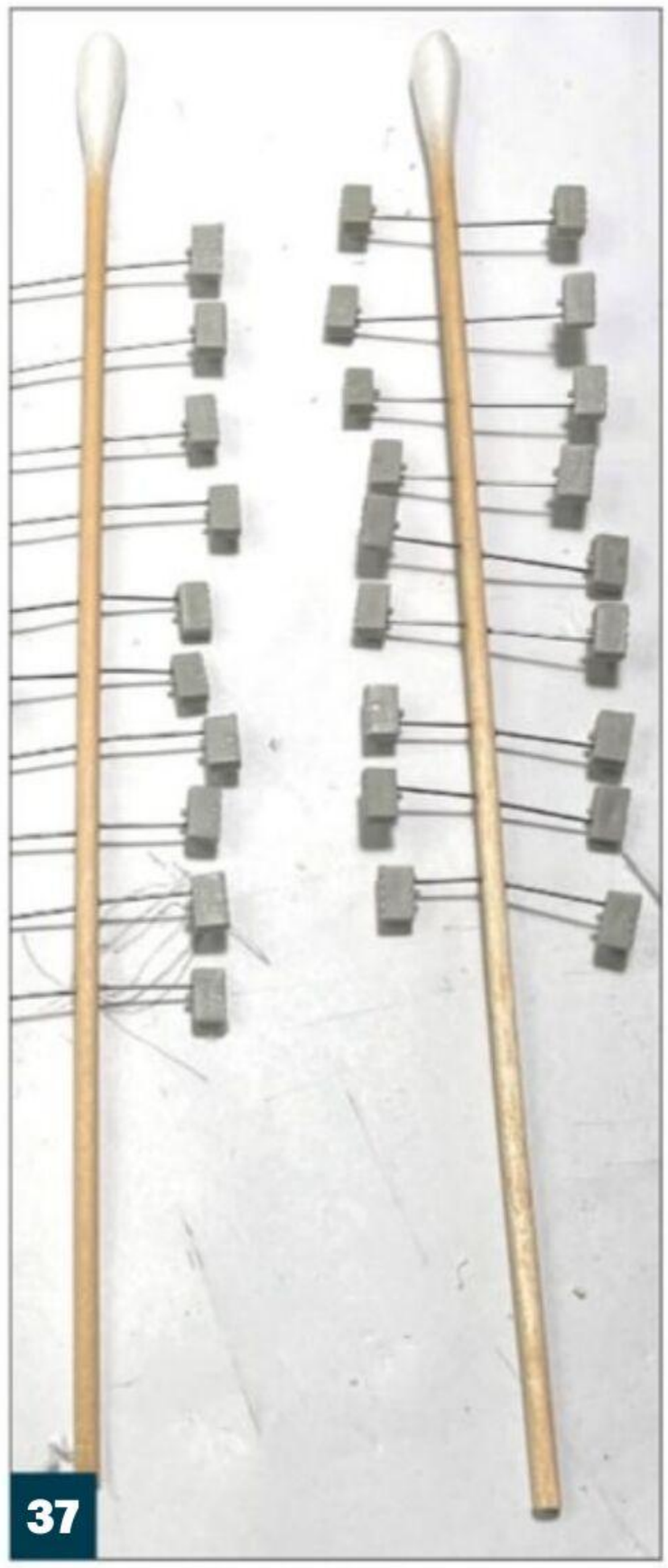


To avoid having to handle the turrets as details were added, I inserted them into a piece of foam board. The brass bar on the roof of the left turret appears to be part of the boom system for launching and recovering paravanes. I made it using brass rod.



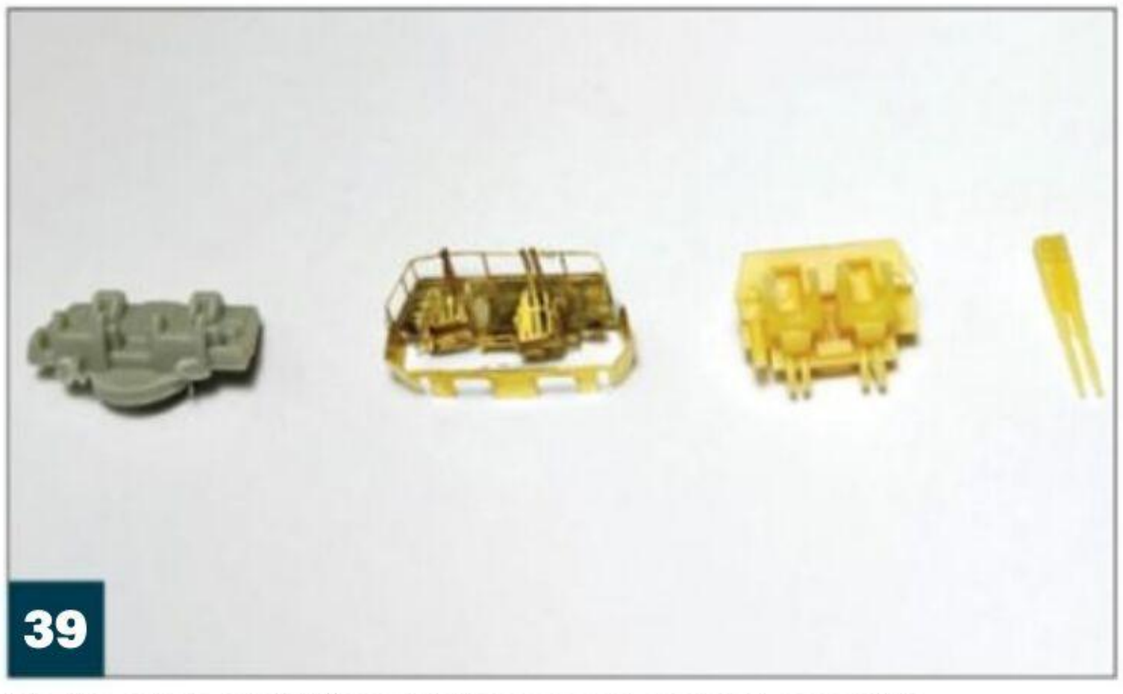
The hoods covering the openings of the chain lockers were opened, the anchor chain was wrapped around the wildcats (capstans), and then the chain led below. The two upper strakes of hull plating have fish plates made of tape to appear as reinforcements covering the plating butt joints.

Some references say the aft turret roof was painted Weather Deck Blue 20-B, several books say it was Ocean Gray 5-O, but *North Carolina* expert Ron Smith says it was unequivocally Light Gray 5-L, and photos substantiate this. So, that's the direction I went.



There are so many 20mm ready service lockers. To paint them, I drilled holes in their undersides and lightly glued .015-inch steel wires that were then inserted into wooden swab handles.

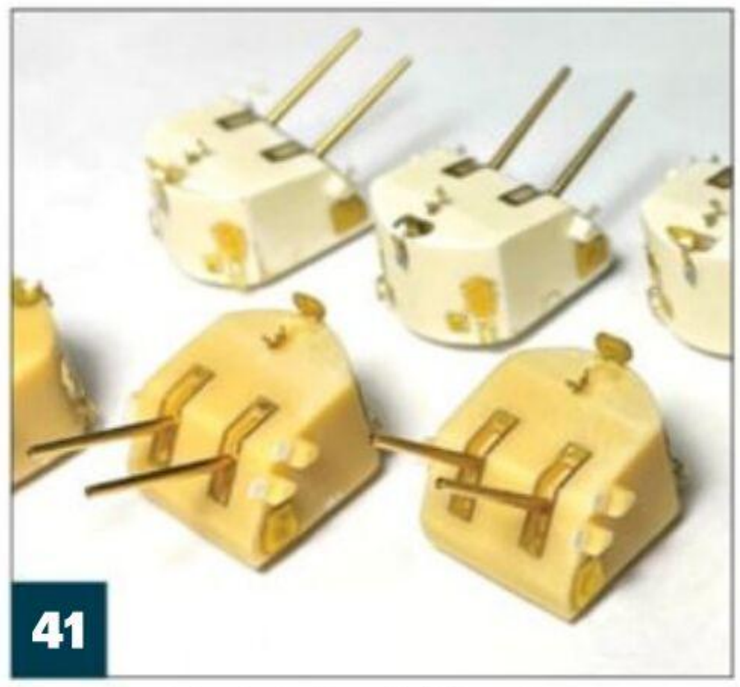
The 20mm Oerlikon guns are PE items from Lion Roar, but that kit has them mounted on tripod stands incorrect for the ship on September 24, 1944. I replaced them with resin conical mounts from L'Arsenal. The guns were tacked to styrene strip for painting.



On the left is a kit 40mm Bofors mount, which bears little resemblance to the real thing. In the center is the overly complex Lion Roar PE version that is fiddly and a lot of work, especially to make 15 for this model. On the right is a resin mount from L'Arsenal that is simpler and carries the same level of detail as the PE part.

40

In the end, I combined the L'Arsenal resin mounts and gun barrels with Lion Roar shields, railings, seats, and handwheels and PE gunsights from GMM. It's nice to have options from the multiple aftermarket sets used. The completed quad 40mm units were almost too delicate to handle, so for detailing I stuck each on the top of a paint bottle using double-sided tape. Each unit comprises 15 parts, so making 15 of them means dealing with 225 parts. I found helpful for my sanity to move on to something less taxing after finishing five.

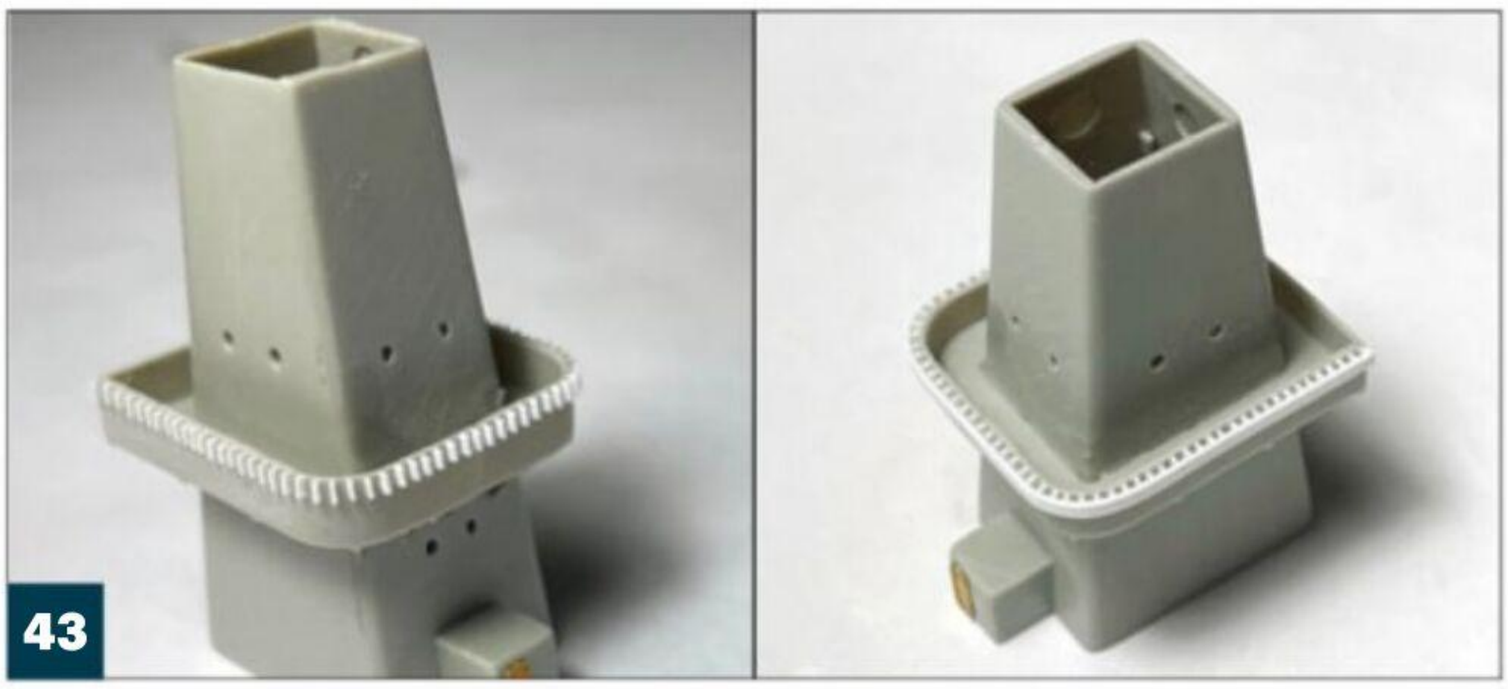


41

I replaced the kit's 5-inch/38-caliber gun houses with resin from L'Arsenal, detailed with PE from other sets, and made pointer's and trainer's telescopes from .010-inch styrene. I posed some top hatches open.

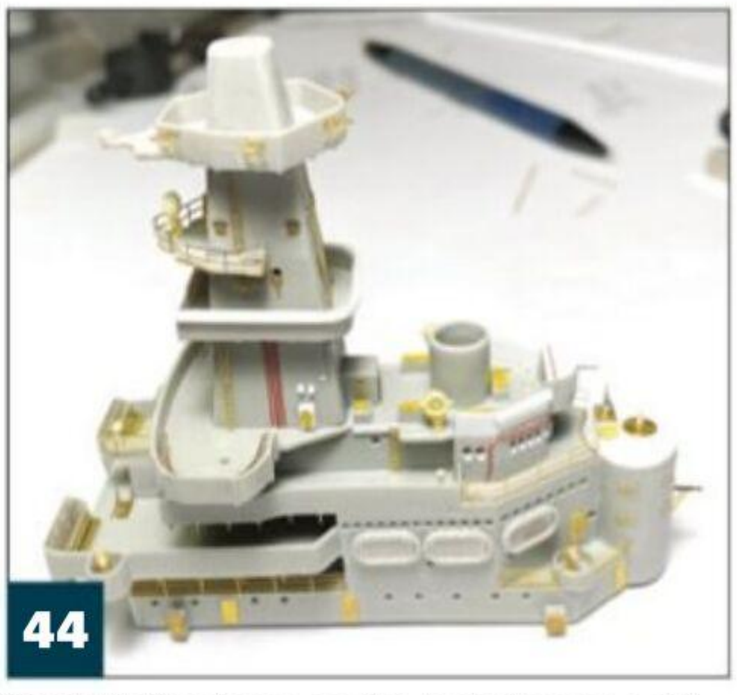
42

The kit anchors were poor, so I replaced them with 3D-printed parts from Model Monkey. The shank and flukes are separate, and I added a brass pin between them as a hinge so the flukes can swivel.



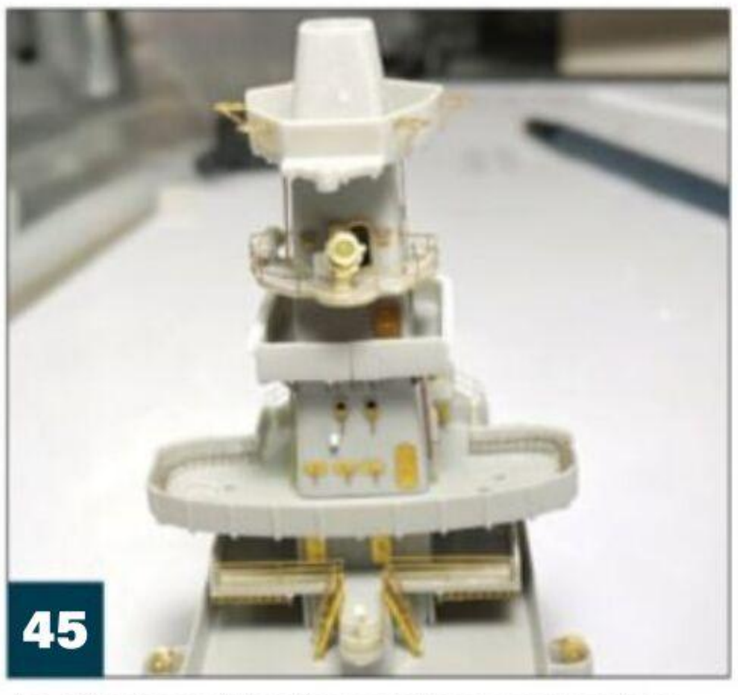
43

The Batt Two position on the tower was the battle post for the executive officer, Cmdr. Joseph Stryker, who persuaded workers at Pearl Harbor to construct this platform during an overhaul in 1943 to give better visibility during combat. Known as Stryker's Bridge, this is a recognition point for the *North Carolina* since its sister ship, USS *Washington*, did not have one. The kit did not provide the wind-deflecting venturi, so I scratchbuilt it by placing .010-inch styrene strip baffles around the upper edges and wrapping them with .010-inch styrene.



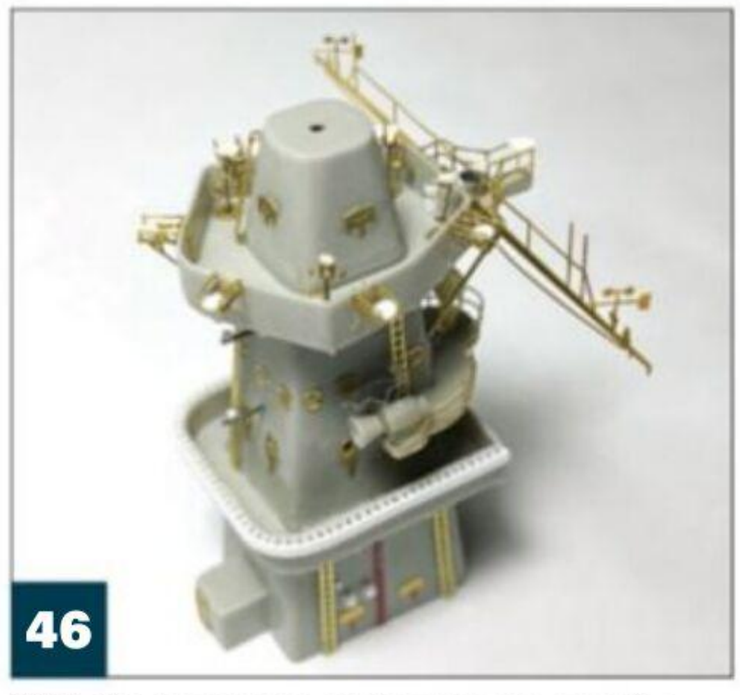
44

The kit's flag bags on the far left were solid on top and open on the bottom, exactly the opposite of what they should be. So, I opened the top, installed signal flag dividers from PE, and curved sheet styrene to fit the bottom.



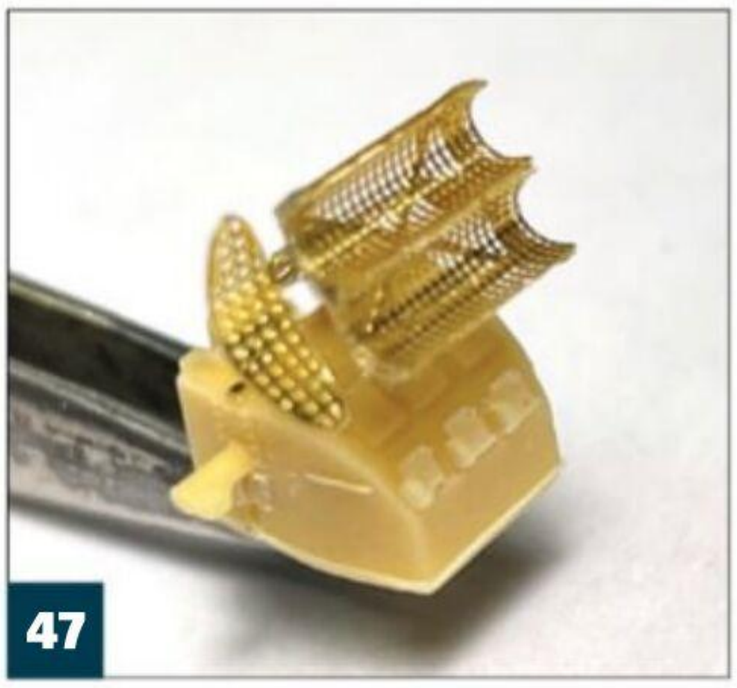
45

An aft view of the forward superstructure includes the PE railings, doors, vertical ladders, armor shutters, flag-bag signal flag dividers, and a resin 24-inch searchlight.



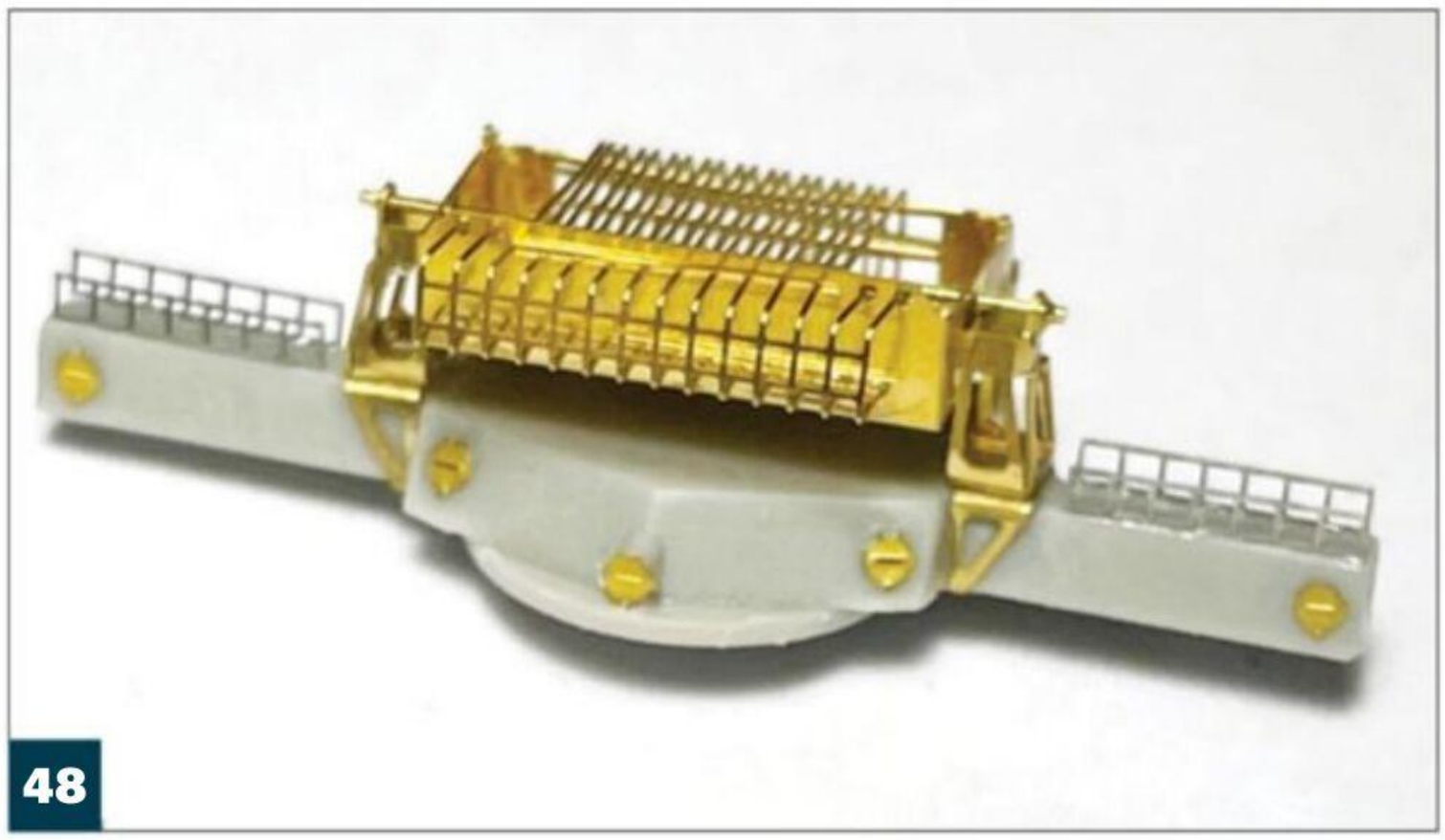
46

With the tower separate, you can see the venturi, ship's whistle, sky lookout chairs, six whip antenna mounts, and the forward yardarm from GMM.



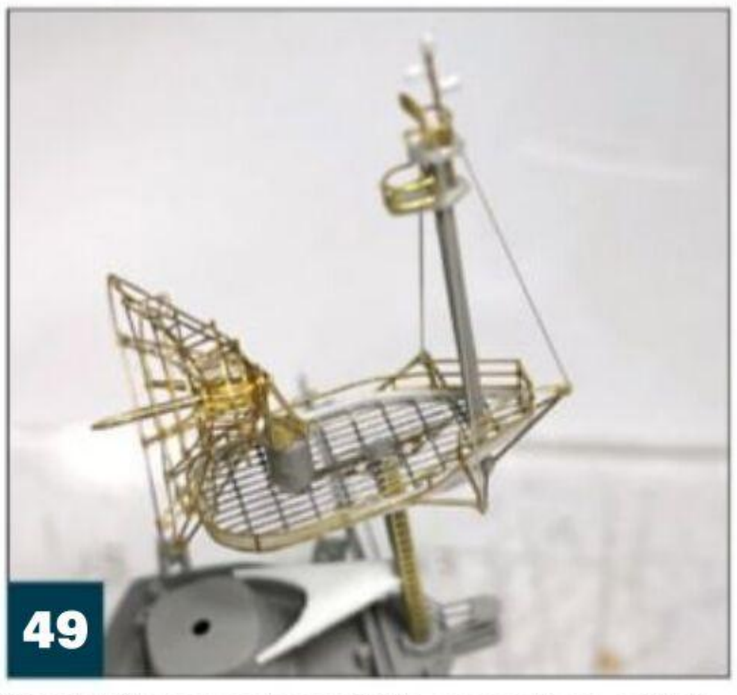
47

One of the *North Carolina*'s four Mk.37 directors for the 5-inch/38 caliber guns, a combination of resin and PE radar parts, all from L'Arsenal.



48

Forming and assembling the two Lion Roar PE Mk.38 directors for the main guns was not fun! Perseverance paid off; it helps to be stubborn and not admit defeat.



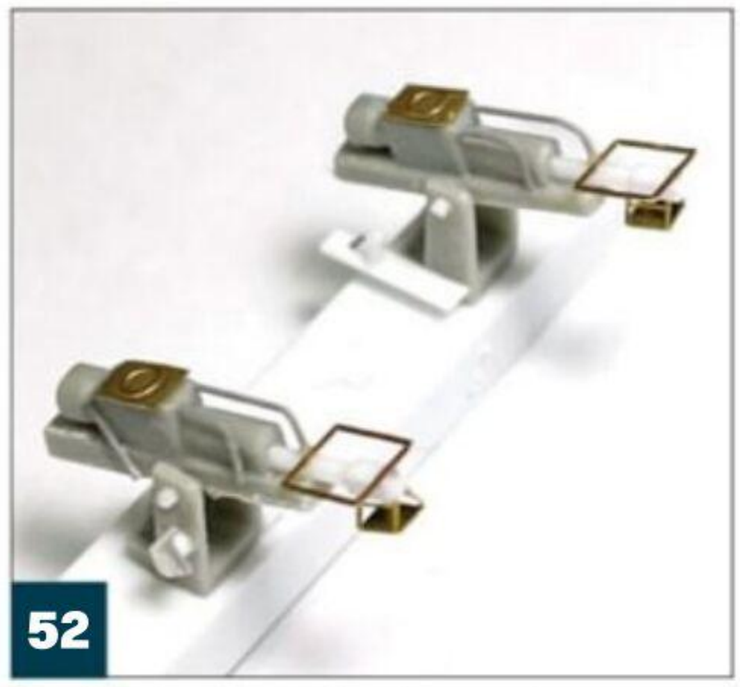
49

The kit foremast was little more than a blob on a stick. I scratchbuilt a replacement using brass rod in several diameters, model railroad PE boxcar screen, styrene strip, and extra bits of PE. The SK-2 radar is from Lion Roar.

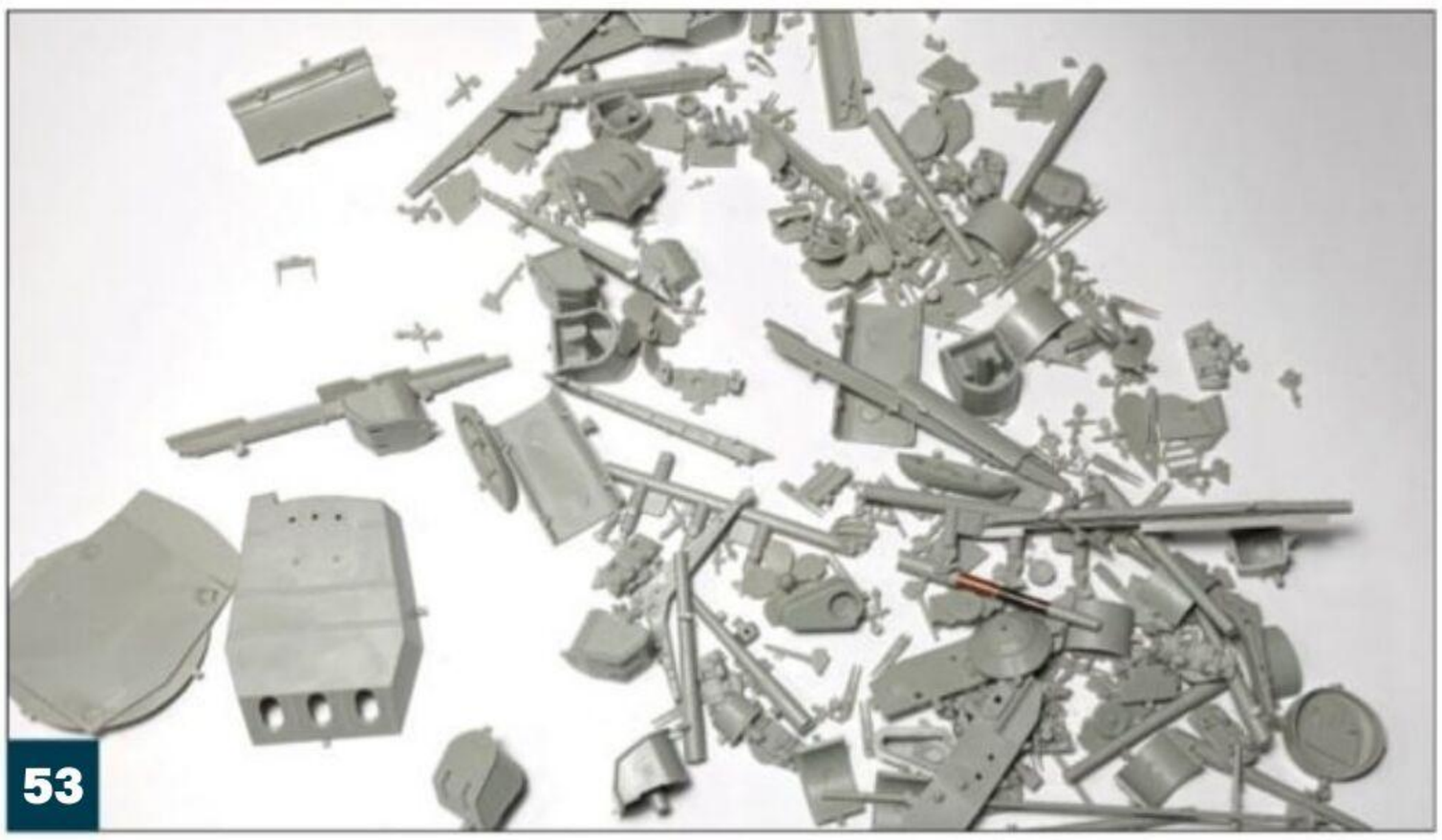
50

There are over forty PE floater net baskets from Lion Roar that need to be folded and curved. In real life, the baskets contained a long line doubled back and forth with cork floats attached as a life-saving device. If the ship sank, these floater nets would float up out of the baskets for survivors to hang onto while awaiting rescue.

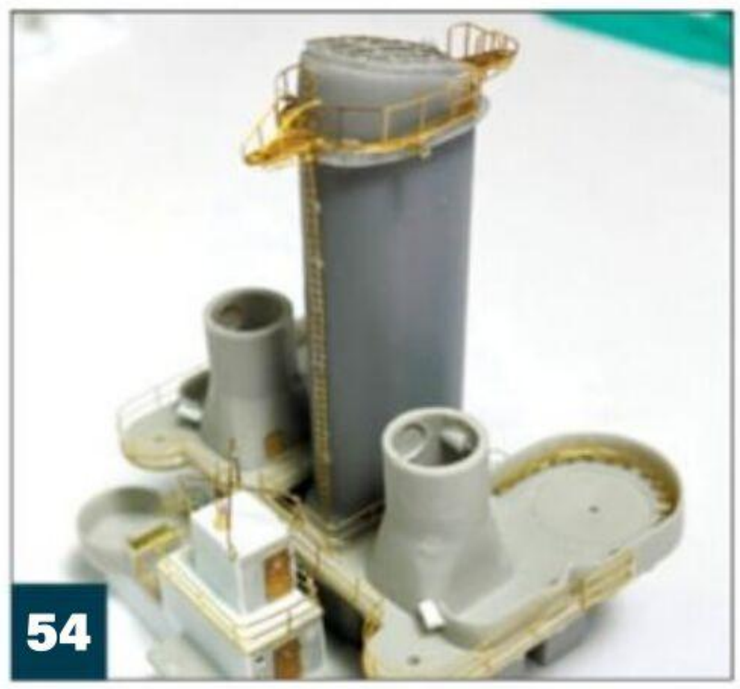
This is the forward stack, a 3D-printed parts from Model Monkey fitted with PE work platforms and ladder. I added the fore-and-aft grating over the top with .006-inch brass wire.



The 5-inch practice loading machines were cut apart and detailed with PE and styrene.

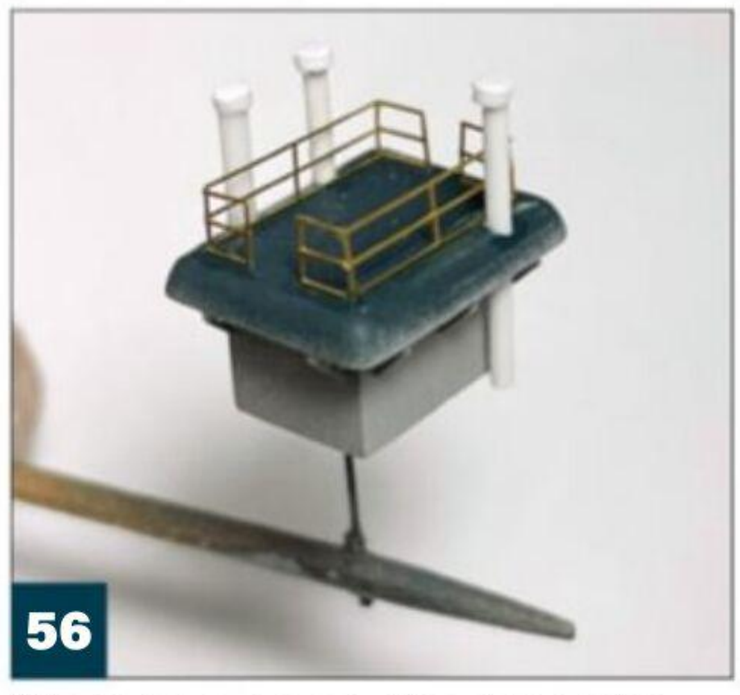


The *Titanic* and *Bismarck* wrecks have debris fields; this is mine, filled with kit parts that have been replaced with aftermarket and scratchbuilt items.



This is the forward stack mounted temporarily on the mid superstructure. The white box appears to be the direction finding (DF) shack with a cruciform antenna made from brass wire.

The PE boat cranes from Lion Roar look fiddly but actually were easy to fold and assemble using a Hold & Fold tool. After adding the arms to kit bases, I detailed them with styrene and .006-inch brass wire cables. The lower line stabilizing the forward hook was added with nylon sewing thread, taking advantage of the natural curve is as it comes off the spool for the realistic sweep.



This massive vent provides air to engine rooms 2 and 3. I detailed it with PE railings and three antenna trunks made from styrene rod. Antenna wires from the rigging overhead will lead down to these trunks.

57

I detailed a pair of L'Arsenal 26-foot motor whale boats with PE decks, railings, thwarts, rudders, and propellers. The sad item on the right is one of the kit's boats that, shortly after this photo was taken, joined the growing debris field.

58

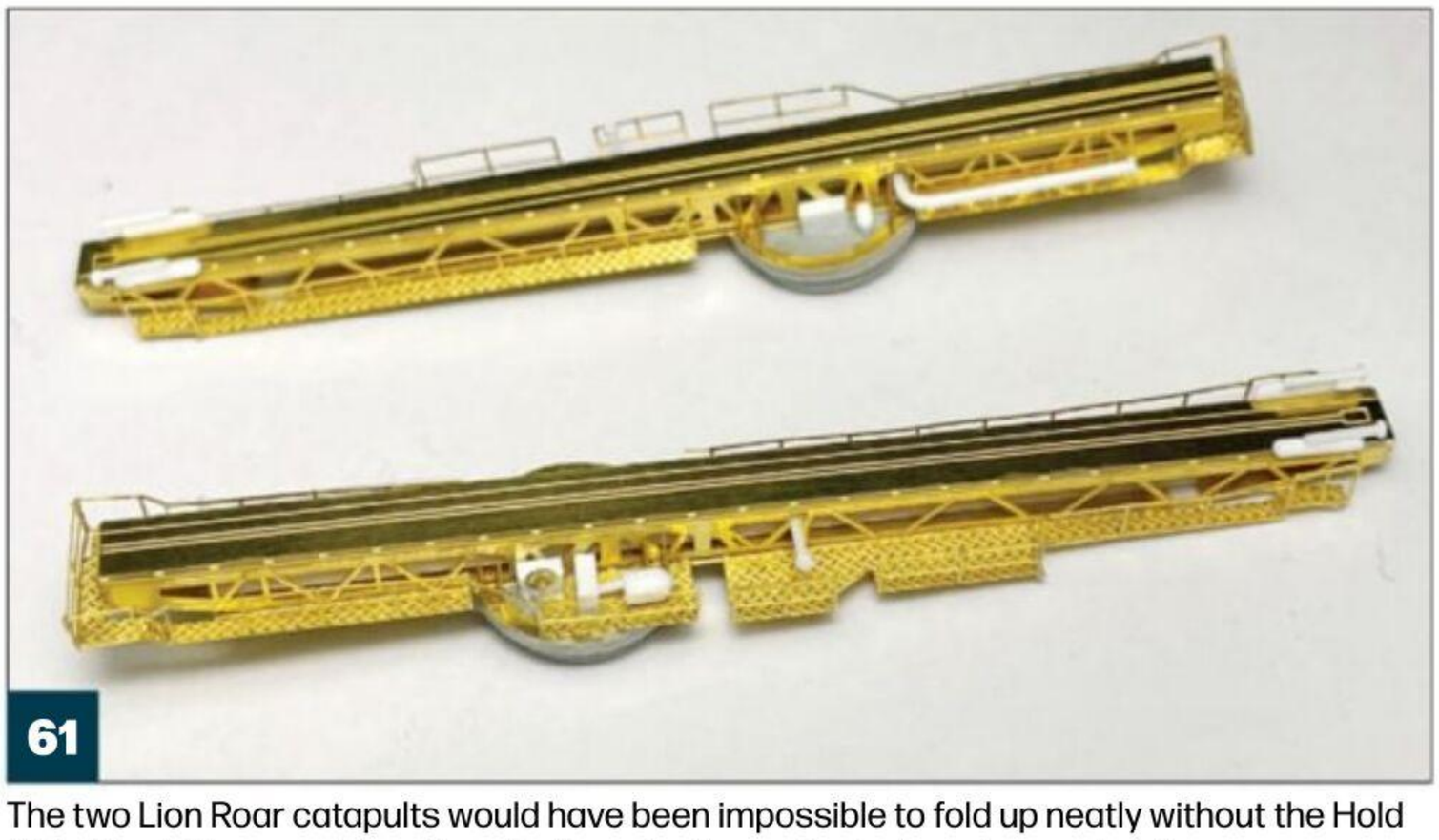
Measure 32/18d camouflage requires a lot of masking, and most of the components and subassemblies must be airbrushed before they're mounted on the model.

59

In keeping with the trend of replacing kit parts, I tossed the too-flexible main mast and made a new one using brass rod and PE railings and screen. The yardarm with antennas came from GMM.

60

The two Vought OS2U Kingfishers are kit items and actually quite splendid. I added main and wingtip float bracing with brass wire, strung antenna lines, and hollowed out the cowls to accept Pratt & Whitney R-985 engines shaped from punched disks. I painted the canopies dark gray, picked out the framing with Sea Blue, and used a 5-0 brush to lightly apply white pastel powder in the center of each canopy frame. I think this gives the illusion of highlights from the sun. The size of the Kingfisher is about 1 inch in wingspan. Photos and references indicate *North Carolina* carried OS2U numbers 7 and 8.

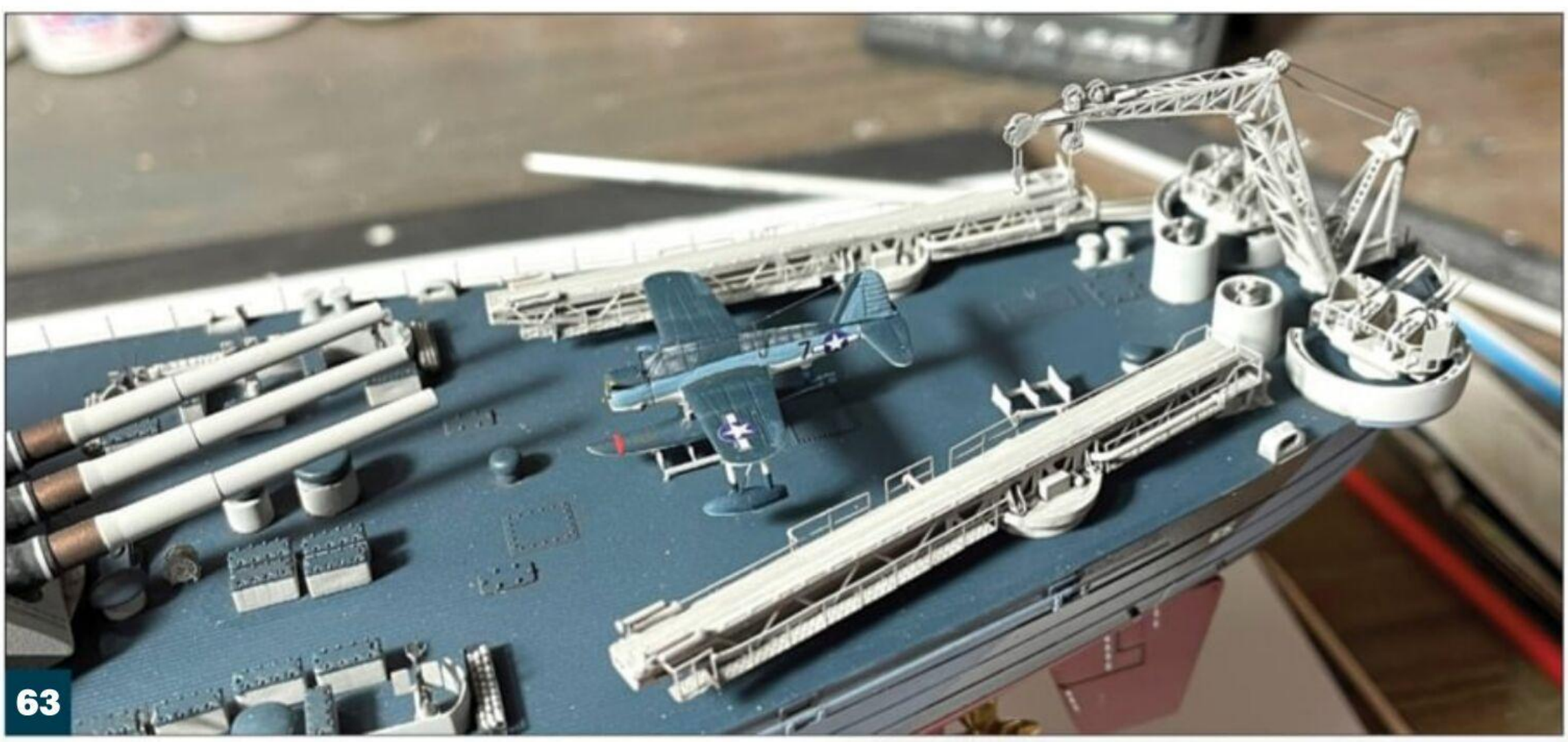


61

The two Lion Roar catapults would have been impossible to fold up neatly without the Hold & Fold tool. They went together nicely and only required a few styrene details.

62

The aircraft handling crane was also from Lion Roar and required some structural details made from styrene at the rear of the base. For the cables, I rigged the crane with .005-inch line from Uschi van der Rosten.



63

I fitted the painted catapult, an OS2U, and crane to the quarterdeck. The floater nets in the baskets are 15 lengths of .015-inch styrene rod painted gray with individual cork floats marked with a draftsman's pencil.

FINAL THOUGHTS

THIS TYPE OF MODEL can take a long time to build, and it's easy to become discouraged. It helps to view each component or module as a model in and of itself as you complete it. That way you feel like you've just finished a model and are making progress on the overall build. The final touch was a brass-like plaque on the base that offers context. This is not intended to be the ultimate model of USS *North Carolina*, but it is an example of my best effort, and it represents a great deal of satisfaction despite the not-up-to-standard quality of the kit. The model consumed 483 hours spread over eight months and has no fewer than 3,552 parts. Dollars to hours, it's fairly inexpensive entertainment. **FSM**

64

After bending the handrails for the two Lion Roar accommodation ladders, I carefully twisted the individual steps to horizontal with needle-nose tweezers. After installation, I rigged and supported the accommodation ladders with Uschi van der Rosten .005-inch black line running up to the ladder crane.

65

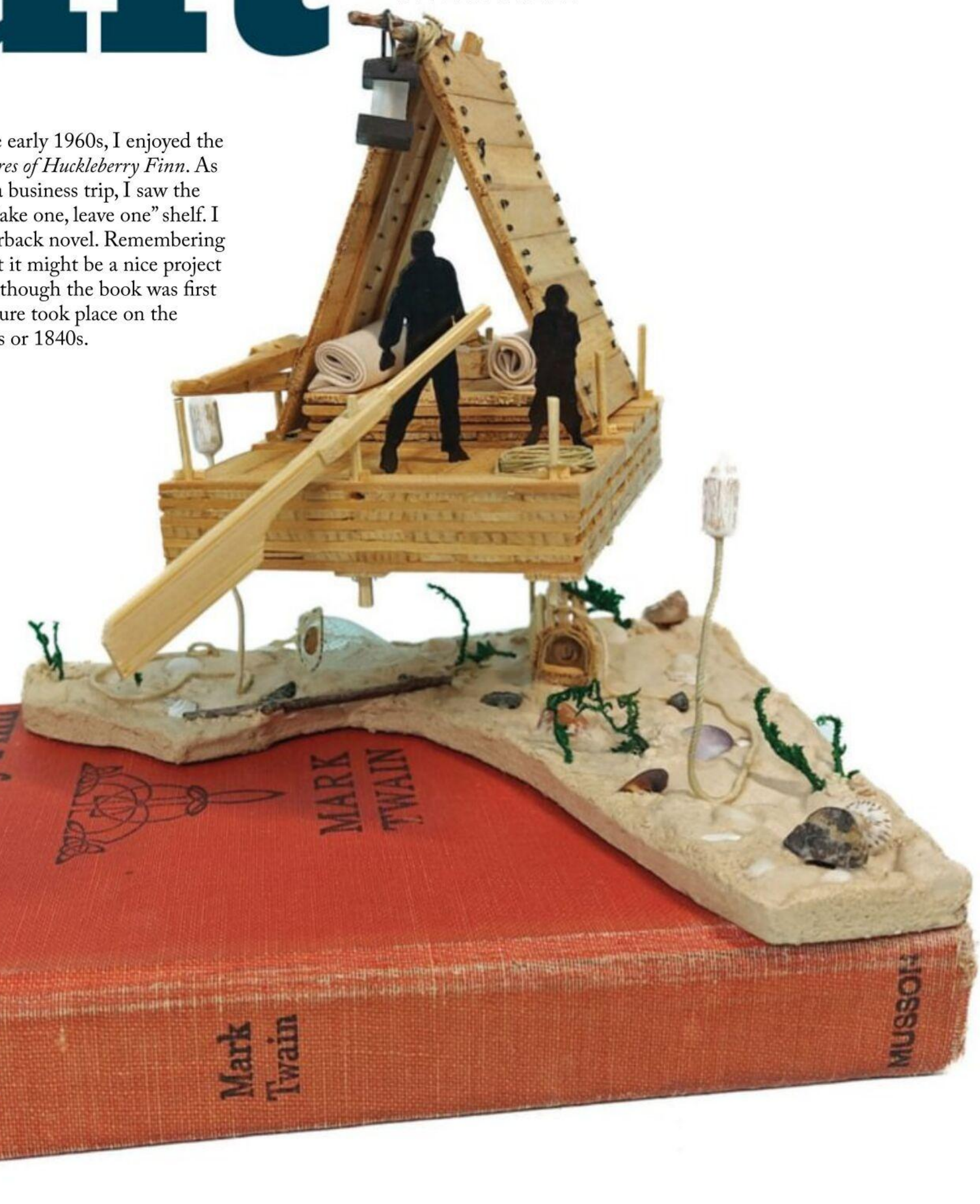
I didn't overlook small details and replaced the kit 40mm gun directors, searchlights, and sky lookout chairs with resin and PE from L'Arsenal. I hollowed out the searchlight and filled the body with clear epoxy.

Build Huck Finn's raft

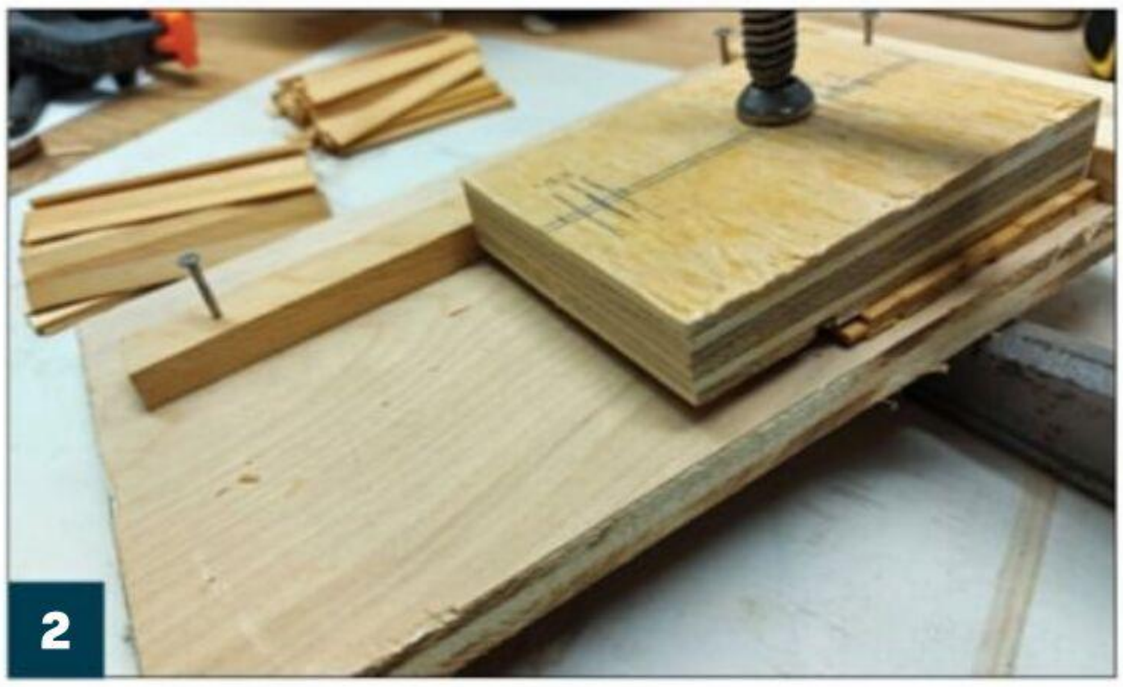
Scratchbuild a Mississippi River plank boat based on Mark Twain's description

BY ALAN O'NEILL

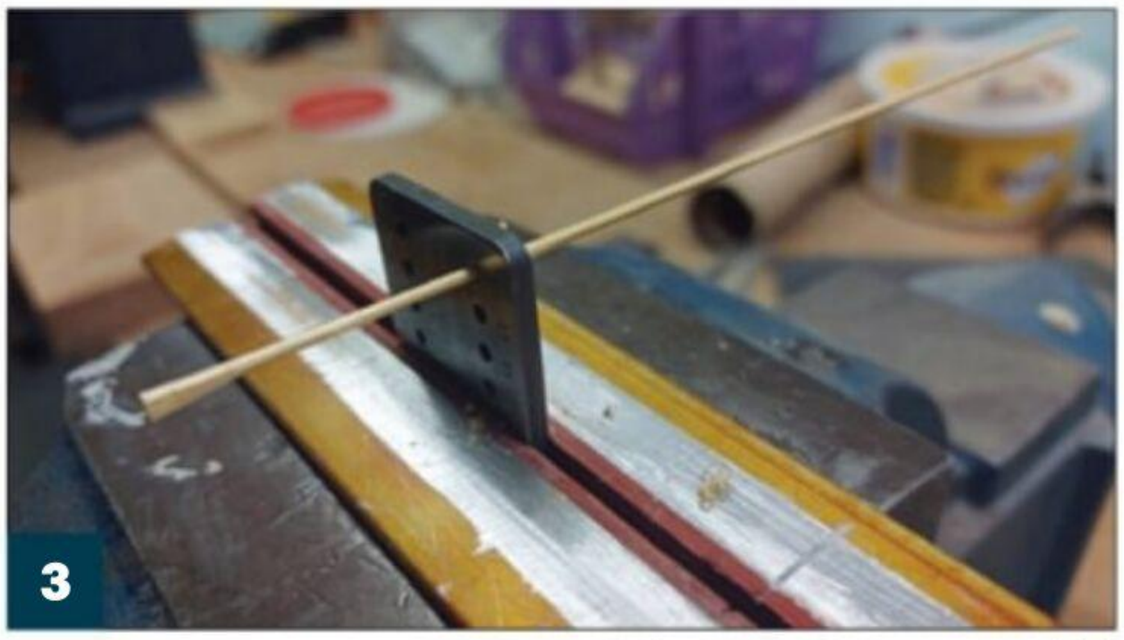
As a youngster in the early 1960s, I enjoyed the movie *The Adventures of Huckleberry Finn*. As an adult, while on a business trip, I saw the book on a hotel's "take one, leave one" shelf. I took the book and left a paperback novel. Remembering Huck and Jim's raft, I thought it might be a nice project to build. Keep in mind that although the book was first published in 1884, the adventure took place on the Mississippi River in the 1830s or 1840s.



Using my construction jig, I built up wood planks running crossways as each layer was added. Yellow wood glue was applied between the planks.



A block of plywood spread the weight across the crib as the first three layers dried. I repeated this process every few layers.



The largest hole on my draw plate is .059-inch, which equates to 2.88 inches in 1/48 scale, so I went with this for the bamboo skewer grub stakes.

I drilled holes for the grub stakes the same diameter as the skewer for a snug fit. A small hammer drove them home.

Research

Two passages in Mark Twain's tale reveal all there is to be discovered about the raft, its construction, and contents:

> "One night we catched a little section of a lumber raft — nice pine planks. It was twelve foot wide and about fifteen or sixteen foot long, and the top stood above water six or seven inches, a solid level floor." (Chapter 4)

> "… so Jim took up some of the top planks of the raft and built a snug wigwam to get under in the blazing weather and rainy, and to keep the things dry. Jim made a floor for the wigwam and raised it a foot or more above the level of the raft, so now the blankets and all the traps was out of the reach of the steamboat waves. Right in the middle of the wigwam we made a layer of dirt about five or six inches deep with a frame around it to hold it to its place; this was to build a fire on in sloppy weather or chilly; the wigwam would keep it from being seen. We made an extra steering oar too, because one of the others might get broke, on a snag or something. We fixed up a short, forked stick to hang the old lantern on; because we must always light the lantern whenever we seen a steamboat coming downstream, to keep from getting run over …" (Chapter 7)

The stack of lumber making the plank raft was called a crib, and it was built with planks cut one or two inches thick and usually twelve feet or sixteen feet long. From sketches found online, I determined the planks to be 18-inches wide. The planks were layered in a crisscross fashion beginning with three short planks on the bottom, with one on each outside edge and one down the centre. This was followed by a full layer of long planks, then a full layer of short planks, and repeated to reach a full two feet tall, finishing with three long planks laid the same way as the first.

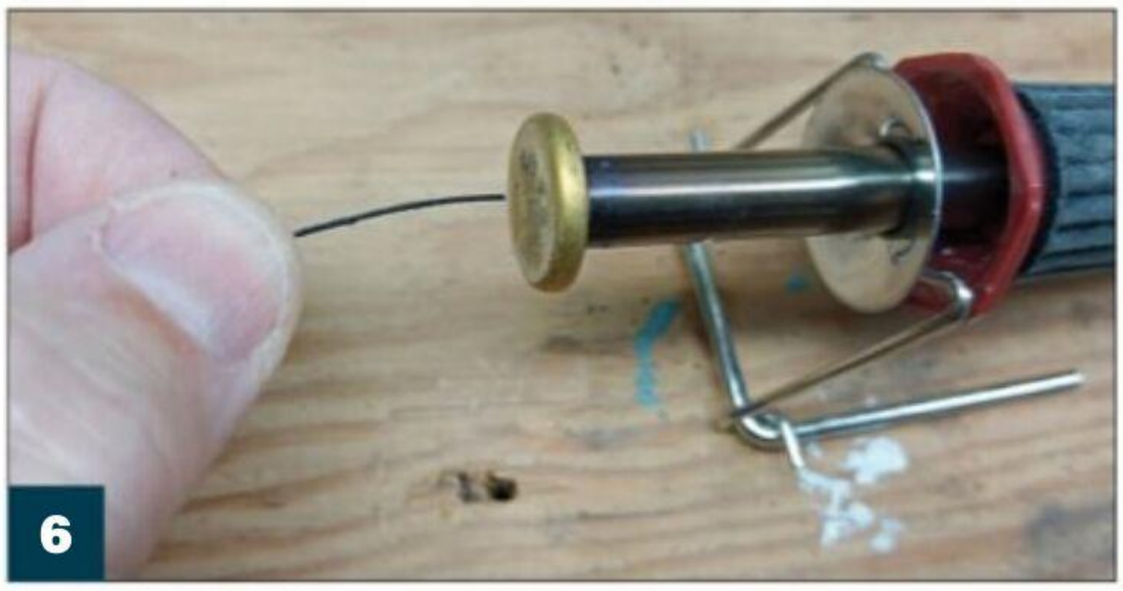
The bottom three planks had three 2-inch holes drilled into them to act as a drilling guide, and once the stack was completed, the holes were extended through the stack for nine grub stakes that bound it together. They were called grub stakes because they were grubbed out of the ground with the root ball attached to act as a stopper to assist in clenching the stack when a wedge was driven through the stake at the top layer to hold the stack of lumber tightly. The exposed portion above the top layer extended at least twelve inches and would serve as oar locks or pivot pegs.

The raft

I used eastern hemlock fir for my 1/48 scale raft planed to 18 scale inches wide (.375-inch). Then I ripped the wood on a table saw to 2 scale inches thick (.042-inch) and cut the planks to 12- and 15-foot lengths, easily divided by 18 inches.

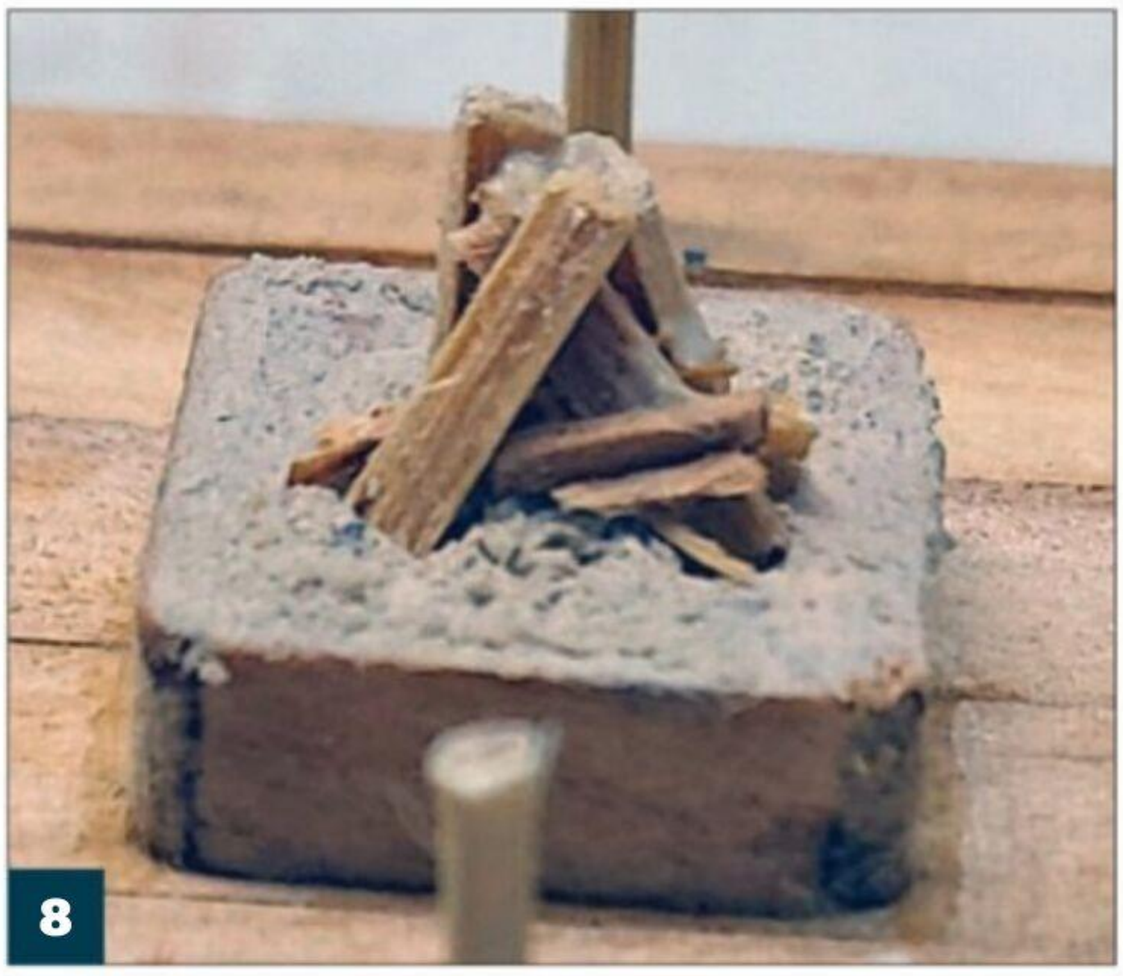
I made a square jig build board from scrap lumber to stack my planks on, starting with three short planks, **1**. After building and securing several layers with yellow wood glue, I clamped them to dry, **2**. When they were ready, I repeated the process as I continued to build the raft. I did not stack the lumber to the full 2-foot thickness because, in the book, Jim removed some layers to build the wigwam and raise the floor under it.

Wanting the wigwam to look expediently built, I glued short planks to a couple of longer ones for each side using a simple butt-join construction.



I used black monofilament fishing line for the nails in the shelter. Holding the end against a soldering iron flared it producing a head.

Bent and protruding nails speak to the effective, if haphazard construction of the lean-to. I'm guessing Huck and Jim were careful not to bump their heads inside.



Modified planks and grout form a safe place for a fire on the wooden raft.

I made grub stakes from bamboo skewers drawn to a scale 2.88-inch diameter instead of 2-inches because, at the build scale, .042-inch seemed too delicate, **3**. I cut off the drawn bamboo beyond the reduced area and left some to simulate the root ball and trimmed the drawn portion so it would be 12-inches above the 2-foot level where the floor likely would have been before Jim removed planks.

After drilling nine holes through the crib, the bamboo grub stakes were installed with a little gentle persuasion from a tack hammer, **4**. I glued tiny wedges to the grub stakes in two pieces with a dab of wood glue to suggest they were driven through it. I did not put holes at the normal height, where they were before Jim pulled them out to remove some layers of planks.

References said the crib short plank side was down under water, but when I was visualizing my placement of the wigwam it made more sense to flip it over, so that's what I did. The top side became the bottom side for my raft as this also provided the mentioned "solid level floor" area Jim and Huck would stand on when steering the raft downstream using the single oar as a rudder.

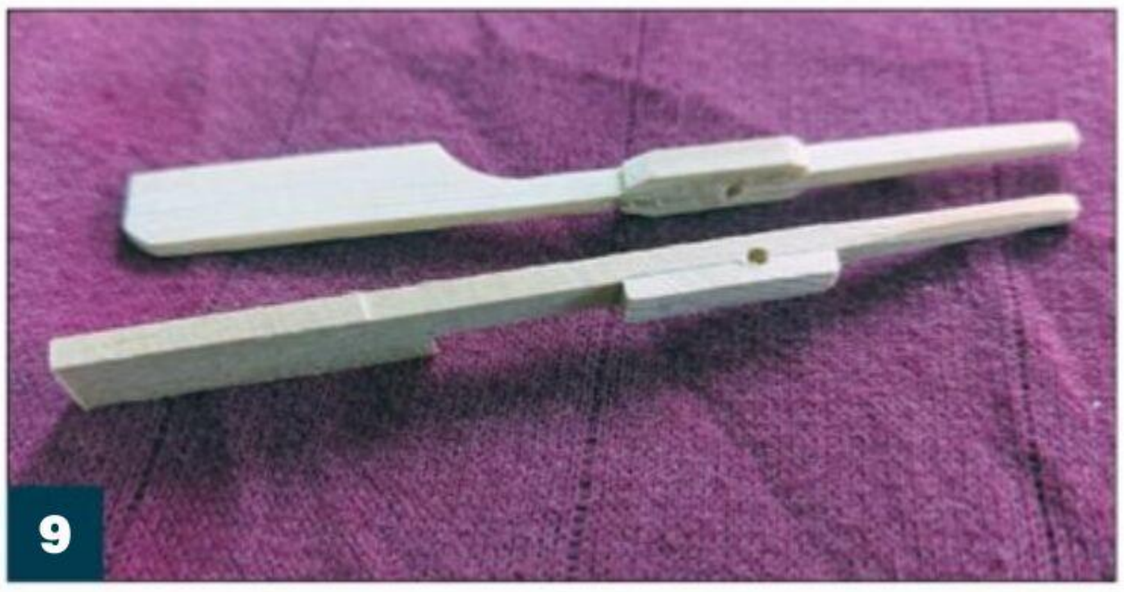
The wigwam

I imagine what Huck refers to as a wigwam was likely a simple A-frame leaning-wall construction and probably not neatly built. I suspect Jim started with full planks for the framework and cut others to lay on top and nailed in place, **5**.

Nails of the 1830s would have had a hand-forged, tapered rectangular shank with a machine stamped irregular round head. At 1/48 scale, the nail heads would be difficult to create or see as the head would be .005-inch across.

Deciding my nails should be round at a much larger scale so they could be noticed, I made them from 30-pound black monofilament fishing line. To form the heads, I melted one end of each nail against a soldering iron, **6**. I marked the nail head locations with a pencil, drilled .028-inch holes, and inserted my nails through these holes. When installed, I let them protrude beyond the far side as any nail too long for the job might. I even bent one nail over and missed a few of the inner planks as I have done many times myself, **7**. Jim would repeat this process to build the other half with the second frame set inwards to nest with the first when the tops were married. The planks were likely not ship lapped, but simple butt joints with one edge nested against the other edge. This is conjecture, as Twain does not go into detail.

The bottoms of the A-frames sit against grub stakes, keeping them locked in place. The remainder of the planks removed by Jim were cut to raise the floor level a scale foot or more in the wigwam. With 2-inch planks this would require a minimum of six layers. I chose not to go quite as high as Twain imagined and fitted only five layers. Although the A-frame is quite tall, the higher the floor,



Fortunately, bamboo drink stirrers turned out to be the right shape for the oars. I bolstered the area around the pivot hole with wood removed from the handle.

Assuming the crew's extra oar was made using a pine plank from the raft, I roughly cut one from a piece of fir, added the pivot, and stored it and the other alongside the wigwam.

A fire needs fuel, so I piled bits of wood split from from planks as well as discarded twigs from my yard inside the shelter.

the narrower the space between them, and the fire box had yet to be placed in the center. With one or two people inside, the height had to be appreciable to allow the smoke to rise well above their heads and blow away.

Room for a fire

For the firebox, I split an 18-inch-wide plank in 9-inch halves and laminated them together to build a short, thick-walled frame. I left steps at the corners for the joints, assembled it and glued it to the deck. Then I filled it with sand-colored grout mixed with a few drops of water. Shavings and scraps represent stacked wood and kindling ready for the next fire, **8**.

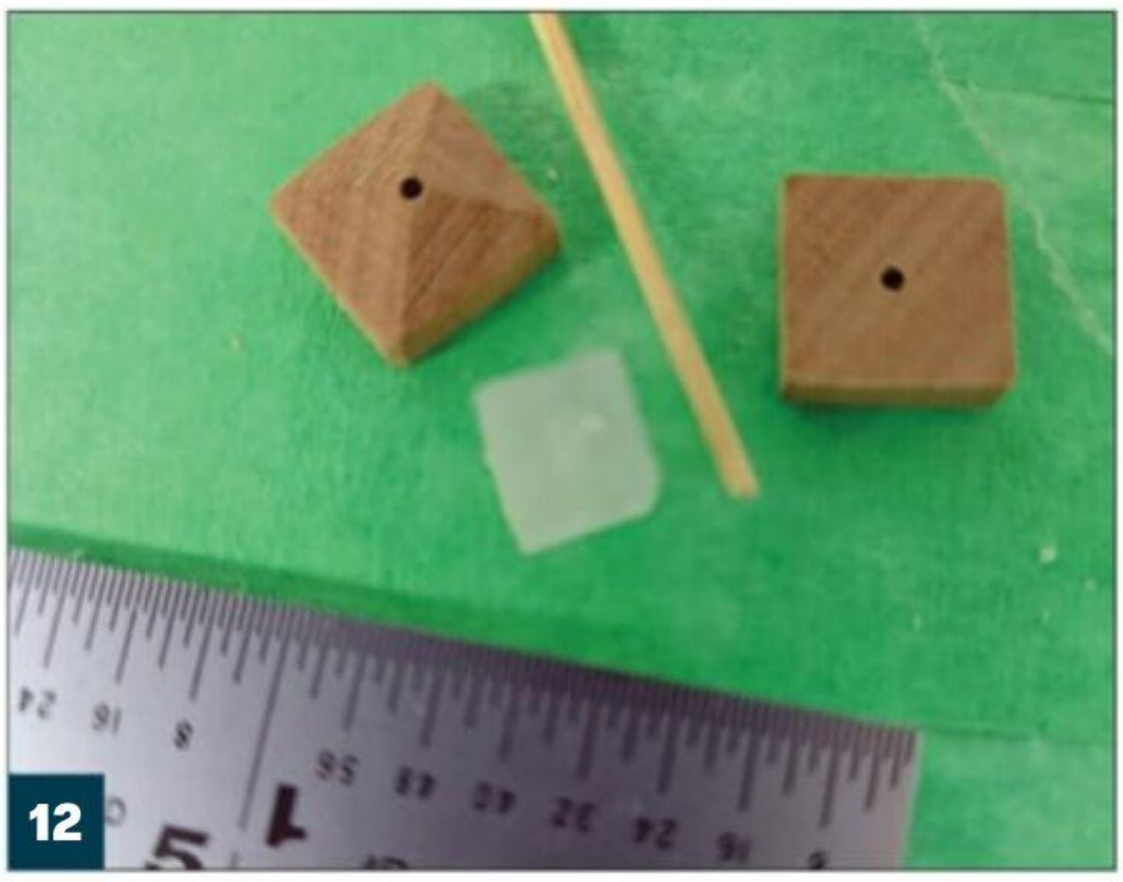
The oars

The book offers no description of the oars, only that grub stakes were used as pivots. Dimensionally, they needed to be long enough to reach a man's hands and enter the water at the same time.

I made two oars using bamboo skewers that were already 90% correct. I cut off the pointed end, sanded down the thickness, drilled a hole for the grub stake, and beefed up each side at the hole, **9**. To store the oar not being used, I placed it alongside the A-frame where it was trapped by grub stakes. The spare oar made by Jim and Huck was likely shaped from a plank, so I crudely cut one to shape, bolstered the side of the pivot hole with extra material, and stored it with the other, **10**.

The lantern

The lantern was said to be hung from a short, forked branch. I gathered a few fallen twigs from my linden tree, eyeballed them against raft, and trimmed the most promising one to fill the bill.

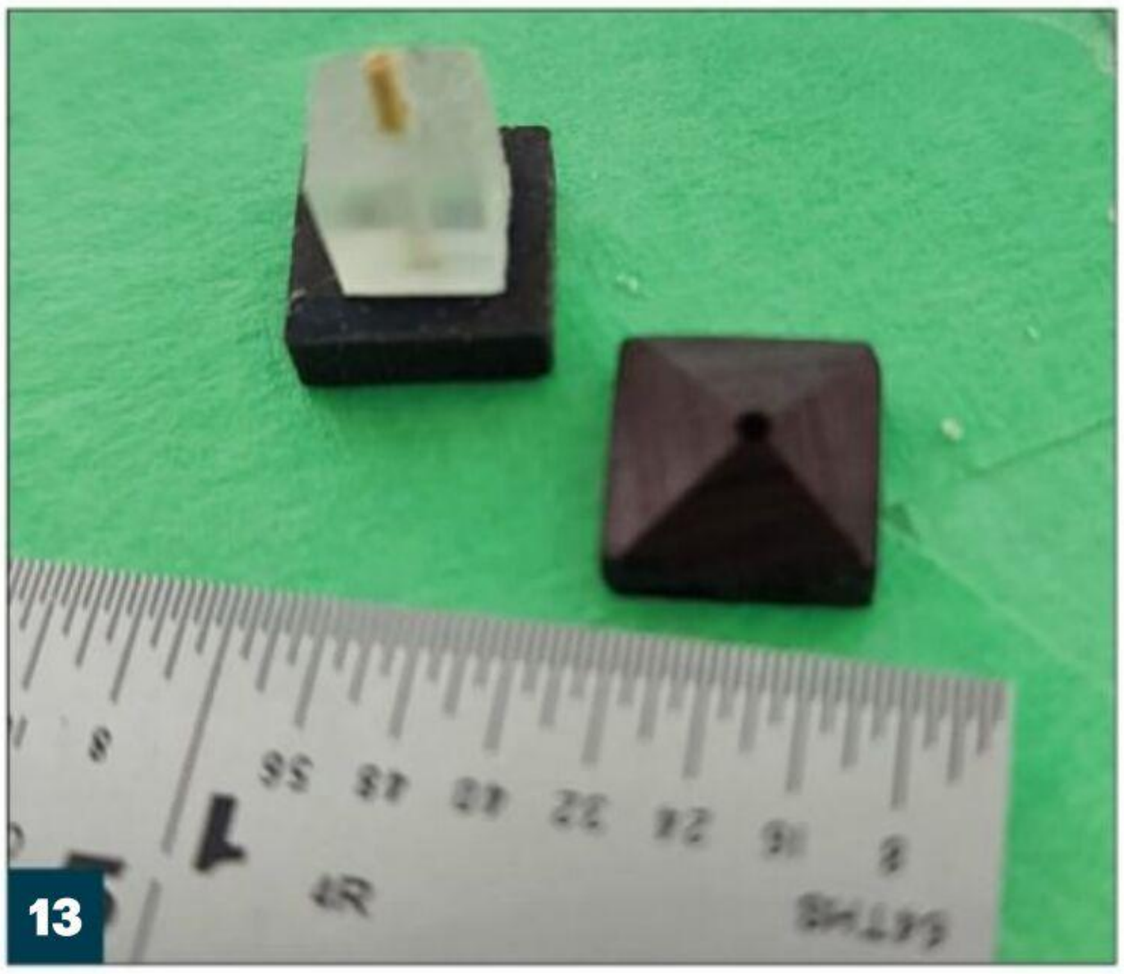


The lantern's glass was cut from a pane of Plexiglas and I slightly sanded the sides to an opaque surface finish like frosted glass.

Assuming the branch would be laid horizontally along the peak of the A-frame, I lashed it down with .02-inch (about 1-inch in scale) beige cotton thread that resembled hemp.

I used a clove hitch and two half hitches to start the lashing, finished with multiple, simple overhand knots and a dab of glue and left the ends dangling as any landlubber might.

The fork faced aft so Jim might reach it to hang the lantern while standing on the raised platform. Worst case, Huck might need to get on Jim's shoulders to get it up there. Later, I stacked



13

The dowel holding the lantern together is cut flush at the bottom, but I left it short at to top to look like a vent hole.

14

With the lantern hung on the raft the crew's light was done. Looking into the lantern glass, the dowel appears to be an unlit candle inside.

15

Borrowing an old-school technique, I left cotton in a cup of tea overnight to make it look like raw, homespun cloth.

16

After cutting the dyed cotton into two blankets, I rolled them and glued them inside the shelter as stored bedding.

pieces split from cut planks and broken branches from discarded twigs against the inside walls of the wigwam as firewood, **11**.

To make a simple coach-style lantern that would have housed a candle, I shaped Castello boxwood for the top and bottom and cut a cube of Plexiglas for the glass, **12**. I blackened the wood with a permanent marker and drilled through the center of all three parts with a No. 57 bit to accept a bamboo dowel secured with wood glue, **13**. I formed the lantern's handle with thin wire and hung it from the branch, **14**.

Equipment and bedding

I cut a pair of blankets from thin white cotton cloth and dyed them overnight in a cup of strong tea, **15**. Each was rolled with a dab of glue to keep their shape. More glue kept them in place on the wigwam's floor, **16**.

Unspecified traps are mentioned in the book, so I made one for crayfish and one for river shrimp.

For the crayfish trap, I glued short strips of wood lath to ends curved around forms found in my scrap box and steamed in a reclaimed rice cooker. I sealed the ends with tulle netting held in place with another loop of wood. A wooden ring — half of a bull's-eye block sanded thin — in one end serves as the trap entrance.

I made the cone-shaped shrimp net from tulle, sewing in the circular top with white thread while the pointed end was held down with a fishing sinker. A ½-inch circle of .020-inch copper wire sewed into the large end maintained the shape and the other half of the bull's-eye block became the opening.

Both traps were said to be stored inside the wigwam, but it was getting crowded. Instead, I posed them with a rope and buoy after the base was built.

The riverbed

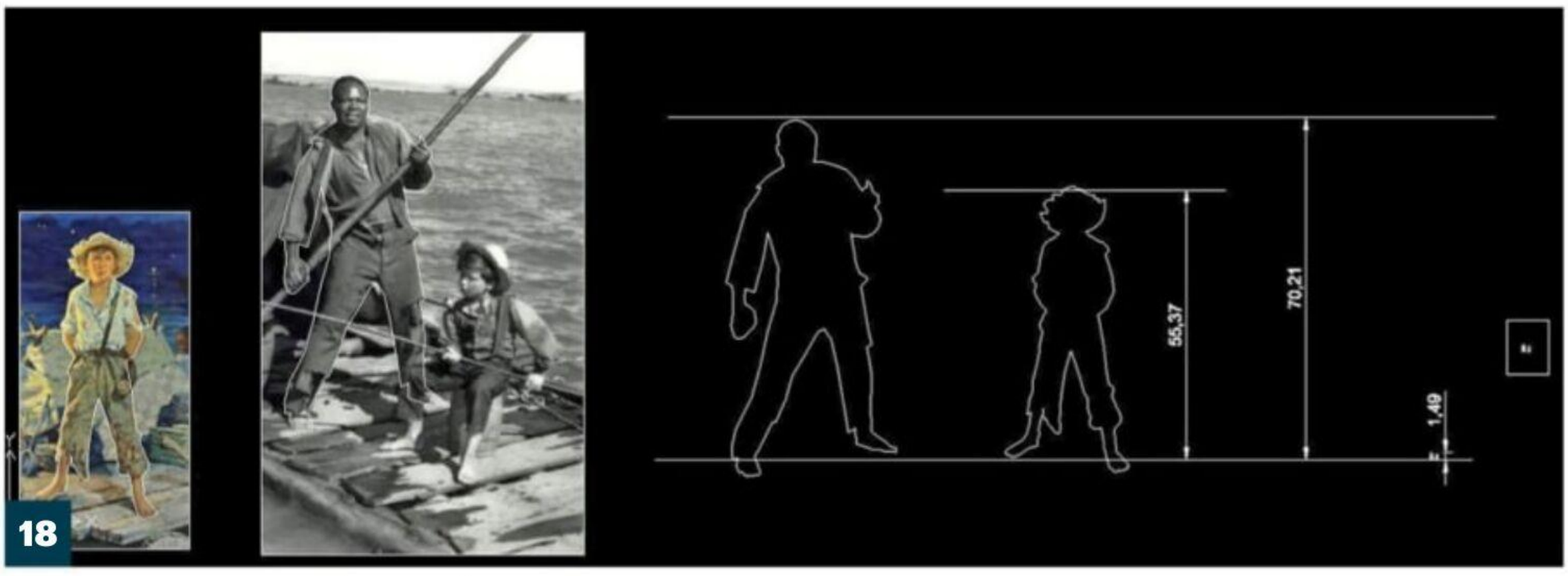
On cardboard from a file folder, I marked a template to avoid covering the words on the cover of an old copy of *Huckleberry Finn* I planned to feature as part of the base. It was cut to a wavy shape and sand-colored grout applied.

I attached the traps and lanyards (.02-inch three-strand thread) to the riverbed with Weld Bond. A section of the thread stiffened with 0.02-inch diameter copper wire so it could stand vertically joined the trap and a buoy carved from wood, painted white, and distressed with sandpaper. Each rope was untwisted partway and then rewound around the wire with glue dabbed and rubbed along its length to keep it in place. The other end was secured to the trap with a simulated eye splice.

Shells, stone fragments, a twig representing a log, and

17

Painting the side of the board with the same sand-colored grout ties the entire base together.



18

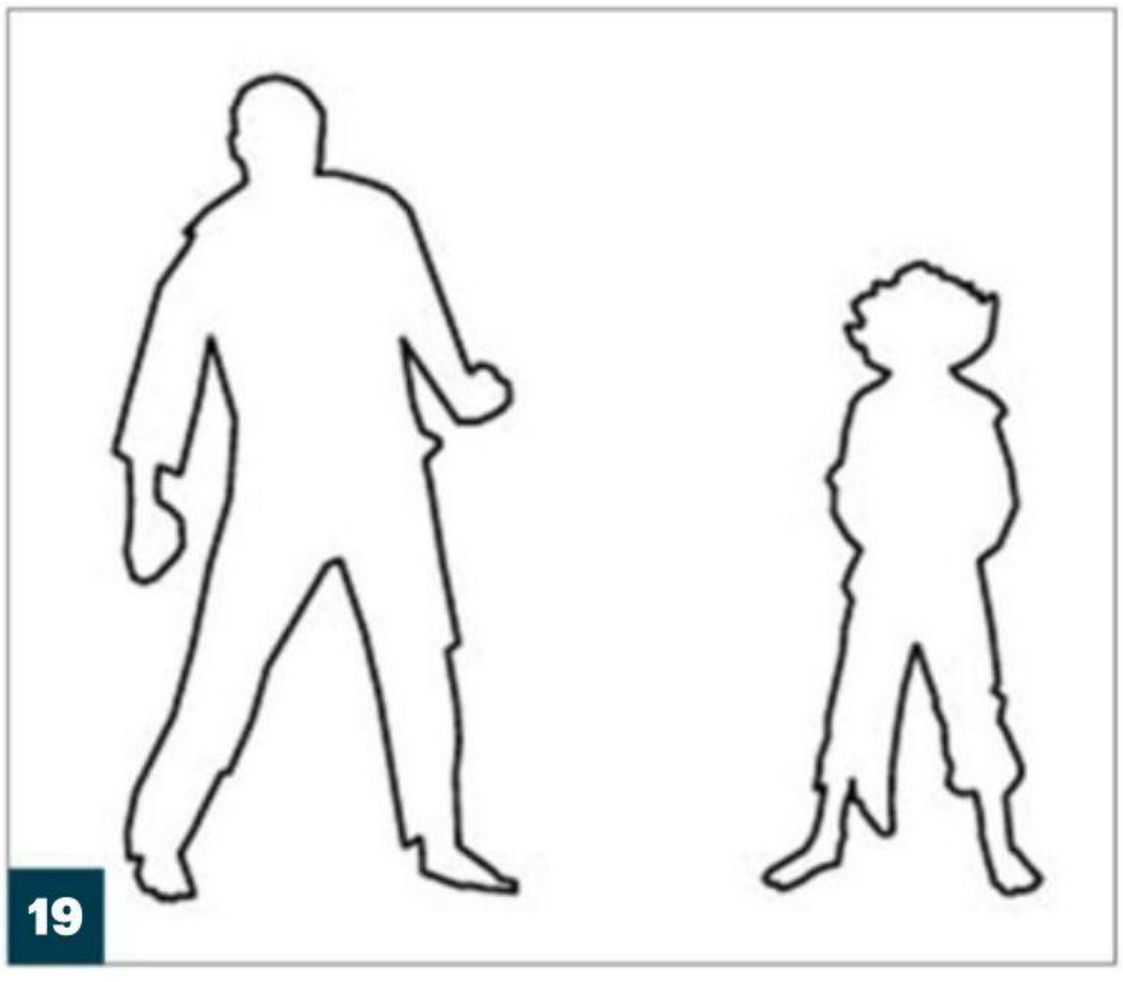
A computer drafting program helped outline and scale images of Huck and Jim I found online.

vegetation — floral arrangement sheet moss — gave it character. A coat of acrylic matte medium sealed the base and produced a wet sheen. Attaching the thin cardboard to 3⁄16-inch MDF stiffened the riverbed for handling, **17**.

Huck and Jim

The model was only missing its two main characters. Deciding silhouettes would be appropriate for scale and context, I found a couple of images online, imported them into a drafting program, created a new layer, and traced the outlines of Huck and Jim. The tracings were copied to a new area of the same layer and measured. I then scaled them to match the raft — a scale 6 feet or 1½ inches for Jim and 4 feet 7 inches (1⅛ inches) for Huck, arbitrary dimensions of my choosing, **18**. After printing them on paper and testing them on the model, I made a couple of adjustments. Jim's raised hand needed to be lowered to reach the oar, so I stretched the arm and hand down on the computer and manipulated the sketch to look better, and the feet had to be stretched to be at the same elevation, **19**.

Copper plate seemed appropriate for the figures. I took a short length of 1-inch household copper tube with a 1mm wall, cut it open with a hacksaw, pried it open with pliers, and flattened it on

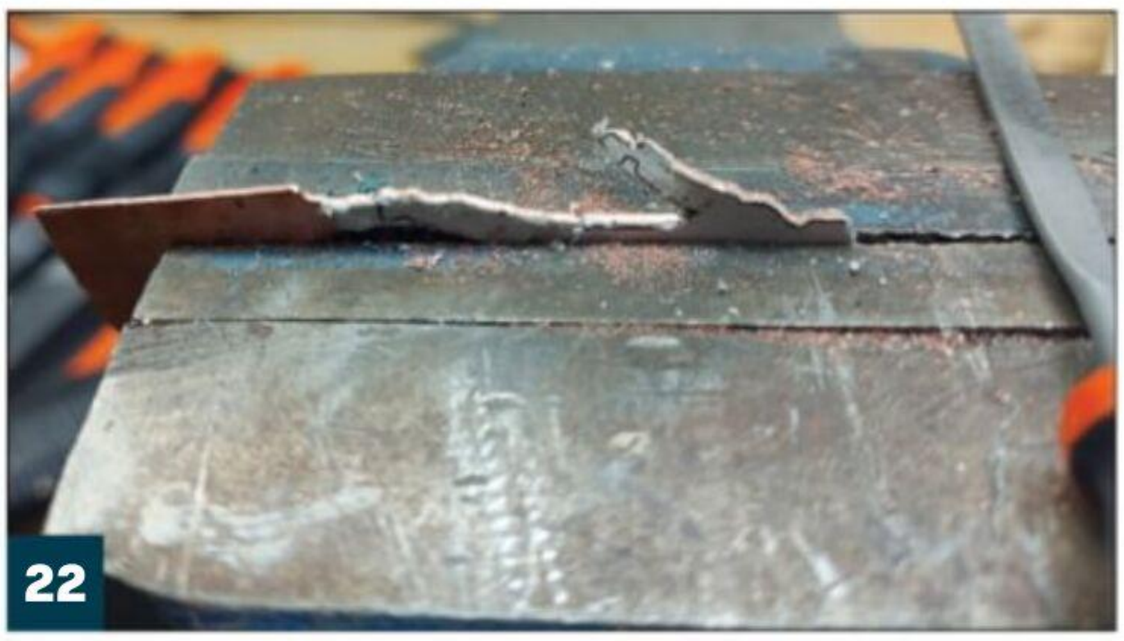


19

Both figures required multiple fitting and adjustments to suit the poses required for the model.

Rather than use cardboard for the silhouettes, I flattened copper tubing. This required more work but gives the figures substance.

I used tin snips and cutting bits in a rotary tool to roughly shape the copper around the outlines.



Jeweller's files refined the cuts to form the final shape of the raft's adventurous crew.

A permanent marker produced the final look of the silhouettes before I tapped them into place on the deck.

an anvil with a hammer, **20**. The paper figures were stuck to the copper with rubber cement, and I removed excess with tin snips and cutting discs in a rotary tool, **21**. (On my first attempt with the rotary tool, I amputated Jim's leg! A steady hand and small bites did the trick.) Both images were finished off with jeweller's files and a wire brush chucked in a rotary tool, **22**. I left dagger-like protrusions on the feet for mounting to the deck.

After coloring the silhouettes with a permanent marker, I attached them to the deck with a few light raps with a tack hammer, **23**.

As a final addition, I added a length of coiled rope secured to one grub stake with an eye splice so the raft could be secured when they went ashore.

I sealed all the wood, except the raised platform in the wigwam, with a premium liquid sanding wood sealer brushed on sparingly. The raised platform should darken over time adding contrast.

Mounting

I wanted the raft hovering above the book to suggest it is floating in the water above the riverbed. I soldered a sturdy length of 12-gauge copper wire to a copper base plate that would fit under the book base. The other end was glued into a hole drilled into the raft, **24**.

With that, my raft was ready for the mighty Mississippi and whatever adventures await Huck and Jim. **FSM**

To float the raft over the book cover riverbed, I made a stand from copper plate and rod. The plate slips under the book.

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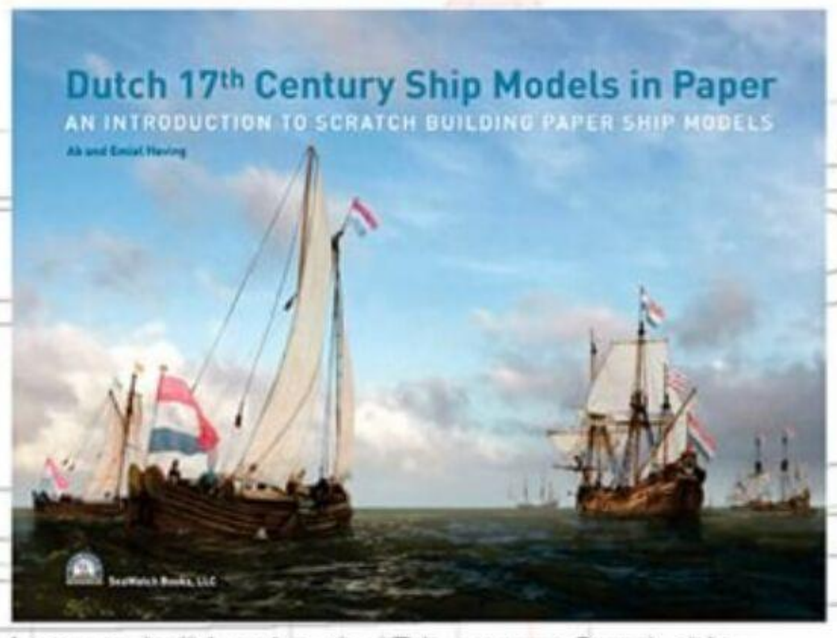

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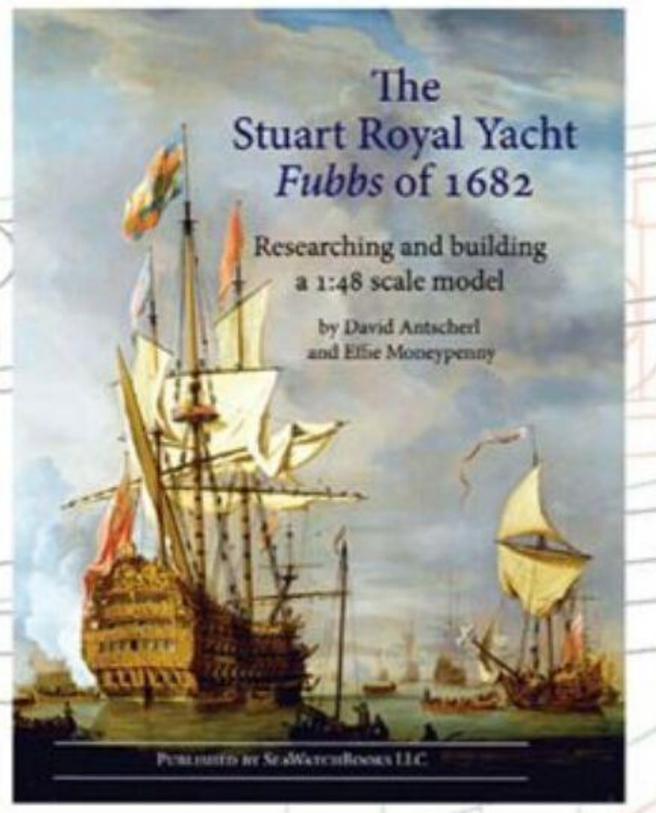

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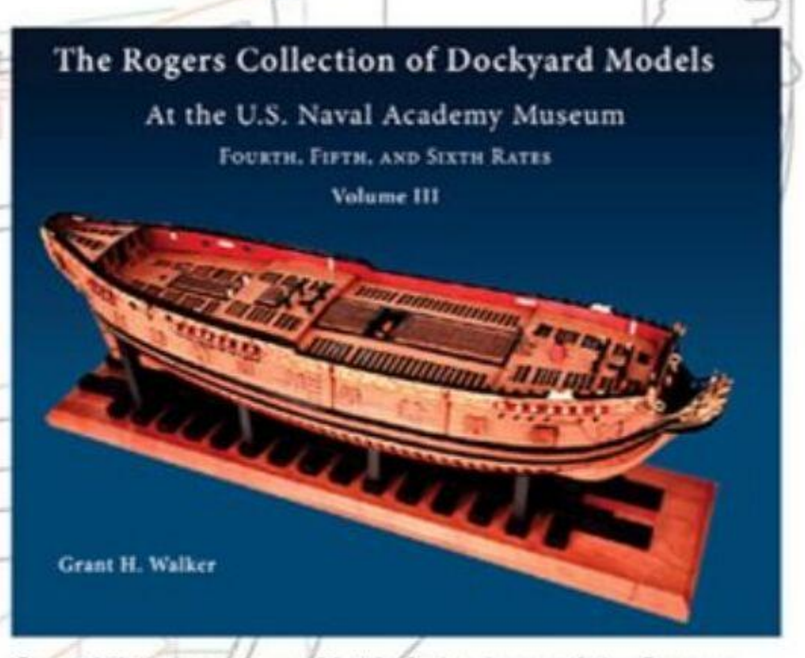

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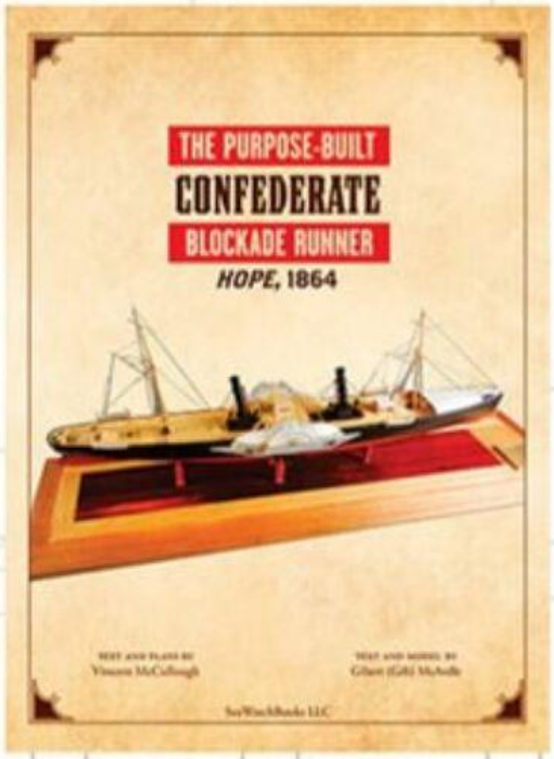

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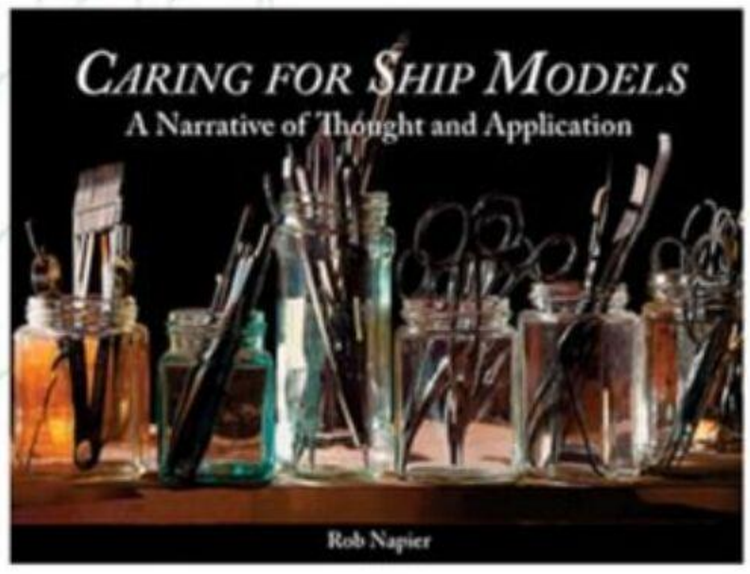

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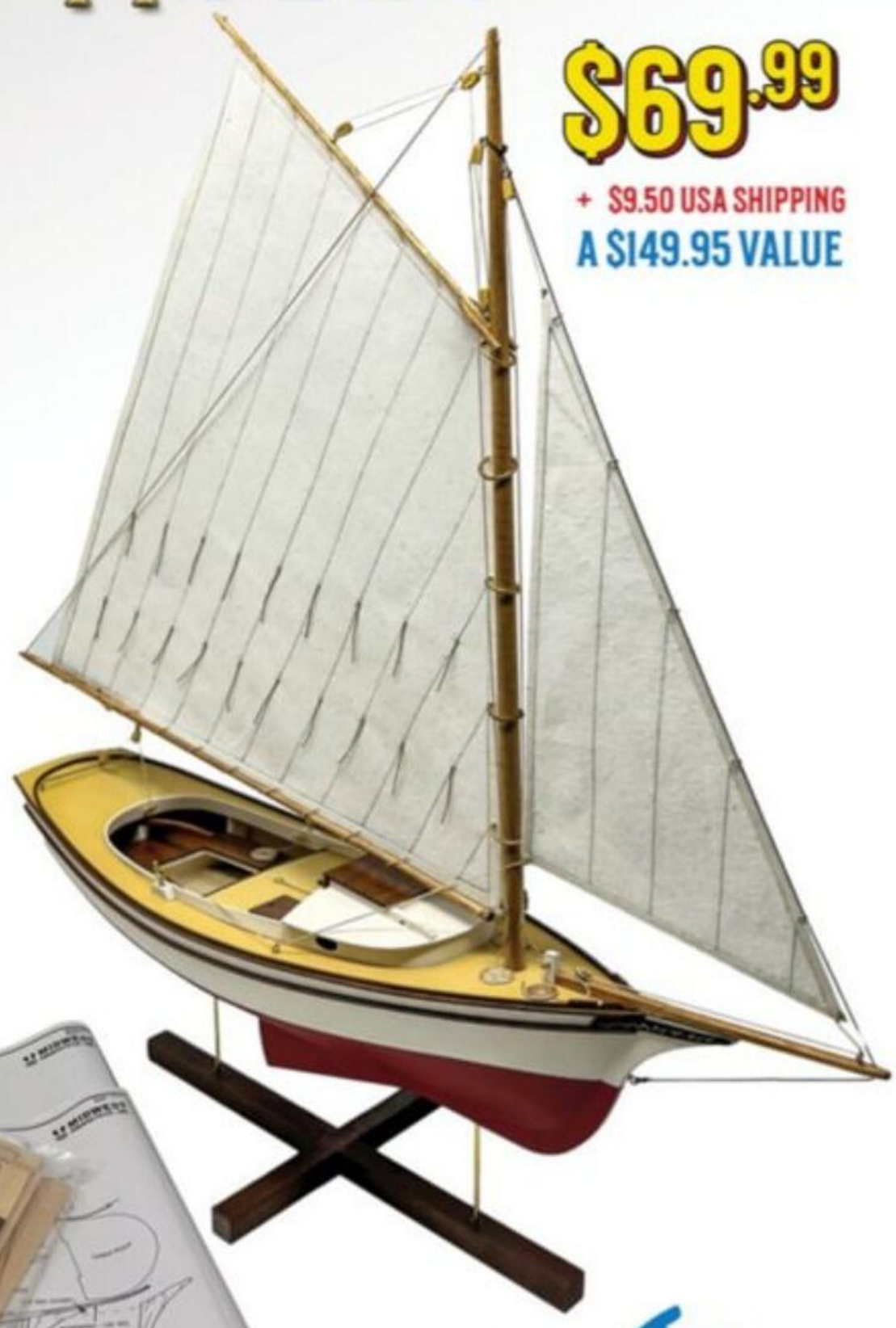

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