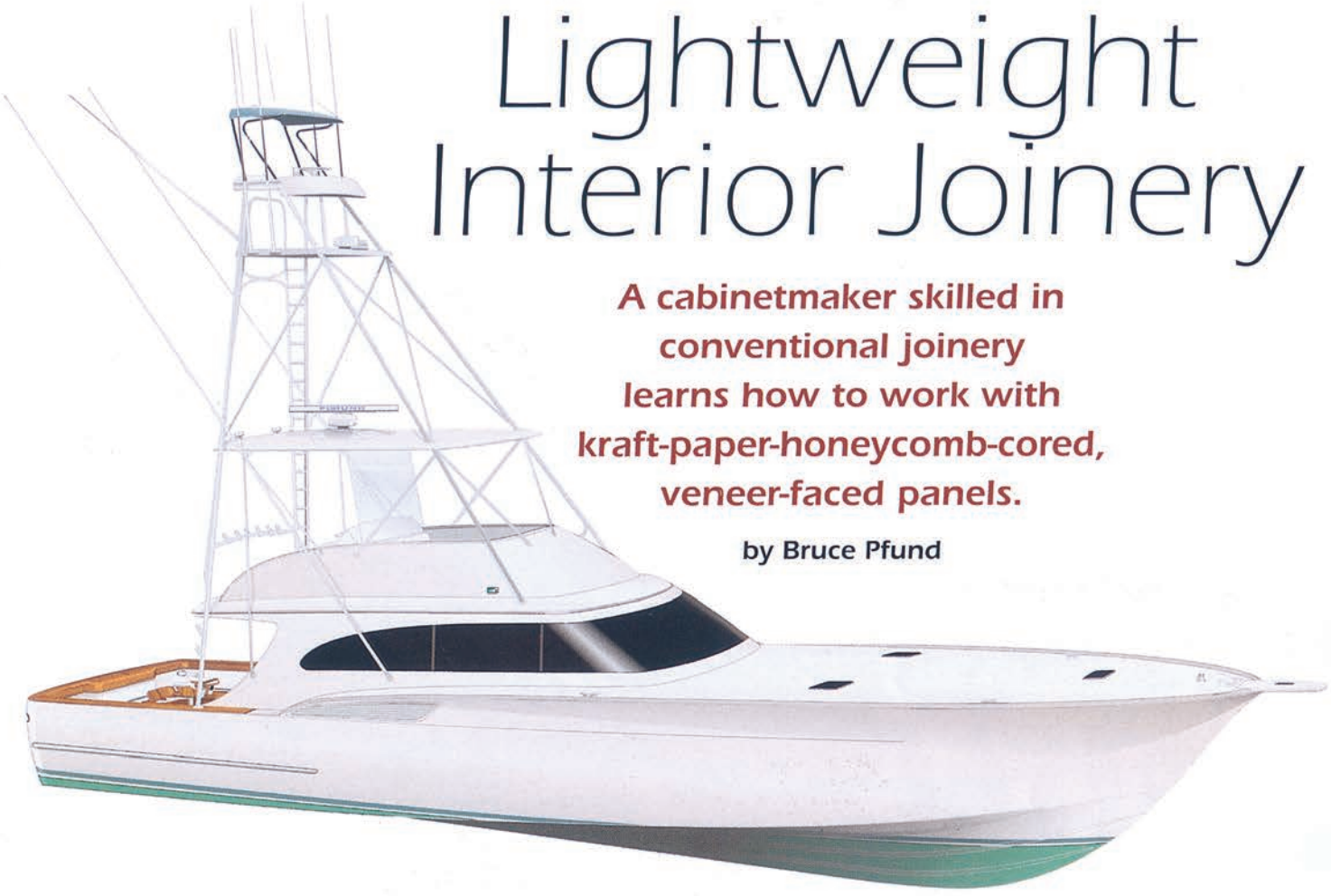
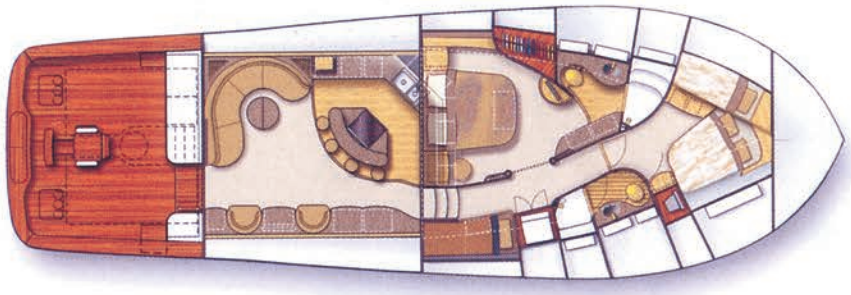
Lightweight Interior Joinery

A cabinetmaker skilled in conventional joinery learns how to work with kraft-paper-honeycomb-cored, veneer-faced panels.

by Bruce Pfund





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For high-speed sportfishermen such as Unexpected, *the 61-footer (18.6m) pictured above, low overall weight is critical to reaching target speed and ensuring stability. Lightweight joinery is one cost-efficient way to keep the weight down. As the boat's arrangement plan shows, there's a substantial amount of cabinetry and furniture, which could add significant weight above the waterline. Cabinetmaker Kirk Evans (facing page), who is building the interior joinery from lightweight honeycomb-cored panels, estimates that the boat's total interior joinerwork will weigh about one-third of what the equivalent modules built in plywood or MDF would weigh.*

Kirk Evans has always had a strong "I can do this myself" attitude. When I first met him in the mid-eighties, he was catching giant bluefin tuna—by himself—in his 31′ (9.5m) boat *Laura Lee*, whose interior he had finished to high standards in his Cape Cod, Massachusetts, shop. Nothing has changed about Evans' approach to challenges in the intervening years.

His next boat-interior project will be for his new vessel—*Unexpected*, a 61′ (18.6m) "Carolina Style" sportfisherman, designed by Steve French (Applied Concepts Unleashed, Stuart, Florida) and built by Sunny Briggs (Wanchese, North Carolina). Evans, who is based in Marco Island, Florida, will build all of *Unexpected*'s interior furniture out of lightweight, kraft-paper-honeycomb-cored panels. "I didn't know much about any of the cored-panel products, so I called around to investigate. I was certain that I could figure out for myself how to work with them," he told me. As we'll see, Evans' self-confidence was not misplaced. His years of experience in building what he calls "mainland joinerwork" is extensive. He moved to the west coast of Florida at the start of the '80s building boom, and his business rode the groundswell of affluence and the desire it created for custom kitchens, entertainment centers, and libraries. Evans reported that his single largest project, a custom library, had cost well over $180,000, while many other projects were in the low six-figure range. His 5,800 sq ft (539 sq m) shop normally had six to eight full-time employees.

After much research, Evans selected Tricel kraft-paper honeycomb-cored, veneer-faced prefabricated panels for

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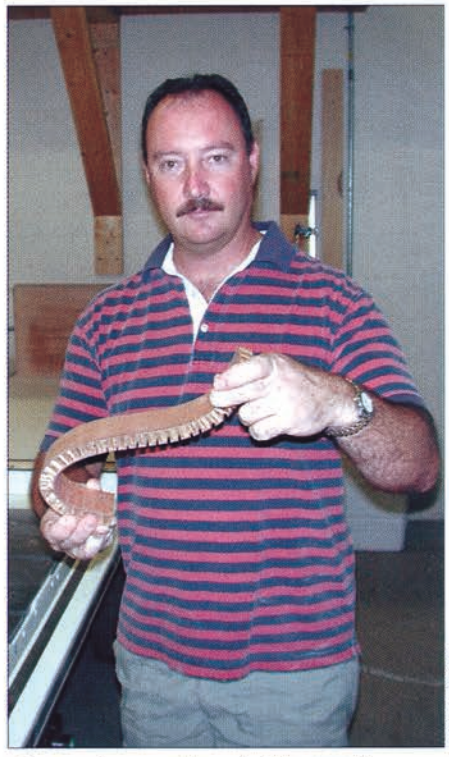
The main saloon features a number of curved elements that would be difficult and time-consuming to build in plywood or MDF. The tradeoff, according to Evans, is that the cored panels are about three times the cost of those conventional materials, and require two to three times the amount of labor.



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Evans shows a "bendability test" sample, which he uses to determine how closely relief cuts need to be spaced to produce various curvatures.

the project. He considered other types of honeycomb-cored panels, but settled on Tricel primarily because he felt it would be the easiest to work with. I thought his experiences in learning how to work with this material would be of interest to *Professional BoatBuilder* readers.

Cost-Effective Weight Savings

In a high-speed sportfishing boat, low overall weight is critical to reaching the intended speed and hull stability. Thirty knots is no longer considered fast for vessels targeting offshore big game—offshore being anywhere from 30 to 80 miles (48 to 129 km) from the continent in United States East Coast fisheries. The bar has been raised to the low 40-knot range if a boat is to be considered "high speed." In a vessel with E-glass-faced foam- or balsa-cored composite construction for hull, deck, and internal structure, where can a builder or designer turn for additional weight savings and increased speed without excessive fuel consumption?

Carbon fiber instead of conventional fiberglass is one alternative, but it's an expensive one, at approximately 10 to 14 times the fiber expense per pound of E-glass. Carbon laminates also entail a switch from styrenated resin systems such as polyesters or vinyl esters to epoxy formulations, which are at least two to three times more expensive per pound. Process costs will increase, too. At a minimum, bagged wet laminates, produced with an on-site impregnating machine, will be required; more advanced projects may call for prepregs. In either case, you'll need ovens and elevated-temperature post-curing to get the maximum physical properties from the epoxy and to produce a vessel with acceptable cosmetics. All in all,

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Evans constructed curved doors to match curved cabinet frames by using the cabinet frames as a bending fixture. He faced the cabinet box with Mylar packing tape as a release material, relief-cut the door panel, packed the open slots with filled epoxy, and then taped it down to the actual cabinet. The panel required little support to produce a fair curve.

a switch to carbon reinforcements and epoxies is a daunting technical challenge, and one with considerable expenses attached.

For further weight savings in a modern vessel that already has a hull, internal framing, and deck of lightweight cored E-glass, look to the hull's internal outfitting—all the plywood and medium-density fiberboard (MDF) that goes into furniture, partitions, and trim. MDF weighs about 3 lbs/sq ft (.5 kg/sq m); ¾" (19mm) marine plywood weighs 1.82 lbs/sq ft (8.8 kg/sq m); and Tricel honeycomb-cored panels with ⅛" (3.2mm) veneers weigh .44 lb/sq ft (2.1 kg/sq m). Evans has lugged a lot of plywood and MDF furniture around during his career as a mainland cabinet-maker, and had no intention of taking it offshore on *Unexpected*. "My best guess is that the joinerwork for *Unexpected* will be somewhat less than one-third the weight of conventional construction, and about three times the cost," he said. "I'm a first-timer with this material, and the work is taking me about three times as long to produce as it would in conventional construction, but I'm getting faster as I go along, and I'm confident that I can further reduce my time. You've also got to remember, I'm doing some fancy stuff that would be difficult and very time-consuming in MDF or plywood."

Bending Honeycomb-Cored Panels

Designer Steve French had drawn furniture and joinerwork with lovely swooping curves for *Unexpected*, and those curves had Evans a bit concerned at the start of the project. "As I learned, bending honeycomb-cored panels is a breeze compared to what I've had to struggle with in mainland projects. The veneers on the panels hold up very well during and after bending, which indicates to me that they are high quality. None of my sheets have any splices in their veneers. The special 'bending ply' I've used for conventional plywood or MDF curved furniture and joinerwork is a relatively rough, flimsy material, and needs a lot of sealing and fairing before it's veneered. It's also got to be supported with frames on very close centers, so there's more work involved in building the structure than there is with cored panels. With hardwood cabinetry," he continued, "I was stuck with pre-made curved pieces, or what I could produce with table saws, jointers, and router bits. With these cored panels, though, all you need for doing custom curves is a saw to make relief cuts. The product takes a fair curve all by itself. If it's an especially tight curve, I'll make a plug, lay the panel with the relief cuts over it, surround plug and panel with web straps, and cinch down on the straps.

"I did some experimenting on whether or not the relief cuts in the back skin should run all the way through the core to the outer skin, or whether it was better to leave a bit of honeycomb behind in the slot, to support the veneer surface and act as a cushion for the bend. It turned out that

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Evans easily hefts an 85-lb (39kg) main-saloon module built of curved honeycomb-cored panels.

leaving about ⅛" [3mm] of the honeycomb behind worked fine. I also did quite a bit of testing with relief cuts at various intervals, to learn how many I needed to get the panel to bend into a fair curve. For tight curves—say, a 3" [7.6cm] radius—I found that cuts every ¼" [6.35mm] worked best.

"I had to make curved doors to match the curved frames for the cabinets. Instead of building a separate bending fixture, I used the cabinet frame I'd already made, because it had the exact curvature I wanted. I faced the cabinet box with Mylar packing tape, which is a good release material, relief-cut the door panel, packed the open slots with filled epoxy, and then taped it down to the actual cabinet. The panel required very little support to produce a fair curve." More on using tape for clamping in the section on assembly, below.

At the time of my visit, Evans had not yet decided how to treat the bending-relief cuts on the furniture's back side. Appearance in that area is not critical, but he was considering bonding a veneer across the back of each sliced-up panel. That might be a lighter way to seal up the core and restore structural integrity to the back skin than filling each relief cut with epoxy.

Epoxy System

I asked Evans why, for a rather small project in terms of epoxy consumption, he had spent the extra money to buy the higher-output, crank-operated dispensing pumps from Gougeon Brothers, the vendors of WEST SYSTEM epoxy. "Buying the pumps was absolutely the best thing I've ever done for this project. I'll bet the whole job won't use 20 gallons [76 l] of resin, but all proportioning problems are gone. I just have to mix the two dispensed components thoroughly. If I've made a bit too much for the bonding or filleting step at hand, there's almost always some bare honeycomb to be sealed up."

It was very humid, and in the high 80sF (low 30sC) the day I visited Evans' shop, so I asked about the working times he gets with the WEST product. "I use the special tropical-grade hardener. On really hot days I first mix the two parts in a standard bucket, but then I pour it out into a shallower container, such as the well at the end of a roller tray. I can get up to an hour of working time on extremely hot days, and I definitely need every minute of it for filleting some of the longer and more complex joints in the furniture. I'm trying hard to keeps the fillets really neat, to minimize finish sanding. For some of the more heavily loaded joints, I plan on taping with epoxy and a knitted biaxial fiberglass like a 1708, to spread the loads out onto more of the panel's surfaces."

Cutting, Sanding, and Routing Tips

Evans conceded that he did encounter a few aspects of working with the product that at first caused him some lost time and materials.

"The first, and perhaps biggest snag, was that the face-veneer perimeters were not always square and aligned with each other and the core. I guess they slipped a bit during press-bonding to the honeycomb core. I found this in over 90 percent of my panels. A 4' by 8' [1.2m x 2.4m] sheet might have to be trimmed down by approximately ½" [12.5mm] on each side to get matched and true parallel edges. The best way to do that accurately is on a dedicated panel saw. Squaring-up the panels, though, is just a minor problem that adds a small amount of time-and-material loss to the project.

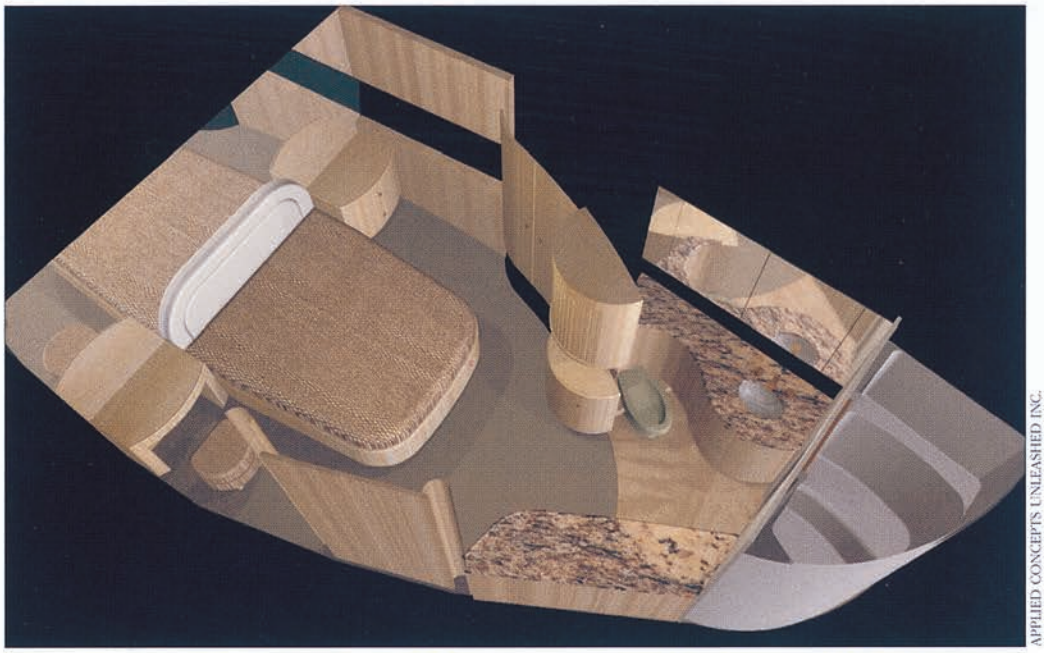
"The panels sand beautifully, but they sure are a pain in the neck to rout and dado. The adhesive's tough and rubbery, especially when it's warmed up by cutting tools. In the beginning I tried all sorts of tricks. I ran it through my machines fast and slow, put blades on backwards, you name it. I tried two-, three-, and four-flute tools, but the results from the cheaper two-flute cutters were acceptable, because the material that's being removed isn't that tough."

According to Evans, the manufacturer does not suggest any particular type of saw blades, so I asked him how he determined which type to use. "I first thought I'd have to use a triple-chip blade, but I was wrong. I didn't need to use a scoring blade in advance of the cutting blade either, as I've had to do with some other veneer products. The best blade I've found so far is one designed for cutting melamine-faced panels, with zero set on the teeth. The chips don't break out through the veneer on the cut's back side. If I'm especially worried, I'll face both sides of the panel with masking tape along the cut line, but that's usually not necessary. At the moment, I'm running a 10"-diameter blade with 90 teeth, but I'm about ready to get one with 100 teeth. By the way," he added, "never use anything but a carbide blade. It keeps the edge."

Evans also had another trick. "The adhesive that bonds the veneers to the core gets pretty sticky when it heats up during cutting or routing. It doesn't take too long for blades and bits to get gummed up, and then cutting and routing efficiency drops. The cheapest and best way I've found to clean cutting tools is with plain old oven

cleaner—whatever kind you can buy at the discount store. Spray it on, let it soak for a while, then wash it and the dissolved adhesive off in hot water. A shot of WD-40 or other corrosion-inhibiting spray on the bit or blade afterwards is also a good idea. Router blades get gummed up, just as circular-saw blades do, so I hit them with the oven cleaner when they get ugly. Still, there are always a few paper flaps left down in the slot, and I find I have to do a final cleanup pass by hand with an offset-handle backsaw."

For drilling small holes in the panels, Evans uses brad-point bits. Although he has tested spade or paddle bits for drilling large-diameter hinge-pocket holes, he reported some splintering and breakout problems, and advised purchasing the specialized bits from the hinge manufacturer, which are actually Forstner bits. For cutting curves with a saber saw, Evans has found that the Bosch T101AD jigsaw blades deliver good results, with minimum splintering. "You get a nice clean cut on both the top and bottom surfaces, because it's a fine-tooth wood-cutting blade with zero tooth set. If there's ever a problem, face the surfaces to be cut with masking tape that's been rubbed down hard onto the wood.



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A rendering of the boat's master suite. Countertops here and in the galley will be of aluminum-honeycomb-cored granite panels to further reduce weight.

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Evans found that an offset-handle backsaw was the most efficient tool for removing the flaps of paper honeycomb remaining in the slots after routing.

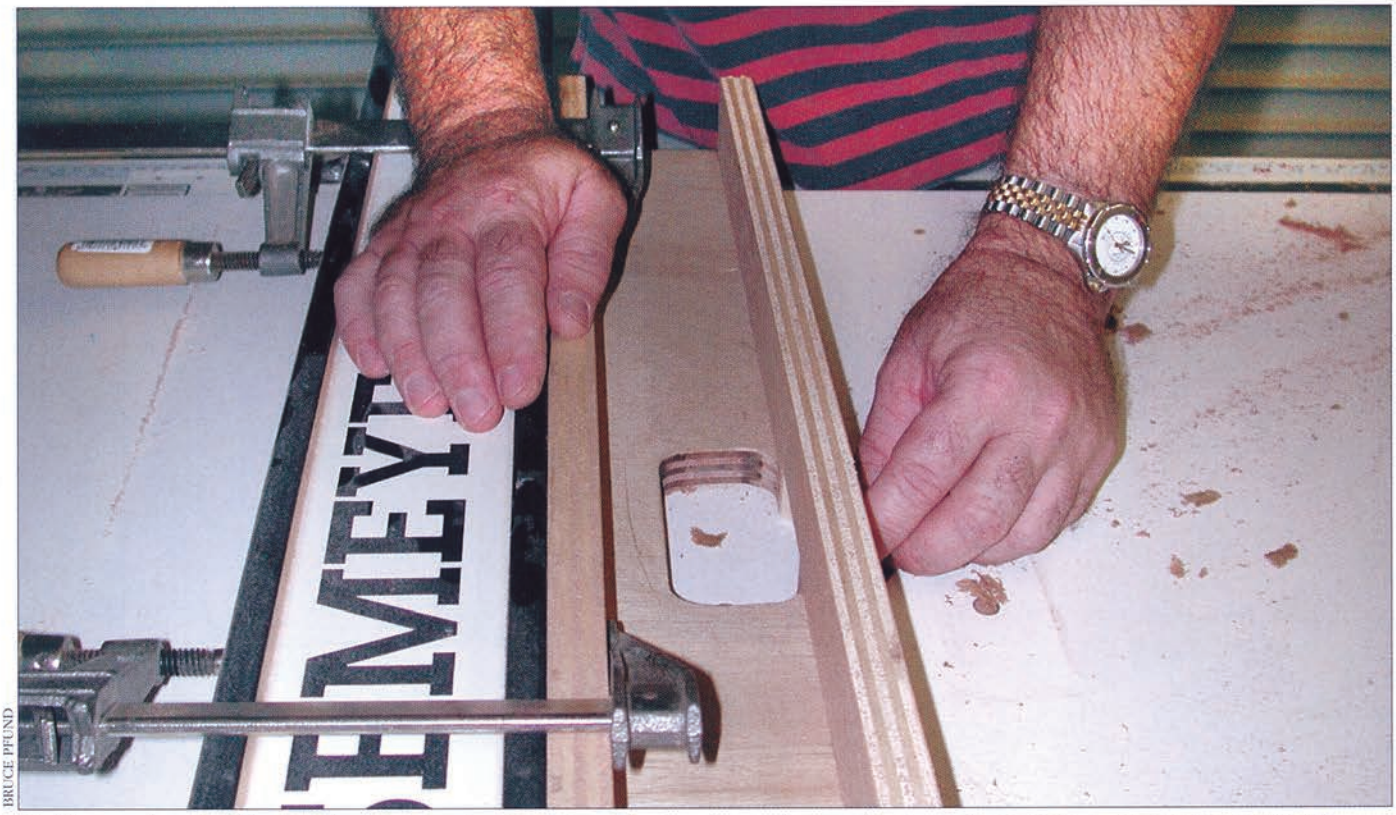
"I also had to tweak the dead fence on my router table," he added. "The chip-relief hole by the cutter head was fine for wood chips, but it got clogged up with bigger flaps of paper-honeycomb core; that pushed the workpiece off the fence and produced a cock-eyed cut or slot. The paper makes one heck of a mess, too, so I always try to work with my shop vacuum's nozzle right next to the hole in the dead fence."

Assembly Methods

Said Evans, "Although the Tricel literature showed simple butt joints with epoxy fillets between panels, I decided early on that assembling complex furniture with that method would be a clamping and alignment nightmare. My familiar mainland cabinetmakers' techniques and fasteners—butt joints secured with brad and staple guns, or screws for higher-quality projects—wouldn't work with the thin-skinned panels. I went with dadoed joints instead. I size the slot just narrow enough for a tight friction fit, and then I can dry-assemble all the various panels of a big piece of furniture without it wobbling around much at all. Once I'm sure the whole piece is okay, I'll disassemble it, fill the slots with a putty of Aer-O-Sil and WEST SYSTEM epoxy, and then fit it all back together again. Next, I check for alignment, squareness, and registration of the pieces' bottom edges on a flat work surface. It takes a minimum of clamping. I go back and add epoxy fillets after the dadoed joints are completely set and the piece is stable. I'm careful not to smear any of the fillet paste out onto veneer surfaces that I'll later have to sand and finish."

What about banding or inserts for raw panel edges? As I looked around Evans' shop, I didn't see the thermal edge-banding roller equipment that's commonly used for mainland cabinetry. But, I did see a number of large-diameter masking-tape balls, so I asked him how he closed out the raw core edges—both hidden and exposed. "I normally don't use any fancy tools—just lots of good-quality masking tape. The hidden edges are easy. I rout the honeycomb back about ¼" [6mm] and fill the slot with thickened epoxy."

To cover exposed edges, Evans decores scrap panel sections on his router table, and cuts edge-band stock that matches the veneer. "One-inch [25mm] masking tape works just great as a way to secure the edge bands until the slurry dries, and tape's inexpensive, compared to clamps. Get fresh, aggressively tacky tape. The cheap stuff won't



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Slotting or de-coring the panels with a router generates a large volume of paper-honeycomb waste that can get trapped in the router table's chip slot. Evans had to enlarge the slot on his router table's "dead fence" to allow the debris to escape more easily.

wrap around sharp corners without tearing. You may save a buck on a roll, but all your hair will fall out by the end of the project. Use lots of tape—every 2″ [5cm] or so. Be sure to vacuum the surfaces the tape's going to stick to until they are immaculately clean, otherwise the tape won't get enough grip." To his delight, he doesn't need laminate-trimmer tools to clean up edgeband overhangs. A fast pass with one of his favorite tools—a simple radius-edged sanding block—does the job.

I asked Evans if he had any worries about a paper-honeycomb product with veneer facings absorbing moisture and degrading in a marine environment. "I'm not building a submarine," he replied. "I did a trial water-soak of a raw-edged panel, and it did get mushy, but the core dried right out and stiffened up again in less than two days of ambient temperature air-drying."

Veneering

Evans does not use vacuum-bagging either for mainland or *Unexpected*'s furniture and joinerwork. Based on his many years' experience with conventional furniture and cabinetmaking, he doesn't feel it's necessary. "I've been using the same construction-grade veneer adhesive from Constantine's for over 15 years, and I've never had a single problem. I think my good results are primarily due to preparation. I always sand both bonding surfaces to 100-grit, and then vacuum them until they're dust free. Then, I spray the adhesive on both the veneer and the substrate. Spraying gives a more uniform bondline than brushing, and that's important for good results, too.

"Next," Evans continued, "I lay six or eight clean, narrow sticks across the bonding surface, and flop the veneer sheet over onto them. I then pull the sticks one at a time from one end of the surface to the other." As each increment of the veneer drops, Evans scrubs the bondline with a piece of approximately 6″ x 8″ (15.2cm x 20.3cm) scrap lumber with radiused edges. The general motion path for the "scrubber block" is to push entrapped air bubbles toward the edge of the bondline that is

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A close look at the marble-faced, aluminum-honeycomb-cored panels that Evans selected for vanity and galley countertop surfaces. The panels will be adhesively bonded to the cabinets underneath.

The Tenderness Myth

Much of a sportfishing boat's outfitting weight—cabinets, trim, and partitions—is located high above the waterline, where it raises the vessel's center of gravity and reduces seakeeping ability. There is a common misconception about lightweight, high-speed composite sportfishing boats, especially those equipped, as *Unexpected* will be, with tall tuna towers. Are fast, light boats always "tender," and subject to excessive rolling, especially when at anchor or trolling in beam seas? According to dockside pundits, it's inevitable. Based on my personal experiences, however, some rethinking on the subject is appropriate. *Cookie Too*, 55' (16.7m) long, weighing just 50,000 lbs (22,679kg) and built 10 years ago of cored-epoxy/S-glass construction by Revenge Yachts (at the time, a new firm in Pompano Beach, Florida), is an early example of a sportfisherman with lightweight structure *and* lightweight furniture and joinerwork. After a day running many nautical miles at close to 40 knots and trolling for giant tuna in all angles of a nasty 5'–7' (1.5m to 2.1m) sea far east of Chatham, Massachusetts, I can attest to her seaworthiness and seakeeping.

Of course she rolled a bit in beam seas. That's to be expected. *Cookie Too's* roll, however, didn't have the snap at the end of each roll cycle that's common in overweight, high-center-of-gravity designs. Adapting to her motion in a seaway was easy, and her performance was confidence-inspiring. Riding over steep following seas caused minimal hull-pitch changes, without the spooky dive into the next trough I've experienced while running some older enclosed-flybridge "heavyweights." Punching through head seas caused none of the top-heavy wiggles and shivers I've felt in other big fishing boats with tall towers. Go inside the main saloon, and you'll find that the galley cabinet doors are disarmingly light. They're built of a honeycomb-cored, veneer-faced product. The drawers are so light that I found myself applying too much force at first, pulling them out against their stops.

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Many consider lightweight, high-speed, composite sportfishing boats—especially those with tall tuna towers—to be particularly tender in beam seas or at anchor. Cookie Too, *the 55' (16.7m) sportfisherman pictured here, proves that doesn't have to be so. Built of cored-epoxy/S-glass construction and weighing only 50,000 lbs (22,679 kg), the boat's motion is easy, says the author, without the snap at the end of each roll cycle that's common in heavy, high-center-of-gravity designs. Part of the reason is that the interior is constructed of lightweight honeycomb-cored panels, which helps to minimize weight above the waterline.*

Captain Cookie Murray described the vessel's balance and setup to me. "We've got huge 12-cylinder diesels and lots of fuel, both located way down in the bilges and amidships, to minimize hull balance changes as fuel is consumed"—at an estimated 75 gallons (284 l) per hour at 36 knots. The tower's upper- and lower-station outfitting is in the Spartan "Palm Beach" style. Said Murray, "The key to our hull's stability and seakeeping performance, aside from hull design and engineering, is keeping the weight down low, or conversely, adding as little weight above the waterline as possible. A lightweight interior is one important part of that equation."

—*Bruce Pfund*

still open and sitting up on the sticks.

After completing the bondline scrub, Evans lightly sands the veneer surface with 120-grit and then 150-grit to remove any rub marks or raised grain fibers. He prefers 3M's "SandBlaster" sanding sponge because it's easy on his hands, and conforms well to curved surfaces and tight inside corners. He doesn't like hand-sanding with folded conventional sandpaper, feeling that the folded edges and the uneven contact patch you get when sanding without a backing pad produce poor results.

Varnish Finishes

Evans uses the same sealer, varnish, and paint systems on *Unexpected*'s woodwork as he has used successfully for conventional furniture. "What about the extra heat and humidity the cabinetry will experience on a boat?" I asked him. "Most of my work lives in beachside housing on the Gulf Coast," he replied, "and we've got heat and humidity that's pretty close to what you get aboard a boat. Many of the condos my work is in are closed up for months, so there's a long heat-soak cycle, and then when the doors are opened the humidity can approach 100 percent. I think that's a pretty tough life cycle, and the finishes I've used for the last 15 years are still looking fine."

Evans' first step after the veneer is sanded and vacuumed dust free is to apply two layers of a Sherwin Williams vinyl sealer. It's a 24%-solids, solvent-borne, sprayable product, marketed as Sher-Wood Vinyl Sealer, #T67 F3 520-3997. Next, he sprays a Sherwin Williams two-part conversion varnish. "I've been using it since the early '80s," he said. "It's got excellent ultraviolet resistance, and fade and yellowing can be big problems down here in the strong Florida sunshine. I'll bet I've sprayed 500 gallons [1,893 l] of it in the last 20 years. It's particularly nice to work with because it doesn't need sanding between coats. I normally apply two heavy coats, wet on wet. It self-levels beautifully, and flows out to an orange-peel-free finish."

Conversion varnish is available in three finish types: gloss, semigloss, and flat. Evans reported that the semigloss is more forgiving to apply than either

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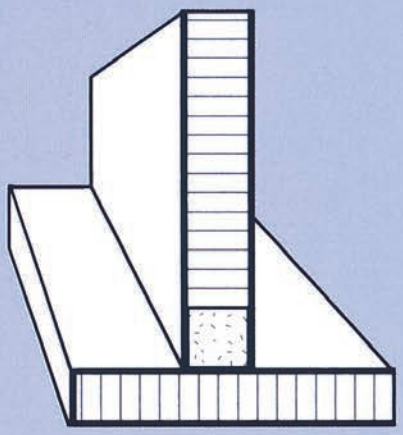
More Tips for Joining, Bending, and Edge-Banding

Kirk Evans, whose cabinet work is featured in the main article, developed his own methods for working with Tricel's kraft-paper-honeycomb-cored, veneer-faced panels. Here are a few other suggestions from the panels' manufacturer, adapted from a recently published Tricel technical bulletin.

▪ **Joining Panels.** In addition to the dadoed and rabbeted joints that Evans favors, the manufacturer suggests the following procedure: epoxy a cleat in place, then rout the core out of the adjoining panel to the depth of the cleat, and epoxy that panel in place over the cleat.



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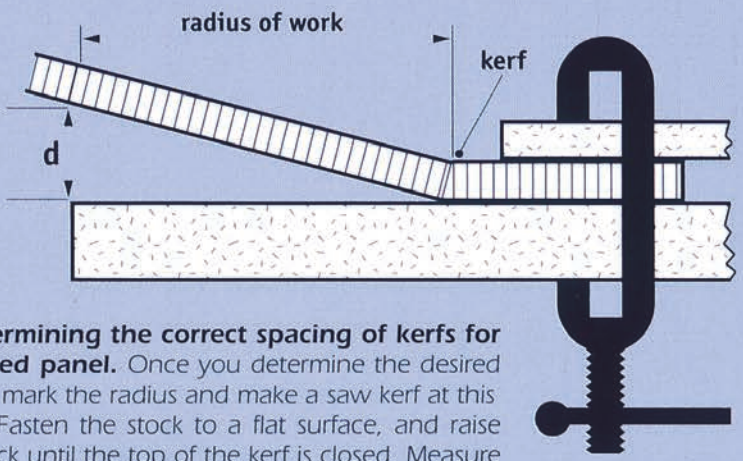
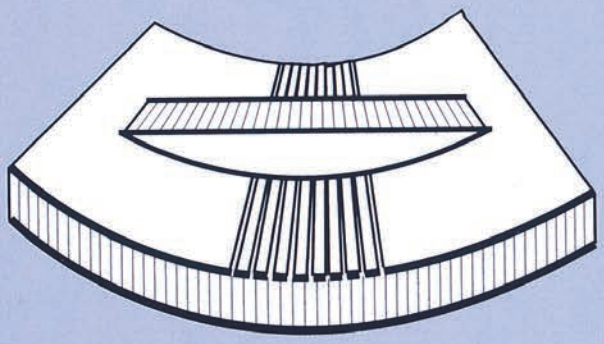
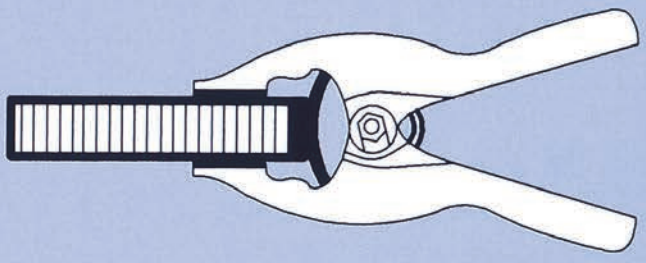


▪ **Determining the correct spacing of kerfs for a curved panel.** Once you determine the desired radius, mark the radius and make a saw kerf at this point. Fasten the stock to a flat surface, and raise the stock until the top of the kerf is closed. Measure the distance between the raised stock and the surface at the radius mark. This is the amount of space to leave between saw kerfs to produce the desired radius. Spread thickened epoxy into the kerfs, bend the panel to the desired curve, and clamp.



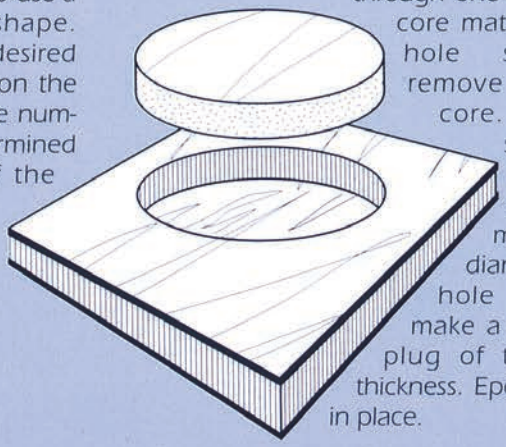
▪ **Curving a panel.** Another method of forming a curved surface is to use a gusset to hold a curved shape. Fabricate the gusset to the desired radius, and epoxy it in place on the inside of the kerfed section. The number of gussets needed is determined by the load requirement of the application.

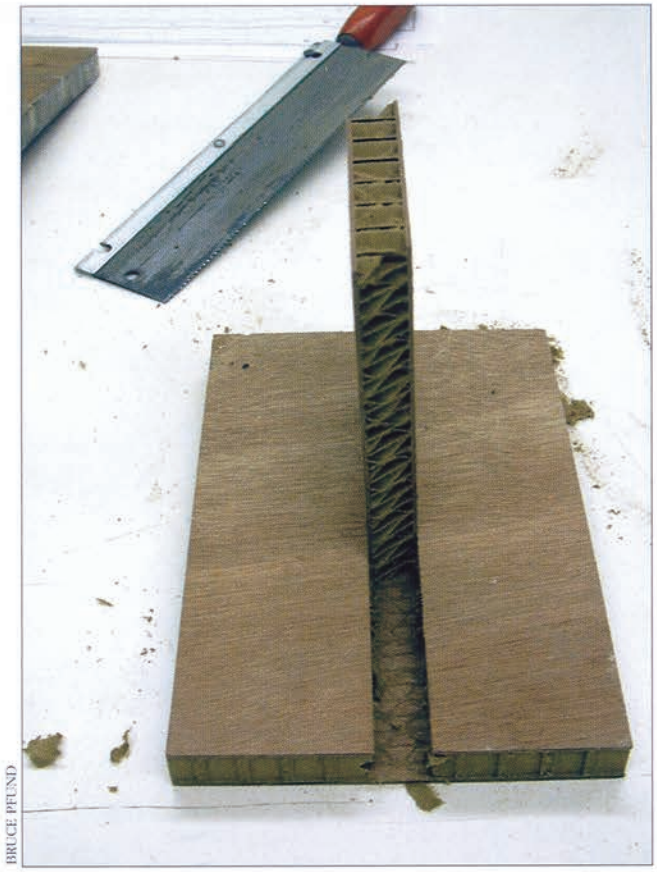


▪ **Edge banding.** One way of attaching edge-banding to raw honeycomb core is with a foaming urethane adhesive. Apply it along the core in a ⅛" (3mm) bead. Position the edge banding and clamp it in position with three-way clamps.

—Eds.

▪ **When multiple fasteners are required in a small area.** Cut through one skin and the core material with a hole saw, and remove skin and core. Using a slightly larger hole saw to match the diameter of the hole just cut, make a solid wood plug of the correct thickness. Epoxy the plug in place.





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Evans sizes the dadoes just narrow enough for a tight friction fit, and then dry-assembles the various pieces of the unit to do a final check before epoxying all the elements together. The fit is close enough that no temporary adhesives or fasteners are needed to keep the dry assembly from wobbling around.

the gloss or flat products. How, I asked, did he deal with the inevitable suicidal mosquitoes or ceiling fallout that contaminate otherwise perfect finishes? "Dust is always a nightmare. Even tiny stuff looks like elephant droppings in a high-gloss finish, but sanding out debris can cause its own set of troubles. The conversion varnish patches well, but you have to be very careful about sand-throughs, because the coatings will sometimes lift or alligator at the edges of a deep scratch. There's a trick to prevent this. Dab in some vinyl sealer, then let it dry. Wet-sand with 600-grit, and then clean and dry thoroughly. Apply conversion varnish, and then compound it with two grades of polish after it dries."

Hardware Installation

Evans likes "Euro hinges" for his projects, both at sea and on the mainland. The mechanisms are set in 35mm (approximately 1.4″)-diameter holes, and Evans uses the special metric bit from the hinge manufacturer, or equivalent, for boring the hole.

"The veneers are quite thin and light, so there's not much meat for the screw to secure to. Although the simple screw and hinge pull-out tests I ran seemed to be okay, I wanted to strengthen the installation a bit. So, I drill a ¼″ hole, break out the honeycomb core around the hole with a nail until I've cleared a space of about ¾″ in diameter, and fill the space with thickened epoxy. I let it cure before drilling the panel for the hinge fasteners." For indexable shelf-track hardware, Evans selects a white plastic track section from the Häfele catalog. He recesses the track into cabinet sidewalls in a routed slot, and secures it with thickened epoxy. The epoxy fills the surrounding core, and bonds the track in place.

"After this phase of the project is complete," Evans told me, "I take all of the pieces up to Sunny Briggs' shop, and do the installation myself. The modules will be laminate-taped to the hull, sole, and topsides surfaces. I've left generous overhangs on each surface that has to be scribed to the hull or adjacent joinerwork. I'm confident that fitting up everything I've made will be far faster and easier than if it were a plywood or MDF project. We've also selected aluminum-honeycomb-cored granite panels for the galley countertops and vanities, and I'll be fitting those on-site, too. By the time I'm done, I'm sure I'll be even more anxious to go fishing than I am right now."

Product Sources Mentioned in the Text

Constantine's Wood Center of Florida Inc.
1040 E. Oakland Park Blvd.
Fort Lauderdale, FL 33334
tel. 954–561–1716
fax 954–565–8149

Dynagrout Inc. (Aer-0-Sil filler)
24B Skidmore Rd. South
Deer Park, NY 11729
tel. 631–242–3366
fax 631–254–8260

Gougeon Brothers Inc.
100 Patterson Ave.
Bay City, MI 48706
tel. 517–684–7286
fax 517–784–1374

Häfele America
3901 Cheyenne Dr.
P.O. Box 4000
Archdale, NC 27263
tel. 336–889–2322

Sherwin Williams
Call 800–524–5979;
a representative will
call you back.

Tricel Honeycomb Corporation
2100 Swanson Ct.
Gurnee, IL 60031
tel. 800–352–3300 or
847–336–1321
fax 847–336–1311

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