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DIY BOAT OWNER

The Marine Maintenance Magazine

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Issue #4 2010

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Cover Photo: © iStockphoto.com/wragg

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Editor's Note:

In boating, bigger is not always better. But it can be in magazines—and that's good, because *DIY Boat Owner* is growing.

Your humble quarterly is proud to announce that we are moving into Barnes & Noble bookstores in 12 states and the District of Columbia, starting with this very issue.

Newsstand readers can already find us at West Marine stores from coast to coast, and now at your local B&N, whether you live in Alaska or New York (and just about anyplace else near water).

Of course, we would never neglect subscribers. And so, the magazine itself is bigger, too. This issue is the largest we have produced yet, with eight more pages of content that we hope you enjoy.

That may not sound like much, but Mad Mariner has been operating DIY for only a year now, and we are proud to see it grow.

Speaking of growing, Mad Mariner and DIY have built up a pretty strong social media presence as well. Our YouTube Channel has hundreds of videos. Our Flickr page has thousands of photos. Our Twitter pages send out headlines daily. In total, we reach about 36,000 boaters on social channels—perhaps the largest in the industry. If you like to get your news and information this way, check out some of our offerings below.

There is at least one more area where DIY can rightly claim some healthy expansion, and that is services. For those who don't know, DIY has started teaching Skills Classes nationwide, an effort to provide boaters with low-cost, hands-on learning on technical subjects.

Our most recent event in Annapolis drew more than 100 boaters, and almost 95 percent said in a survey that they would take another Skills Class. That's great, because we are going to offer more. As long as you want to learn, we'll keep hosting classes. Send us your ideas.

Of course, there is much more work to be done here at DIY. A redesigned website is coming soon, and we are continually working to improve the quality of our articles. Sure, bigger is not always better—and so we strive for both. Bigger and better. That's our goal.

Glen Justice
Editor

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Editor: **Glen Justice**

Managing Editor: **Leef Smith Barnes**

Art Director: **Matthew C. Sheehan**

Technical Editor: **Doug Cowie**

Associate Editor: **Brian Hartz**

Sales Director: **Gaspare Marturano**

Webmaster: **Michael Miller**

Copy Editor: **Marcia Kramer**

Contributors: **David Aiken, Marlin Bree, Paul Esterle, Chris Ferro, Tim Flanagan, Rich Ian-Frese, Harry Hungate, Quent Kinderman, Sandy Lindsey, Roger Marshall, Edward McDermott, Peter A. Robson, Lenny Rudow, and Andy Schell**

Customer Service: **Nyla Deputy**
888.658.BOAT or info@diy-boat.com

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Tools & Gear

We Test So You Don't Have To

SodaStream Saves Money

9

I have to confess, I'm a soda freak. I like the stuff, in almost all flavors, as a mix or by itself. That obsession has caused some problems aboard my boat.

My stash of soda cans and bottles is stored in the bilge, where the motion of the boat occasionally causes a leak. The resultant mess is a job to clean. Then there are the problems of storage and properly disposing of the empties.

Then I stumbled across a vendor at a boat show passing around free samples of do-it-yourself soda. The system, offered by SodaStream, $99.95, includes a dispenser that contains a carbon dioxide cylinder, one-liter bottles to contain the mixed soda and bottles of concentrated flavoring.

To produce soda, one of the bottles is filled with cold tap water and then screwed into the carbon dioxide dispenser. You then push a button to dispense the CO_2 into the bottle, controlling the level of carbonation by the number of times you push. After the CO_2 is dispensed, the bottle is removed and a capful of the flavoring is added.

The cylinder of CO_2 is good for about 110 liters of soda, while a bottle of concentrate will produce more than 12 liters. The selection of concentrates is wide: everything from cola to energy drinks is available, both in regular and diet versions. Refills for the CO_2 cylinders are ordered online and shipped via UPS. The same applies to the bottles of concentrate.

The cost per liter of soda works out to around 30 cents a bottle—far cheaper than the store-bought stuff. The best part, though, is the number of soda cans and bottles headed for the landfill: zero. On longer cruises, the soda machine itself goes on board. On day trips, I just take the one-liter bottles in the cooler. Satisfied customer? You bet.

– Paul Esterle

PROS: Saves on space and eliminates unexpected cleanups in the hold.
CONS: One more thing to make room for.

www.sodastreamusa.com

DIY Rating System

10. Everyone should own this
9. A very strong product
8. Strong, with a note or two
7. A fine product
6. Good for some applications
5. Think about it first
4. We don't recommend it
3. Product has major flaws
2. Don't buy this
1. Don't even look at it

ClampTite Works, With a Little Practice

7

It's not too often that a new tool comes along, something that is practical—not ridiculous—and puts new capabilities in your hands. But the ClampTite is exactly that.

The ClampTite is a jig that allows you to tighten stainless steel wire, creating wire "clamps" (not unlike a hose clamp) that can bind things together just about anywhere on your boat.

It comes in several variations and sizes, ranging in price from $39.95 for a basic stainless tool to $129.95 for a large model capable of clamping items to a mast or dock pole.

It's not exactly new—the ClampTite has been around a few years, often seen at boat shows—but it continues to sell, and so we thought it was time for a test.

What we found was a very practical tool with many applications—if you are willing to take the time to learn to use it.

Unlike many tools, the ClampTite has a learning curve. The premise is not especially complicated, but it does take a fair amount of practice to make solid, useful clamps.

Users should plan on obtaining wire in different sizes, reading the instructions, watching the videos on the website and sitting down with some scrap materials to make practice clamps for an hour or so. There are several types of clamps that the ClampTite can create, and you'll want to get your technique down.

Then, plan on using it. If you come back a few months later, you are apt to forget all that technique you developed and you'll have to start the learning process over. Again, it is not complicated. It just takes a little form.

Having said that, the ClampTite can be extremely useful on a boat in cases where you want to mount, hang or attach something without drilling holes or using glue. It can clamp hoses, bind rope for a quickie splice, or affix something to railing or rigging—all extremely useful stuff.

Often, you'll hear the ClampTite billed as a way of clamping engine hoses in an emergency. While this is probably something the tool can do, any well-stocked boat should have enough spare all-stainless hose clamps to handle a crisis. The ClampTite may be a backup in a real pinch, but you should use hose clamps on your engine.

Instead, we see this as simply a handy tool for the countless small repairs and upgrades that face every boat owner—something you'll reach for often, if you have it onboard and have your technique down.

We have used a few ClampTite models over time, but the unit we tested was a stainless model that was 4¾ inches long and 7 inches when fully extended. It sells for $69.95, plus the wire, which the company offers in various sizes (both 304 and 316).

That's not exactly cheap, but this is one tool that may pay for itself over time, if it saves you from buying various mounts and brackets. It also lasts. We have had one in a saltwater environment for more than a full season, and it held up well.

Overall, the ClampTite is a useful tool that is likely to make a solid addition to your bag. That's why we gave it a 7 on the DIY Rating Scale. It may well have a place on your boat.

– Glen Justice

PROS: A tool that legitimately adds to your capabilities.

CONS: Takes some time to develop a proper technique.

www.clamptitetools.com

Otterbox Defender iPhone Case

My experience with OtterBox cases was with its waterproof, crush-proof and airtight dry boxes.

For example, its 2500 Series box easily fit my compact camera and Motorola Razr, with room to spare for small extras, neatly sealed inside. Not to mention that the highly visible bright yellow case would float if dropped overboard.

6

But the OtterBox Defender iPhone case ($49.95), billed as "the highest quality, toughest case available," is an entirely different animal from its predecessors.

That's because it encases the iPhone and its vulnerable screen inside three layers of protection.

The first is a clear protective membrane covering the screen against scratches, minor dinks, dust and dirt. The second, which incorporates the membrane, is a high-impact polycarbonate shell that appears similar to those of the company's popular dry box. The shell comes in two snap-together parts that are easily assembled and disassembled. Layer three is a flexible silicone skin designed to absorb bumps and shocks, with cleverly covered access hatches for the phone's connection ports. The case then snaps into the belt clip/holder with the phone's screen turned inward for further protection while its owner is handling lines and gear.

I found the case performed superbly as it was slammed against gunnels, made contact with a hard-sided cooler and was even dropped. It was also easy to hold securely with wet hands. There is full access to key buttons, and sound quality is unaffected. The unit is oversized, giving it a pleasant feel, but I had to switch back to a smaller leather case for land-based use. I could not properly connect aftermarket backup batteries while the phone was in the case, though taking it out and putting it back in is not the worst thing in the world (the silicone skin gets easier to put on with each use).

There is one major downside: The unit does not appear to be waterproof. According to OtterBox, the company, "has not tested the Defender for, nor does it recommend it for, water protection."

For some, this may be a deal breaker. But as long as you're not planning on going swimming with the phone and you don't drop it overboard (always a hazard), you should be fine.

– Sandy Lindsey

PROS: Rugged protection that is easy to use.
CONS: Not waterproof, and the case must be removed to use a backup battery.
www.otterbox.com/iphone-cases

Clarification

DIY Boat Owner maintains the highest journalistic standards, and part of that is correcting our mistakes.

In the August Issue of DIY, we ran a photo that may be misleading. In an article explaining how to install a compass (page 43), we published an image that showed solid wire being used rather than stranded wire, which is the correct material for a marine installation. The image should have shown stranded wire.

Original Nantucket Diddy Bagg

The Original Nantucket Diddy Bagg is made of heavy, 23-ounce canvas, with a whopping 36 pockets of all sizes. But the real feature is that it is "convertible," with a design that can only be called genius. With a few adjustments, the Nantucket can be configured like a bucket-style tool bag with pockets inside, a rigging-style bag with pockets outside, a tool roll—even a backpack

8

It definitely gets high marks for ingenuity. In practical use, it is a solid, if somewhat expensive, product at $72. It is taller and stiffer than most bags, with a 10-inch zipper, a drawstring and a pair of straps to accommodate its shifting design.

The bag we tested was The Original Nantucket, which comes in only one color, the traditional beige or "duck" that you think of when you picture canvas. The company has expanded its line, and you can find smaller polyester bags in many colors that are a bit cheaper.

The Original Nantucket design was created for carpentry tools and has expanded into use by all kinds of hobbyists and workers, from knitters to locksmiths—even archeologists, according to the company. For boaters, it was a natural.

We bought our Nantucket at the Miami boat show two seasons back and have have used it in all configurations — and stuffed to capacity — ever since.

The bag maintained its shape well. When we say stiff, we are not kidding. This is not a lightweight rigging sack that will get pliable with age. This is a heavy-duty bag that is still standing upright after years of use.

ONE STIFF BAG

When you get ahold of the Nantucket, you have to play with it a bit to see what it can do—in fact, the company offers some instructions. But it becomes clear soon enough.

The Nantucket makes a solid, if plump, tool roll that fits nicely in a boat's small spaces. But it really shines as a tool bag, where it can be packed with handy items and moved around the boat. At 16 inches high and 12 inches wide, it is about the same size as a 5-gallon bucket. Its upright design allows you to store stuff inside, and the zipper offers great access.

"The greatest thing about this bag is that you can find what you put in it!" wrote Charlie Cirigliano, the artist and carpenter who designed the bag for himself and refined it over the years.

Admittedly, we never had much use for the backpack mode, but we did try it and it works.

One interesting feature is that the pockets can be configured. To turn two small pockets into one large one, the company advises you to just pull out the stitches, and be careful doing it. We tried it and didn't have any problems.

After two years in the marine environment, the bag's metals fittings have not corroded. Because the material is extremely heavy, we did find that the zipper stuck if left in place over time. But it was nothing that could not be fixed with a little patience. A little wax or lube—something that won't stain—is probably a good idea.

Speaking of which, we are not too keen on washing a tool bag (a low-priority item), but we figured that any bag that costs more than most of the tools inside it should be able to stand up to a Maytag or Kenmore.

Instructions on the company's website say, "wash and block to dry, as one would with a wool sweater." We were not quite sure what that meant, so we removed the drawstring, kept it in bucket mode to prevent shrinkage, and threw it in the machine with some Tide and cold water (no bleach). We then let it air dry, and it came through unscathed—and much cleaner.

IT WORKS TOO WELL?

So, how does a bag work too well? Well, like many heavy-duty products, some boaters may find that the Nantucket is overkill.

For example, if you frequently move tools from your home, truck or shop to the boat and back, the bag will make it easier and may be worthwhile. If you are hard on your bags, the Nantucket is likely to stand up, and if you lack storage on the boat, the tool roll configuration may work well.

But if these situations don't apply to you, then you may want to investigate cheaper options, which are abundant at just about any hardware store. Like so many products on a boat, whether the Nantucket Diddy Bagg is for you will depend largely on your needs and habits.

Overall, it's a solid, dependable bag, with years on the market and glowing reviews from the likes of Popular Mechanics. It may also have many uses beyond tools—it could work as a beach bag or overnight bag —and it might make a pretty nice nautical gift, too. That's why we gave it an 8 on DIY's Rating Scale.

– Glen Justice

PROS: Extremely tough, versatile tool bag.
CONS: Pricey and might be more than you need.

www.nantucketbagg.com

Big Kahuna Portable Shower

Deck showers and washdowns are great when it comes to cleaning nasty stuff off the boat—or the crew. But there are drawbacks.

8

Seawater requires another through-hull in the boat. Freshwater requires installing a tank if you don't have one, and drawing down your supply if you do.

For those looking to own a sprayer, without having to add or subtract from the boat, the Big Kahuna Portable Shower may be a solution.

The Big Kahuna ($116) is a square, 6.6-gallon bucket fitted with a 12-volt submersible pump inside and a trigger-driven hand shower on a coiled hose outside. A Gamma Seal lid with a gasket—a great product by itself—keeps the water in.

The Kahuna's advantage is that it is portable. At 13 inches high and 12 inches wide, it can be filled and taken on the boat or anyplace else you can power it—the beach, a campground, your truck or backyard.

It can also be used with raw water or fresh, and it can heat the water using the same principle as a sun shower: Just leave it on deck in the sun.

CATCHING ON

We tested the Big Kahuna on a larger boat for a few weeks and found that it produced a mighty fine shower. The bucket is solid, easily cleaned and contains enough water to shower a large adult, or even a few, with a little conservation.

The pump, a 400 gallon per hour Johnson First Mate on our test unit (others have a 360 GPH model), gives off a powerful spray, well suited for washing decks or people. The handle was a bit slippery in soapy hands, though nothing that some tape wouldn't solve, and it had a nice, hefty feel. The spray is adjustable.

Full disclosure: Big Kahuna is an advertiser, and so we dialed up our skepticism when we took a look (our opinions are not for sale). But we found the Kahuna is a solid product that lives up to the manufacturer's claims. Indeed, the company has sold more than 2,000 units over seven years, has a lifetime warranty and recently caught the eye of West Marine, which is now carrying it in some stores.

How useful the Big Kahuna Portable Shower is to you, of course, will depend on your boat and your needs. The Big Kahuna is truly portable and will work well as a washdown on the swim platform, in the cockpit, on the dinghy or elsewhere. It has tie-down eyes, which can be used to lash it, and clips for the handle and cord, to keep them out of the way.

WEIGHT AND POWER

One thing to note, however, is that water weighs about 8.35 pounds a gallon, so when full the Kahuna weighs more than 50 pounds—not exactly light. Its handles are molded into the sides, allowing it to be carried around the boat easily enough. But if you plan to take it any distance while full, you may want to experiment with adding a strap, so you can carry it with one hand or on a shoulder.

The Kahuna also offers a 13-gallon version, but at more than 100 pounds when full, we would consider this on the heavy side, unless you are creating a semi-permanent situation. That kind of weight may be hard to move around when the unit is full.

Another factor is power. The Kahuna does not function

via gravity like a traditional sun shower. Instead, it runs on 12-volt power and the 9-foot cord has a DC plug. On smaller center consoles, this will work perfectly. The shower can be plugged in at the console and moved wherever you need it. But on a larger boat, you will be limited to wherever your DC outlets are located, usually at the helms.

It is easy enough to rig an extension or to add DC outlets (taking care to apply marine standards to whatever you install). In fact, Big Kahuna sells a 20-foot extension for $15, a battery pack for $60, a kit to turn it into a livewell and other accessories. The shower might also be powered by a portable battery charger with a DC outlet, something you may already have onboard.

SOLID DESIGN

After only a few weeks, we did not administer the beating this shower will get over several seasons, on just about any boat. We can see broken tie downs, clips or even a shower handle, if your crew is tough on gear. But the product is modular—you can replace things—and Big Kahuna warranties the unit for life. If you need parts, just call. It is also significant that, after thousands of sales and almost a decade in business, the company says there has never been a return.

DIYers may take a look at this and be tempted to try to build one themselves. Indeed, that approach can be taken with many products on the market, if you have the time and inclination. But Big Kahuna has assembled a very nice set of parts. The bucket, lid, pump and handle are all high quality, with aluminum or stainless steel fasteners, and the unit is well designed.

Overall, the Big Kahuna Portable Shower is solidly constructed and powerful enough to get the job done. For smaller boats, it will increase the amount of water you can carry and how you can use it. On larger boats, it can provide water in places you often need it, like a fly bridge or anchor locker. It even comes in colors: blue or orange. Practical Sailor liked it, and so do we. That's why we gave it an 8 on the DIY Rating Scale.

– Glen Justice

PRO: A good-size portable shower with high-quality parts.
CONS: A bit heavy when full.

www.bigkahunashowers.com

FIELD TEST

Reel Life: After A Season of Use, Spooling Lines Get a Report Card

Earlier this year, we took a look at a pair of spooling lines, with the promise that we would come back at the end of the season with a report on how they worked.

We tested Quickline's Flat Rope and Reel, which features flat Dyneema or polyester line coiled on a thin reel that is designed to mount on a rail or bulkhead. The model we chose cost $430 and came with 135 feet of 1-⅜-inch flat line on a 15-inch wheel.

We also bought the $60 Anchor Reel, a plastic wheel and handle mounted to an aluminum post, which fits into a fishing rod holder. It holds 150 feet of ⅜-inch line or 75 feet of ½-inch line.

The Quickline and the Anchor Reel got plenty of action, as we used the lines to anchor, tow and moor the boat. How useful they will be to you—and which might suit you better—will depend a lot on your style of boating.

Quickline Flat Rope and Reel, $430

Anchor Reel, $60

The Quickline is a solid product and we tended to favor it because it was stationary, always there and ready. We mounted it amidships on a 40 footer, and were able to use it all over the boat.

The Quickline held up well to the elements, and we found the flat rope fine in most applications. For example, we used it as a dock line for more than a month and it held fast. Our only complaint is that the rope is more slippery than traditional three-strand nylon and other common lines, which made anchoring a challenge when hauling up by hand.

But overall, the Quickline lived up to its promises. It's not cheap, but it does provide a ready line when you need it. We gave it an 8 on our DIY Rating Scale.

We found the Anchor Reel a tad less convenient when used as intended, which meant storing it in a locker and taking it out as needed. We tended to just leave it out, allowing the plastic to fade slightly in the sun.

Overall, it worked reasonably well, but it's a bit bulky and tended to wobble a bit in its holder, though a little tape might have fixed that, as would sawing an inch or so off the mounting rod. How well it fits on your boat will depend on how your rod holders are designed and positioned.

Ultimately, it is probably better used as a storage device than as a ready line. The Anchor Reel may well find itself at home on a smaller boat, as storage for a stern anchor line or in some similar use. It is also worth noting that the Anchor Reel's price is reasonable, and that this is exactly the type of item DIYers might use to create their own customized system.

We gave it a 6 on the DIY Rating Scale, as something that could be very useful in some applications.

– Glen Justice

Departments

Engines | Nice Threads | Electrical

POWER PLAY

How to Build a Gantry, Pull Your Engines—and Save a Bundle

By Lenny Rudow

photo by Lenny Rudow

Pulling your own outboard motor can be simple with the right equipment, an assistant and a little patience.

Whether you just purchased a used boat with dead outboards or decided to repower your present boat, removing those old power plants presents a challenge.

You could pay someone to do it, but savvy do-it-yourselfers know that you stand to save a bundle by taking on this chore yourself. Why? Because you will save on the labor costs associated with the engine's removal, and can make a buck by selling those old eggbeaters.

Before you can get that trash off your transom, you'll have to get a few things ready for removal. First, disconnect and remove the battery cables. What about the steering and control cables? Disconnect them, but don't pull them out of the boat just yet. These may come in handy because many different outboards will work with different cables. Until you choose a new set of power plants and verify that they won't match up, you might as well leave the cables where they are and cross your fingers for a lucky break.

Lenny Rudow was senior technical editor for Boating Magazine *for more than 10 years, and is currently the electronics editor for* Marlin Magazine*, angling editor for EarthSports.com, and boating editor for* Texas Fish & Game Magazine.

The gauges, controls and associated wiring harnesses are far less likely to be usable with any other engines, so you might as well remove them. But don't just yank, break or cut them. There's potential value in those old parts, if you keep them in good shape. As you remove the wiring harnesses, make sure you tie a pull cord to the end, and snake it through the chase as you take out the old harness. Leave this cord in place. It will make it much easier to fish a new harness through.

Finally, you need to remove all of the engine's fluids. On any outboard, you'll need to pull the plug on the lower unit, and drain the oil. If the engine is a four-stroke, you'll need to drain the crankcase oil and remove the oil filter, too. Don't forget to remove any internal fuel filters and drain the fuel lines as well.

GET A GANTRY

Once the prep work is done, you need to establish

This DIYer made a $1,600 profit by pulling his own engine and selling the old equipment on eBay.

Make sure all the wood for your gantry is in good condition and use clamps to hold the pieces while you prepare to through-bolt the sections together.

some sort of gantry (a frame used for hoisting heavy objects). The best gantry is one that already exists—if there's a tree in your yard with a branch at least 8 inches around, which is at least 2 feet higher than the top of your outboards, then you're in luck. Back the boat under the branch, and move on to the next step. Otherwise, you'll need to construct a free-standing gantry or rent a capable piece of equipment to do the job.

If you build one, your gantry needs four legs, a main transverse beam and cross-bracing. You can use 6-by-2s for the legs and cross-bracers, but the transverse beam will be under the most strain, so use a 4-by-4 for this section. Make sure all of the wood is in good condition, and steady the bases by driving stakes at least one foot into the ground and securing the legs to them. This is an important step because stability is every bit as important as strength, and these stakes will prevent the base from moving.

Don't use nails to hold your gantry together. In-

photo by Lenny Rudow

stead, use large C-clamps to secure each piece in place as you drill holes for the fasteners, then through-bolt the sections to each other. Constructed this way, your gantry should have no problem supporting an outboard up to 500 pounds. If you're pulling twin engines that total more than 500 pounds in weight, you might want to focus on one motor at a time.

THE BIG LIFT

Once the gantry is in place, use a webbed strap—with sufficient weight capacity, of course—to attach a "come-along" (a small, hand-operated winch) to the transverse beam.

The come-along will have a hook on the end, which you can use to attach to the engine's lifting eye. Where this eye is depends on what brand of outboard you're lifting. On some brands, the lifting eye is permanently mounted under the cowl, but some others require you to buy an eye that screws into the top of the motor. Once it's all hooked up, ratchet the come-along until there's minimal tension on the strap.

Now you're ready to remove the nuts that secure the bolts going through the motor mount and transom. Got them off? Good deal. But there will still be some pressure on the bolts, and you can't simply pull them out. So you'll need a partner for this next step: pull the boat forward slowly as someone holds the motor and gently rocks the lower unit back and forth to jiggle the bolts free without damaging the mounting holes. Once this step is complete, you'll have those horses hovering and you can pull the boat clear.

Before you start celebrating, get a tube of silicone and seal the transom holes on your boat immediately, so moisture doesn't invade this critical area. You'll also need to make sure the old outboards are stowed in such a way that they won't get damaged. Most important is to keep them in an upright position, so rainwater or dew doesn't make its way into the engine. Lowering it onto a sturdy saw horse, then covering it, is a safe bet.

THE DROP

Now get on eBay, and sell that old eggbeater. One word of warning: be sure you say it's for "Local Pick-

photo by Lenny Rudow

You'll need some help to loosen the bolts without damaging the mounting holes—have someone hold the motor while you pull slowly forward until it comes free.

Up Only" or someone will expect you to ship the engine.

Just how well might you make out? I pulled a pair of 1998 90-hp Honda four-strokes with 1,300 hours on them. One was operational, the other had thrown a rod through the block and was totaled, and they both looked terrible under the cowl. Through the wonders of eBay, I found a buyer who had the same model motor and needed a good supply of fresh parts. He paid $1,720 for the pair. I spent $21.99 on a lifting ring, $30.00 on a come-along, and eBay took a $47.41 cut of the proceeds. That adds up to a $1,620.60 profit, for a day's worth of work. Now consider the fact that I also saved $300, which is what the yard wanted to charge me to pull the old power plants. That adds up to a grand total of $1,920.60.

Of course, your old, dead outboard might not be worth quite this much—or it could be worth more. What about mounting the new outboard on your own? That's a tougher call. In some cases, doing this yourself means you will risk voiding the warranty. Many will find this an unacceptable danger, considering that mounting new power plants costs less than $1,000. Besides, you probably just saved that much or more—so call the dealership and schedule an appointment to have your new outboards installed by a pro. You can spend the difference on new gear for your old boat. **DIY**

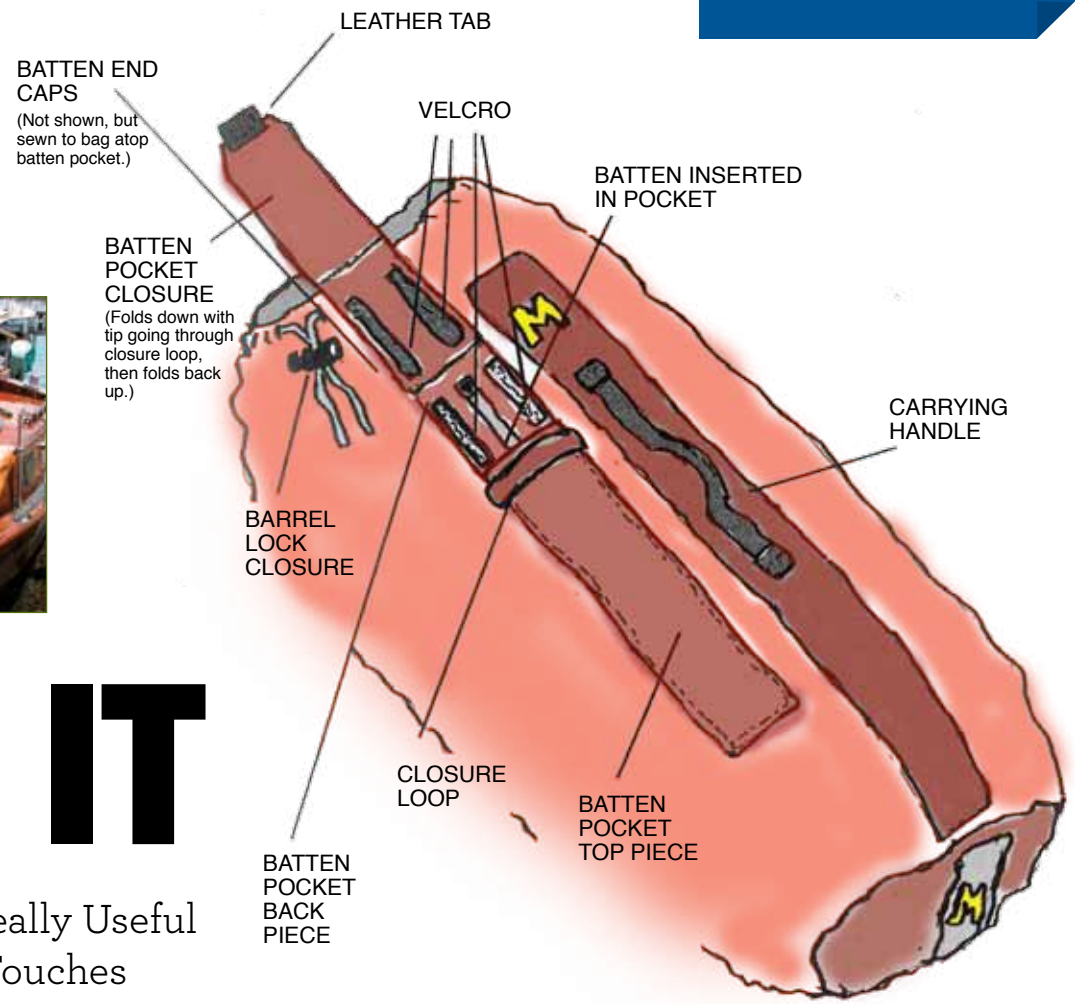


photo and illustration by Marlin Bree

BAG IT

Make that Sail Bag Really Useful With Some Custom Touches

By Marlin Bree

With a little planning, some extra nylon cloth and an ordinary sewing machine, sailors can add custom touches to a sail bag to make it both easier to handle and more useful.

I started with a medium-size sail bag from a Sailrite kit (22 inches wide by 46.5 inches high), with a drawstring top-fitted with a barrel-lock closure. This ingenious bit of nylon keeps the drawstring held tight with a locking spring. No knots to tie or slip, like older drawstring sail bags.

I added a batten pocket, made from 5.4-ounce tanbark-colored Dacron sail material. It is 24 inches long by 4.5 inches wide. Folding over the edges about ¼ inch, I sewed them down to form neat seams.

For the enclosure, I wanted a flap that folded through a loop and closed with Velcro. For the loop, I used folded-over nylon that resulted in a band across the pocket, which I sewed to the bag on the left and right edges. I used tanbark for the enclosure that would fold through the loop, taking a piece 12 inches long by 4 inches wide and sewing half to the bag. The other half folded to become the enclosure. I then added a leather tab and Velcro.

To use the pocket enclosure, you simply fold the flap through the loop, then bring it back up again and close it with the Velcro. I also sewed extra nylon batten end caps directly to the sail bag above the pocket, where they'd be safe until I needed them.

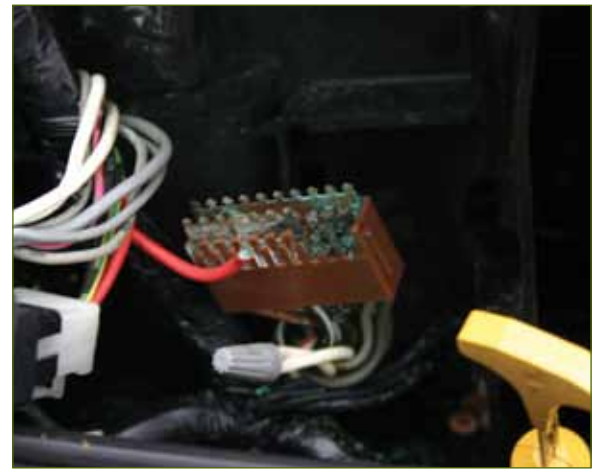
To form a carrying handle—yes, an actual carrying handle on a sail bag—I sewed up a 4-inch "backbone" of tanbark nylon directly to the bag. A piece of 2-by-18-inch black nylon strapping was then added to form the carrying handle. I folded over the middle 4 inches of the black nylon and sewed these two edges together to form the portion where you grip the handle. Next, I folded over 2 inches on each side and sewed them together to form a base on each end, which was then sewed to the bag.

My distinctive new sail bag is easy to use and won't slide open when I carry it. It holds battens securely, where I can find them, as well as extra batten end caps. Best of all, it's easy to carry.

The project took about 12 hours. The Sail Duffle Bag Kit was the biggest expense at $22. I used some scrap materials from around my workshop and sewed the project on a sturdy old sewing machine with redV69 UVR polyester thread, $5. The grand total: a no-sweat $32. **DIY**

Marlin Bree built his own 20-foot wooden boat Persistence *and has chronicled his adventures in* Broken Seas, Wake of the Green Storm, Call of the North Wind *and* In the Teeth of the Northeaster. *He is a two-time winner of Boating Writers International's Grand Prize Award.*

BURNED OUT



photos by Roger Marshall

One Nearly Sunk Boat. One Fried Electrical Terminal. One Owner Eager to Get the Rewiring Job Behind Him.

By Roger Marshall

I put 17 months into rebuilding a SeaCraft 18. The boat was a mess when I bought it and, over time, rewired it, installed a new fuel system, a new Suzuki 115-horsepower outboard, and new electronics. I gave it a new paint job top and bottom; added trim tabs, bilge pumps and a new windshield; and rebuilt all the wooded portions of the boat.

When I launched in spring, I forgot that the 416-pound engine was fully raised and that the fuel tank was empty. I had run it to my mooring on a temporary tank to make sure everything worked, with the intention that I'd fill the fuel tank the next morning. But that night we got a 35-knot storm that rocked the boat. Just before dawn, it flipped over. It had enough buoyancy in the hull to float, but only just.

Space becomes an issue when trying to access screws in the project.

The yard turned it upright and drained the hull, then I drained the Suzuki engine, which had just 10 hours of running time. My son and I washed the engine with fresh water, flushed it, changed the oil twice and it ran—until it smoked and stopped. After digging into the guts of the wiring system, I found that a terminal had flashed and caused a lot of smoke, but no fire.

Frankly, I was annoyed. After all the time I'd put in, I lost interest in the boat. So I put it in a shed and left it for almost two years before I could work up the energy to face it again. Not the best thing to do with a brand-new engine.

STARTING AGAIN

When spring came and the project became a space hog, I decided to rewire the engine to remove the burned terminal. I purchased an engine wiring harness, a pair of relays, and a few other parts.

During the rebuild, I had rigged the engine using a color-coded wiring diagram that I had purchased from Suzuki. The job had been remarkably hassle-free and I felt that rewiring the engine would be similar. I had good backup from Suzuki North America and prompt answers to my questions.

The first part of the project was to remove the plastic air silencer box. This meant disconnecting a few screws, unhooking a few hoses and removing a plastic box. With the box out of the way, almost all of the wiring was accessible.

To replace the wiring harness, you don't have to know the names of each part. All you need to do is unclip each terminal on the old wiring harness and install the new one. All the terminals and sensors have a unique connector and the wires are color coded, so it's hard to make a mistake.

As I removed one plug or connector on the old harness, I replaced it with a new connector on the new harness. I found the job to be straightforward and easy—until I over-tightened a terminal that appeared

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Roger Marshall is the author of 14 books including his newest, Fiberglass Repair Illustrated. *Marshall has written extensively on boats of all sizes for magazines in most parts of the world.*

to be part of a fuse for the starter motor circuit. That ripped the copper terminal out of its plastic housing and twisted it quite badly. It took half an hour to straighten the copper piece and reinstall the copper terminal in its plastic holder. To ensure that I fixed the terminal, I installed a new fuse across the terminals and checked the continuity using a multimeter. This seems to have fixed that problem. The second fuse is a spare, but I replaced it as well.

COMPLICATIONS

At this point, the job started to get tricky, with two sets of harness wires in a very small space around the sealed central processing unit (CPU) box. I found that two pairs of needle-nose pliers did the job of pulling and replacing connectors far more efficiently than my fat fingers.

In this same area were two relays, three terminal connectors for the relays, the CPU and a screw terminal that appeared to be an engine ground at the bottom of the CPU housing. This single-screw terminal almost caused me to leave the project for another couple of years.

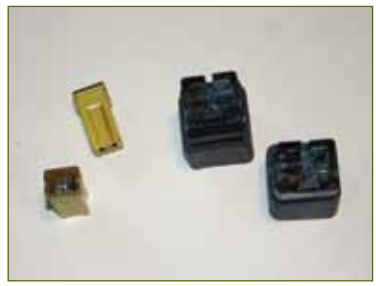
The wiring harness had to be positioned just right

Using needle-nose pliers assisted with some of the connections, but accessing some screws proved to be difficult because of the tight space.

to get the screw to align with the hole, and I could not get more than two fingers on the screw at any one time. Getting a wrench on the screw was impossible until it was correctly positioned in the screw hole. It was a bear to get undone, a bear to get the screw back in the hole and big pain to do up again. I managed to drop the screw and the washer into the engine sump three times. The last time it went far enough down

into the bottom of the engine area that I wondered whether I'd have to remove the engine casing to reach the screw.

Fortunately, there was a rubber bung in the casing just where the screw had landed. Perhaps the Suzuki engineers had also dropped this screw a couple of times and made the bung hole to reach it without tearing the engine apart. Perhaps.



Tiny fuses and tight spaces caused this $700 project to take 4 to 6 hours.

Once the terminal had been reconnected, the remainder of the job was relatively easy. The last few terminals were a little difficult because they snaked around the air manifold piping, again causing me to shift to needle-nosed pliers in lieu of fingers.

The last job was to install the relays, again in the unique sockets provided for them. This led to a slight delay in the project, because I had ordered an incorrect relay.

Installing the original Engine Control Unit (ECU) was easy. It is a sealed unit, and as long as the pins are not bent it will push into its socket quite easily (this is good, because a new one costs about $1,200). A bigger problem is stowing the relays, the ECU and all the other pieces in their housing. Of course, it didn't help that someone (read: me) had thrown out the CPU/rectifier box cover, so we had to order a new one of those, too. That's an added price of taking things apart and leaving them for a while before coming back to work on them.

LAST STEPS

Somehow, we put everything back reasonably close to its original configuration.

The instruments—fuel gauge, rpm gauge, and pressure gauge—also got drowned and need replacing. We're going to replace them with Suzuki's Modular Instrument System, which will upgrade the entire panel and make the boat even more efficient.

I have also installed the mis-ordered relays, purchased a new battery to replace the old one and rewired the consol-mounted Blue Sea instrument panel. It was corroded but replaced free of charge by Blue Sea. This is truly a company that stands behind its products. I have to do a little more work on the trim tabs and steering gear, but we fully expect to go fishing again soon.

The cost of this project was about $700, with the biggest expenses being the wire harness assembly at $452 and the Air Silencer Assembly at $105. Overall, it was a savings over what a boatyard would charge, and I spent about four to six hours on the job. **DIY**

GREASE VS. OIL

Which Wheel Bearings Are Best on Your Trailer?

By Lenny Rudow

While it may seem there is not much "new" to say about trailers, there is one question worthy of consideration: Will you roll on traditional grease wheel bearings or oil-filled bearings?

Although grease bearings are generally considered reliable and inexpensive, the oil-bearing manufacturers claim you can trailer up to 40,000 miles without changing the lube (the norm for grease bearings is 3,000 to 4,000 miles). Oil-filled bearings also reduce bearing wear and friction, which contributes to tow-vehicle efficiency, and they are easily monitored via a see-through cap on the hub.

But there are also downsides. Oil-filled bearings may allow condensation to form in the hub, ultimately leading to bearing failure. They are also more expensive than conventional bearings, and they won't work with solid rotor disc brakes.

So which is better? Let's examine each argument, starting with ease of maintenance. Yes, oil baths can be expected to go much longer distances than grease baths, but only if they are used on a regular basis. Let them sit for a few weeks, and condensation can become a problem. Pitting then takes place on the bearings, and the next breakdown is just a few miles away. Rotating the wheels every week or two that your trailer is laid up can solve this problem. So you'll find oil advantageous if you trailer long distances with regularity, but grease wins out if you trailer only on occasion, or if you don't use your boat for weeks at a time during certain periods of the year.

On to the see-through hubs and easy monitoring. If you like at-a-glance checkups, oil bearings win. But the viewable casings are made of plastic, so if you tend to clip curbs while pulling around tight turns, you may want the grease hubs on your trailer.

What about expense? Oil baths are more expensive, but only by five or 10 bucks. Plus, oil-filled bearings may actually save you some cash, because their longevity means you won't have to change the bearings nearly as often. But wait a sec—if you're a do-it-yourselfer, changing grease bearings is fairly simple, while oil-filled bearings require a pro to install and work on them. Considering how many "ifs" there are in this argument, let's call expense a wash. In the long run, either one could turn out to be more or less expensive.

There are a few other factors to consider, too. Grease bearings are the norm across the country, and parts are easy to find. They also often keep on spinning long after a problem arises, allowing you to make way for a repair shop. Not so with the oil-filled variety. Experience a failure where there aren't any dealers, and your rig could be sitting on the side of the road for a while. And when they fail, they usually go up in a more catastrophic manner—everything's running just fine, then you're suddenly sitting on the shoulder.

So which one is better? It depends on you—and what you do. **DIY**

Lenny Rudow was senior technical editor for Boating Magazine *for more than 10 years, and is currently the electronics editor for* Marlin Magazine*, angling editor for EarthSports.com, and boating editor for* Texas Fish & Game Magazine.

LET IT RAIN

This System Uses Deck Space to Capture Water For Rinsing, Flushing and Cleaning

By Edward McDermott

In the Caribbean Islands, you can buy water, but it gets pretty expensive at 60 cents a gallon. Even worse is the work of hauling it back to the boat in 5-gallon cans.

Everyone talks about capturing rain, but this usually involves going on deck while it is raining to catch water in buckets and other devices.

I wanted something simpler and more dry for my C&C Landfall, and I devised a system that met both needs. Better still, it can be built in a single afternoon for about $10, using common parts from a hardware store.

Simple garden hose connections can be used to divert water from the deck.

How much water can you get from a tropical cloudburst? Imagine a cloth about one yard by one yard square and a quarter of an inch high. That will catch roughly 13 gallons. Double the space, and you double the water. Don't believe me? Try emptying your dinghy after a cloudburst.

I thought of several schemes for capturing water, but all required complicated equipment, a lot of setup or both. Then I came up with an elegant solution after watching my four deck drains perform during a cloudburst. Some were plugged with leaves, and the others were struggling as the rain overpowered them. I noted that there was about an inch of water standing on the deck. After quick consultation with a calculator, I figured at least 30 gallons of rainwater was going down those drains.

photos by Edward McDermott

Utilizing his deck drains, the author captures some of the nearly 30 gallons of rainwater that hits his deck for a greywater system to power his head, shower and other non-potable sources.

I decided to build a system that could divert the water to work for me, perhaps not as drinking water but for many other purposes. At the hardware store, I discovered that the components I needed already existed

(evidently people watering their lawns have similar needs). And I could find the components in the right diameter for my existing hoses.

BUILDING THE SYSTEM

I purchased a threaded "Y" adapter for a hose bib, with dual shutoffs, and heavy plastic components to connect my hose to the adapter. My plan was to use these parts to divert the rainwater from my deck, which was carried by a hose to a through-hull above the waterline.

I cut the ends of the pipe and attached the components to give me threaded ends, one male and one female. Then I inserted the Y adapter between them and added a hose to the other end of the Y. With the controls on the Y adapter, I could stop all water flowing through the pipe, allow it to flow to the through-hull or divert the water to the hose. After I had completed assembly, I turned on my shore water to simulate falling rain and made certain nothing leaked.

I did not attach the hose to my water tanks—the hose was more convenient for my purposes. I would not drink this water unless I had to, and even then only if it was treated. But there are many other uses.

The system allows the author to stop all storm water, flow it through to the through-hull, or divert it to use elsewhere on the boat with a hose.

For example, I use this water to flush the head, wash dishes and fill my solar shower. Normally, I leave the drain set to flow to the through-hull. When it is raining, I let it run that way for a few minutes to wash the deck clean of salt, then divert the water to whatever I need at the time.

There is one other aspect worthy of mention: I now clean my decks more often, because I'm collecting rain on that same surface. **DIY**

Ask the Expert

by Paul Esterle

Fabric Hull Liners. Old Fuel. Antifouling Paint. Our Expert Weighs In.

I need some help redoing my 30-foot sailboat's interior walls with a fabric hull liner. I have to replace the original, which came from Hunter Marine in 1977.

I have looked on the Internet and can find only three colors: white, off-white and gray. I am looking for a medium tan, that is mildew- and stain-resistant.

Any ideas on how to get the old stuff off? It has a ¼-inch foam backing that turns to sand when touched.

–David Poss

First of all, I found a supplier called Gary's Upholstery that seems to offer foam-backed vinyl in additional colors. There are at least four or five colors that might suit you.

Personally, I hate that foam-backed vinyl. As you mentioned, the foam turns to dust, yet the adhesive used to bond it to the hull remains. I have tried sanding (it gums up the sandpaper), as well as solvents (be sure you ventilate well and avoid sparks) to remove it. At best, it is a messy, miserable job.

I ended up painting the cleaned hull and applying ceiling strips of cypress and mahogany—it's a much nicer look!

I am concerned about the 3-cylinder diesel (Universal M25) in my sailboat, which uses approximately two gallons of fuel per year from an 11-gallon fuel tank. Some of the fuel has been in the tank for over five years. The engine is also quite noisy, which I thought was typical. Should I be concerned about the old fuel and the engine clack? The engine always starts and runs well.

–Gerald Fisher

The main problems with old diesel fuel are water and loss of cetane rating.

Keeping the tank topped up will reduce water added via condensation. You can also drain your primary filter into a glass container periodically to check for water in the fuel.

The water will also promote "algae" growth on the fuel/water interface. These bugs die and will clog your filters, especially when a rough day on the water stirs up the sediment in the tank. Have spares on hand and know how to change them. You should also learn to bleed the fuel system.

Diesel fuel has a cetane rating, which is similar to an octane rating for gasoline. There are cetane boosting additives that will raise the rating, but I have never had to use them. I've got a 40-gallon tank and my fuel is also about five years old.

My older Yanmar also clacks—in fact we call it our Yanmahammer. As long as the noise level doesn't change, you're probably OK.

We have a Marine Trader 40DC, and I have stripped the bottom to bare fiberglass and will be applying Pettit Protect Barrier coat. This fall, we'll be heading south and spending this winter in saltwater. What antifouling would you recomend? We had Woolsey Premium on before.

–Rod Christie

You didn't say how far south, but many tropical saltwater cruisers swear by Pettit's Trinidad SR bottom paint.

It's not cheap, at about $249 a gallon, but it does its job well. Be sure to read and follow the application instructions and use Pettit thinners if needed.

I don't like to mix manufacturers.

Paul Esterle is a boating writer and editor and the author of Optimizing the Trailerable Sailboat.

The information in **Ask the Expert** *is advice only and should not be used as a substitute for the services or opinions of a marine professional who can directly assess your boat and equipment.*

MORE ONLINE

BUCKET BOSS

Recapping the Saga of One 5-Gallon Can

Earlier this year, we promised to investigate all the uses one could find for a 5-gallon bucket—and there are a lot. We looked at seats, covers and add-ons. We turned it into a washdown, an ice chest and a vacuum. We built what may be the most expensive—and useful—5-gallon marine ever. Take a look at **WWW.DIY-BOAT.COM/BUCKET** to see what obsession can do.

WINTERIZATION!

Resources for Surviving The Deep Freeze

If you have questions about winterization, we have answers.

Mad Mariner's Winterization Page can tell you how to protect your engine and your plumbing, how to build snow covers, how to setup ice eaters and bubbler systems—even how to live aboard in the cold.

There are more than a dozen articles that cover winter-related topics, and all are available free.

Simply visit **WWW.MADMARINER.COM/WINTER**.

Tech Tips

LABELING EQUIPMENT PROPERLY

Labeling equipment can be a real safety booster on a boat, from the dashboard to the fuel manifold. Labels serve as a guidepost—and sometimes a warning—to crew members, and can be a reminder for the captain, too.

If you are going to go on a labeling spree (and that's a good idea this winter), pass on tape or stickers. They always come off eventually, especially in a moist environment.

Instead, choose a vendor on the Internet and have small plastic signs made. You can pick your own wording, shapes and colors, and it is not expensive. You can then attach them with adhesive you already have in your bag.

– Glen Justice

NATURE'S WONDER JUICE

Mother Nature has a wonder juice that cleans, deodorizes and sanitizes, is inexpensive and available worldwide. It eliminates bad smells emanating from a galley sink drain; dissolves built-up calcium in the toilet bowl and crystallized salt in the head hoses; deodorizes the nauseating smell of diesel spills; and removes mold and mildew. Used undiluted, it cleans countertops, stainless steel stanchions and just about everything else. Yes, it even does windows. What is it? White vinegar.

– Martin Samuel

PLEDGE CLEAN WINDOWS

If your boat has isinglass, it's important to keep it clean. Not only will this help lengthen its life, but it is a lot easier and safer to see through isinglass when it's clean. You don't have to use expensive cleaners to get the job done. The furniture polish Pledge will work well. You don't have to rinse off the enclosure after you use the polish, either—just spray it on and wipe clean.

– Chase Thompson

BLACKENED DECK

For all of you fastidious sailors who despair over the faded black on your nice blocks and winches, good old petroleum jelly restores the color and luster beautifully. A small amount is all you need.

– David Doody

NO MORE SPILLS

Find an old fuel-water separator from a used boat parts store, or buy a cheap one from a supply shop. Place the separator in the vent line from your fuel tank. If you mount it correctly, you can easily tell when the tank fills because the unit will be getting fuel—and you'll never spill a drop over the side.

– Joey Buettner

DIY Rigging Class Draws More Than 100 Boaters

Sailors Passed a Good Time in Annapolis (and Almost 95% Say They Would Do It Again)

More than 100 sailors gathered at DIY's latest Skills Class in Annapolis to learn more about rigging, from safety inspections and tuning to the latest in cost-effective upgrades.

The class was heavy on basics, as professional rigger Mike Meer, of Southbound Cruising Services, walked through a long list of common problems.

In photo after photo, Meer illustrated cases of neglect seen in the yard, from taped turnbuckles that hide damage to cracks and corrosion at every point from chainplates to masthead. Often, the result was catastrophic failure.

SYNTHETIC RIGGING

The second half of the evening was devoted to synthetic rigging, which replaces traditional metal wire with rope that advocates say is stronger than steel, less likely to stretch and can dramatically reduce the amount of weight aloft.

Some experts say synthetics are one of the biggest advances in sailing to come along in decades, allowing sailors to do their own rigging more easily and increasing self-reliance.

John Franta, the head of Colligo Marine, took the stage to explain how synthetic rigs work and answer a bevy of audience questions, from the cost of installation to the expected longevity these rigs provide.

He was followed by Andy Schell, a licensed captain and boating writer who runs Father and Son Sailing. Schell completed a synthetic rigging installation on his 35-foot Allied Seabreeze yawl last year, which was on display at the show (he wrote about the project in DIY's Issue #3 2010).

Samples of Colligo's synthetic products were also on hand, allowing participants to get acquainted with the new gear, and Schell gave a splicing demonstration. All three instructors stayed to answer questions after the class.

In a survey completed by participants, almost 95 percent said they would take another Skills Class.

DIY writer Andy Schell demonstrates techniques using synthetic rigging to attendees of the DIY rigging course in Annapolis, Md.

AFFORDABLE LEARNING

DIY's Skills Classes are held nationwide on a variety of topics. They are designed to provide hands-on learning in an afternoon or evening, at prices that most boaters can afford.

Participants took home a rigging CD with dozens of stories from the DIY archives and a gift bag with products, samples and discounts worth more than $100.

A raffle gave away more than a dozen pieces of gear, including Colligo synthetic rigging products, an Autotether Wireless Safety Lanyard, a moisture meter and more.

Sponsors of the class included Starbrite, West Systems, Treefrogpad, Autotether, Colligo, Sea Tow, J.R. Overseas, Forespar, Defender Industries, V-Lock, Shurhold, Canada Metals, Coveralls, Big Kahuna and Intelligent Maintenance. **DIY**

The Galley

A Special 17-Page Report from DIY Boat Owner

30 Stainless Steel Worktops

32 Replacing Laminate with Corian

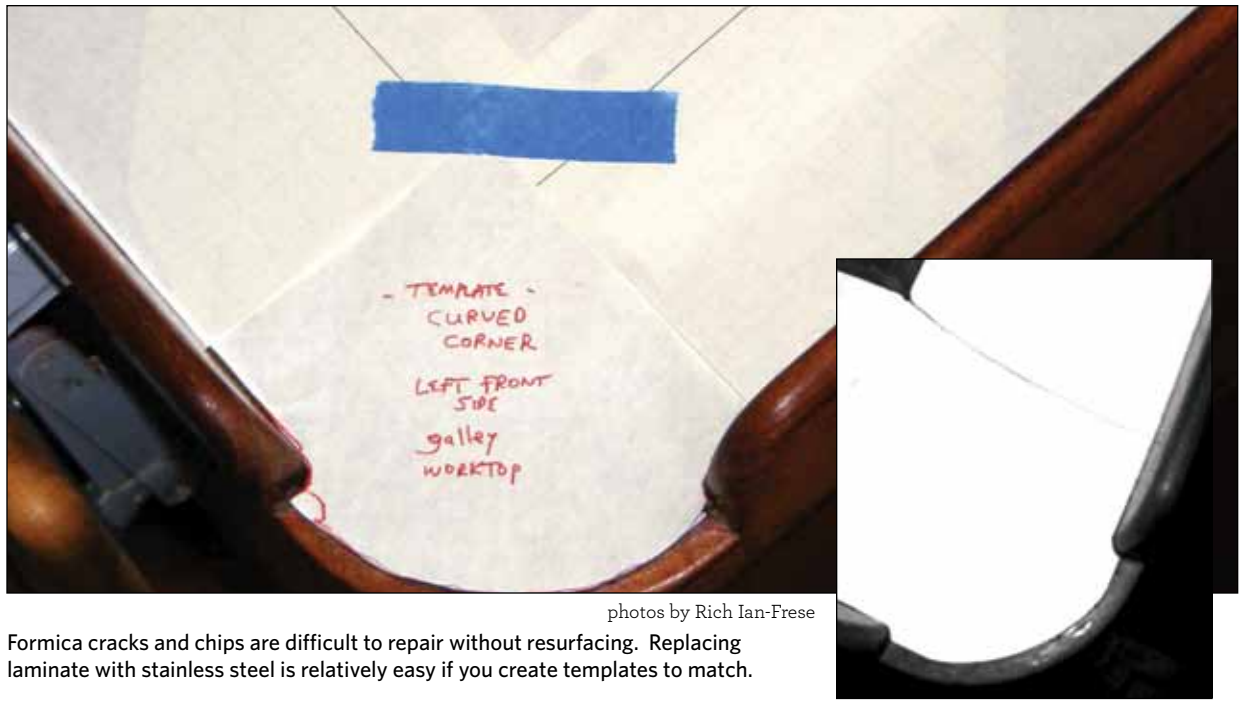
34 Creating Extra Counter Space

37 Cool Ways to Save Power and Keep Food

41 Get Your Caffeine Fix on the High Seas

42 Install a Microwave for Quick and Easy Meals

46 Escape the Galley... Cook Topside



photos by Rich Ian-Frese

Formica cracks and chips are difficult to repair without resurfacing. Replacing laminate with stainless steel is relatively easy if you create templates to match.

KISS THAT LAMINATE GOODBYE

Give Your Counters New Luster with Stainless Steel

By Rich Ian-Frese

Brushed stainless steel sheet metal is an excellent choice when replacing or resurfacing an existing galley worktop. The material is thin, lightweight, stylistically neutral and extremely easy to clean and maintain.

It is virtually indestructible, unlike the more fragile plastic laminates such as Formica. It is also inexpensive to fabricate and install, unlike solid-acrylic polymer surfaces like Corian. Best of all, it is easy to retrofit over an existing surface that has sustained cosmetic damage that is difficult to repair.

Sixteen gauge stainless sheet metal is thin, at .0625 or about 1/16 of an inch—barely noticeable when added to an existing surface. Unless the countertop that you want to resurface is heavily damaged, rotted or extensively delaminated—in which case repairs must be made first—all that is required is an accurate template of the old worktop, which can be taken to a good sheet metal fabricator and used to cut out the new stainless countertop. That is then bonded, permanently, over the old surface.

Rich Ian-Frese is a freelance writer. His work has appeared in numerous publications. Rich and his wife, Cat, have been refitting, living aboard and voyaging throughout the Northeast Pacific Ocean on, Anna, *their Tayana 37 cutter, since 2000.*

CREATING A TEMPLATE

If the countertop to be replaced does not need major repairs, the first step is to create an accurate template of the worktop surface. This is straightforward, but it requires some care to accurately replicate curved edges and other difficult shapes.

I handled curves by tracing each onto a separate sheet of tracing paper. It may also be possible to replicate the contour by creasing the paper along the edge of the curve. Top-opening lids, if any, need to be traced as well.

Once all the curved sections and openings are traced, cut them out carefully and tape them to the rest of the surface template. This way, the entire countertop surface is re-created.

It is then a straightforward job to transfer the initial mockup to thicker poster board and cut it out to create the final template. Modifications can be made if needed. When you are satisfied that the template is an exact fit, a reliable sheet-metal fabricator or machine shop will use it to create your final product to your exact specifications.

INSTALLING THE COUNTERS

For my new galley worktop, I specified 16 gauge—or 1/16-inch thick—304 stainless steel, with a No. 4 hairline (HL) brush finish. The cost is about $17 per square foot. We all know that stainless steel resists rust and corrosion, thanks to its high chromium content.

Another advantage of this selection is that the grain is continuous and runs the length of the sheet. A continuous, long-grain hairline finish allows minor scratches to be repaired easily by sanding with 120-grit sandpaper and finishing with a 3M Scotch-Brite abrasive pad.

Before installing the stainless counters, repair minor flaws in the original surface. Often, a small section of plastic that has delaminated can be glued back down or cut out and replaced with a filler piece, so that the surface is a uniform height. A clean, dry and solid surface is required.

After getting the new stainless countertop back from the sheet metal shop, I was ready to bond the new top to the old surface. I checked to make sure that the machine shop work was accurate by laying the templates over the new stainless cutouts. The new stainless pieces matched the templates perfectly.

I then dry-fit the new worktop in the galley. One advantage of stainless plates is that, if the existing countertop has fiddle rails, they do not need to be removed during installation. The dry fit went well, so I continued on to the permanent installation.

I used 3M™ Contact Adhesive (Scotch-Weld™ 10, light yellow) to ensure an excellent bond. This product can be used for joining laminate, wood, steel and nonporous materials without clamps or presses. It should be applied at room temperature to both surfaces. I made sure that both surfaces to be coated were clean and dry and then applied three coats to each, leaving about 10 minutes between them for drying. I did all countertops and lids this way.

It was handy to use Venetian blind slats to separate the two coated surfaces, so that I could adjust the position of the new countertop or lids before it bonded permanently. Once the two surfaces come into direct contact, it is no longer possible to reposition them. When the two surfaces were aligned correctly, I removed the slats and let the adhesive do its job. Afterward, screw holes for attaching lid handles can be drilled and the lids replaced.

DURABLE WORKTOP

After two years, my brushed stainless galley worktop looks as handsome as the day I completed the installation. It has required no maintenance and shows absolutely no signs of age or wear.

Stainless is tough stuff. That's why they use it in commercial kitchens. It doesn't need paint or surface finishes, it's indifferent to extremes of hot and cold, and it will not burn, buckle, fracture, chip or delaminate. What's not to like?

The most labor-intensive part of this project was the creation of the templates for the two galley worktop surfaces and three lids, a total of five separate templates that took about 10 hours.

But the savings was worthwhile. I spent $250 to complete my galley project: the brushed stainless steel sheet metal ($100), the contact adhesive ($20) and the $130 the machine shop charged me for cutting. If the sheet metal shop came to my boat, made the patterns and then cut the stainless sheets, and then a contractor installed them, the cost could have easily topped $1,000. **DIY**

The new countertop blends well with the other stainless appliances in the galley.

Replacing Counters with Corian

turn the page >>

SERVING UP SOMETHING NEW

Corian Transforms One Galley into a Modern Cooking Space

By Harry Hungate

The galley is the most used area on a liveaboard sailboat and, having just completed a circumnavigation, our Formica countertop and fittings were looking tired. Rather than replace the Formica—we considered it old school—we went with Corian.

This synthetic material is durable, available in an incredible array of colors and textures, and can be shaped with ordinary woodworking tools. We found a kitchen supply company that had a surplus white Corian counter that would easily cover our galley worktop, and at $20, we could not have been happier with the price.

Harry Hungate and his wife Jane Lothrop are liveaboard cruisers and have continuously upgraded their Corbin 39, Cormorant.

First, we removed the water tap and the foot pump spigot from our vessel's existing counter. Next off was the teak trim. Because it was all custom made, it was critical that we not destroy it in the process.

The trim was attached with screws concealed under teak plugs. To remove the plugs, I drilled a small hole in the center of each plug until I felt the drill bit touch the screw head. Inserting a screwdriver into the hole and backing out the screw forced out the teak plug with no damage to the trim. Some gentle tapping with a putty knife and mallet loosened the trim for complete removal.

photo by Jane Lothrop

The author carefully working on the trim surrounding the counters.

The old sink had a flange above the countertop, and it was removed easily by taking off the brackets below it. After removing the old sink, we detached the old Formica counter, which would be used as a template for the new Corian worktop.

I cut the Corian to shape with a table saw and used a band saw and disc sander to round the two corners. I added an extra 1/16 inch for final fitting against the mating edge of the countertop. A few thin wooden wedges placed between the Corian and the galley counter frame were required to level it with the mating surface.

With the new countertop temporarily in place, the next step was to measure for the new sink. It was larger than the old sink and had a concealed flange, so it was critical that it

be located with sufficient room to install the faucet and spigot. It also had to clear the supports for the galley counter.

With the cutout for the new sink marked, the Corian blank was taken back to my workshop, where the actual cut was made with a saber saw. A wood rasp and sanding block removed the saw marks and a router was then used to round the upper edges of the cutout.

This was the only part of the job that required some skill, as a router in a beginner's hands can do damage very quickly. After making a few trial runs on scrap Corian, I used a ball-bearing bull nose router bit to make the final cut. If you are not skilled with a router, get someone who is to do this task, or use a sanding block to round the edges.

A general purpose marine adhesive/sealant such as 3M or Sikaflex can be used to bond the new sink to the Corian countertop to the galley counter. We used white 3M 4200 applied with a cartridge gun.

After the adhesive cured, the trim—newly sanded and varnished—was carefully fitted into place and bonded to the Corian with the marine adhesive. The screws and teak plugs were replaced and final coats of varnish were applied. We installed a soap dispenser as an added bonus.

photo by Henry Hungate

Installing the fresh water spigot, mixer tap and soap dispenser in new countertop.

Overall, the project took two weeks (we had to wait for the arrival of the new sink) and the total cost was about $180, most of which was the sink at $120. **DIY**

Creating Extra Counter Space

turn the page >>

Every Galley Needs More
COUNTER SPACE

By David Aiken

photos by Zora Aiken

This temporary galley counter/shelf fits over the companionway ladder and stores neatly along side it when not in use.

It used to be that the primary goal for boat meals was to keep them simple. Entire cookbooks were devoted to this "non-cooking," in this spirit of KISS (you remember: keep it simple, stupid).

But as galleys got better equipped, cooks got more inclined to prepare real meals. Many of today's galleys boast house-sized appliances—some even have restaurant-style upgrades.

Smaller boats will always be more limited by space, but all boats can benefit from a simple modification. Adding extra counter space near the galley can eliminate the hassle of a dinnertime juggling act. With a small, dedicated shelf or two, even the smallest-boat chef can serve an assortment of dishes, each of which can be passed around one at a time and returned to its assigned place without destroying the cook's ongoing activity at the stove.

COMPANIONWAY SHELF

On many boats, the galley is positioned alongside the companionway hatch, one side or the other (sometimes both). With this arrangement, it's easy to add a small shelf or counter that will fit over the companionway ladder when needed and stow alongside the ladder or underneath any flat surface when not in use.

For the galley aboard our Chris-Craft, I measured a 21-inch length for a shelf that would extend across the ladder, to be supported by brackets on each side. The 11-inch width of the shelf was determined by a piece of ⅜-inch finished plywood that had been left over from a previous project. I planned to install a strip of 1-by-2-inch pine on each side as a support piece for the shelf, but soon realized that the starboard side did not need this added bracket. A fiddle (fid) was already in place in front of the sink, and it was the perfect height to support the new shelf.

For the opposite side, I cut the 1-by-2 and attached it to the bulkhead to match the level of the existing fid. I checked its placement with a carpenter's level to be sure the shelf would not sit on a tilt. I planned to paint the shelf and bracket white to

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David Aiken has lived aboard a classic Chris-Craft sailboat for more than 25 years. He and his wife Zora are the authors of Good Boatkeeping, 2nd Edition*;* Cruising, the Basics*; and* Fiberglass Repair: Polyester or Epoxy.

match the bulkhead, but if the shelf were to be finished bright, a matching hardwood could be used for the bracket(s) as well.

To hold the shelf/counter in place for its temporary use, I drilled a hole through the shelf at each end, and continued drilling about ½ inch down into the support piece. I inserted a cotter pin into each hole; the pin fits through the shelf and into the support backing to prevent the shelf from shifting. Because I wanted to stow the shelf next to the companionway ladder, I did not want to add a permanent fid, but a removable one could be made to prevent anything from sliding off the front of the shelf. Short pieces of dowel rod can be inserted and glued into the fid at 2-inch intervals, to extend ⅜ inch out of the bottom. When matching holes are drilled along the front edge of the shelf, the fid can be inserted and removed.

Rubber-mesh placemats are practical to use on the shelf, to keep things from slipping. A wet dish towel or even a damp paper towel also works in a pinch.

A hinged counter, above, or shelf is instantly available when needed and folds neatly against the bulkhead when not needed, above right.

HINGED SHELVING

In addition to the companionway, most boats have a number of places where a small shelf could be installed for temporary use without creating a storage problem when it's not needed. The end of a bunk usually has a bulkhead onto which a shelf can be attached, hinged to fold up when needed, and down when not. On our boat, the best spot was the forward cabin's starboard seat. At the aft end of the seat is a half-height bulkhead that defines the galley area, so a shelf there was perfect.

I measured the available height and width, and was lucky to find the exact width (12 inches) in a 4-foot length of ½-inch shelf stock with a neatly finished surface. I cut the appropriate length (for this shelf, 16 inches), cut a small diagonal section off each of the non-hinged corners, then rounded them using 80- and 120-grit paper on a finishing sander. I finished the shelf with primer and two coats of white enamel.

To install the shelf, I cut a 12-inch length of stainless steel continuous hinge (also known as "piano" hinge) and used

stainless screws to attach one side of the hinge to the underside at the rear of the shelf. I also attached a rubber bumper further down on the back side, so the shelf would fold down quietly and neatly.

Holding the shelf against the bulkhead, I raised it to its horizontal position (opened the hinge), to make sure it would sit level and clear any obstructions that might be at the bottom of the bulkhead in the fold-down section. When its correct position was confirmed, I screwed the other side of the hinge in place onto the bulkhead.

Because the shelf/counter will often be used for food containers, some of which will be heavy and all of which will demand careful handling, I wanted a secure hold-up for the shelf, and so I chose a barrel bolt. First, I attached the bolt to the

top surface of the shelf, opposite the hinged end. I put a strip of masking tape on the surface into which the bolt would eventually slide (on our boat, this is a wooden framework around the galley lockers), and I marked the end of the barrel boat with a soft lead pencil. Then, opening the hinge and holding the shelf level, I pushed the barrel bolt against the tape, so it would leave a center dot as my guide for drilling. I drilled into the wood at the same angle as the bolt, using the ¼-inch bit to match the bolt's diameter. The hole must be deep enough so the bolt can slide in and turn into its locking position.

The barrel bolt may not work in all installations, but other hold-ups are possible. A sliding hatch adjuster—or even a piece of 1-by-2 hinged and fitted with a stop to hold it in place—can run diagonally from the underside of the shelf to the bulkhead. A basic line-and-cleat arrangement might also provide a simple but secure solution.

The cost to add these two temporary shelves to the galley was about $50, and the time to complete both projects was about six hours. **DIY**

photo by Zora Aiken

The author cut diagonal segments off the two non-hinged corners, and then rounded them with a finishing sander.

photos by Quent Kinderman

Clockwise from left: The old box lid, built mostly of plywood and fiberglass, provided almost no insulation value. Blocks of foam insulation inside vacuum bags used to fill open space inside the refrigerator box. The new digital thermostat has two control circuits; the second runs the system when alternator power is available.

FROSTY FREEZE

Cool Ways to Save Amp Hours

By Quent Kinderman

There is no way to cool food and drink quite as cost effectively as ice. Unfortunately, it's also labor-intensive and messy. It drives many of us to install refrigeration. Now, instead of humping blocks of ice, we are charging batteries.

The more the refrigeration system runs, the more we have to run the engine or generator to charge batteries. But there are some ways to make your fridge more efficient.

To cut the system's run time—and therefore battery usage—we must do a better job of getting the heat out of the box and keeping it out. Our Pearson 424 sloop, Clairebuoyant, has a 12-volt, ½-horsepower holding plate system, but evaporative systems such as the popular Cold Machine can be improved, too.

How much can you improve your system? Our refrigerator, once a major power hog, now runs on less than 50 amp hours per day, which is provided entirely by solar panels. Here are a few ideas that worked well on our boat to improve both things.

INSULATION OVERKILL

Some experts say that there is a diminishing return on insulation. They say 4 inches for the refrigerator, and 6 for the freezer, is plenty. However, insulation is cheap, and the stuff from home improvement stores works fine. Using canned foam outside the box and sheet foam on the inside, covered with laminate and sealed with caulk, our insulation is limited only by the space available. The materials cost is relatively cheap, especially when compared with cooling the same space over and over as heat leaks into the box.

Canned foam, such as Great Stuff, is especially useful for getting to the difficult-to-reach cavities that ex-

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Quent Kinderman is retired from everything except boats and writing about them. His work has appeared in numerous publications. He spends a lot of time sailing or fixing Clairebuoyant*, his Pearson 424 sloop.*

ist on most boats outside and around the refrigerator compartment. Use a copper tube to extend the reach of the can, and take care to avoid overfilling closed spaces with high expansion foam. The stuff has a surprising ability to push panels out of the way. Around the box, we filled all the way to the hull. Is it overkill? Perhaps it is—but it works really well.

Lids are especially important in improving efficiency. Almost by definition, space for a lid is limited. Anything that is not actual insulation is wasted space. Our lid is simply insulation covered with Formica. Surprisingly durable and light, it has held up well as a part of the countertop for several years. We enclosed a vacuum panel inside the lid with two 2-inch-thick foam panels to make it as insulated as possible within the thickness constraints.

The vacuum panel did cost more than sheet foam, but the lid is really the only place where thickness is limited and heat cannot be stopped with cheaper materials. Compared with the original lid, this is a major improvement. Remember, only insulation stops heat transfer. Fiberglass, wood and plastic might be pretty and durable, but they don't help keep the box cold.

LID SHUT, FRIDGE FULL

Something as simple as adequate lighting can save precious minutes of open lid time. We mounted lights over the box so there will be no time-consuming searches in the dark.

Organizing the refrigerator box is critical because the more time the lid is open, the sooner the system runs. Instead of shelves, we organize food into labeled storage boxes and stack them in the refrigerator. Lock & Lock boxes are leakproof and available in many sizes; we find them excellent.

To avoid empty space for warm air, we use foam insulation, the same stuff we used to line the box, cut in blocks and sealed in vacuum bags. We pack them around the outside of the interior as the box is emptied. You really can't have too much insulation. And this reduces warm air infiltration.

COOL WHEN YOU CAN

Perhaps the only thing on a boat that is free is electricity while the engine runs. A digital thermostat installed on the refrigeration system that has a second circuit for when charging power is available is a good idea. It can start the compressor early and freeze the holding plates or cool the refrigerator to minimum temperature without depleting batteries. Some sophisticated refrigeration systems do this, but it is easy to add to any thermostat-controlled system.

There are sources for very sophisticated thermostats that will do all this and more for an expensive

Organize and Protect Your Food in the Icebox

When my wife and I shove off for a multiday Chesapeake cruise, we can't bring the big bed and the HDTV, but we won't skimp on food. Since the icebox on our 30-footer has limited capacity, we try to use every bit of space. That means keeping things as organized and as cold as possible—and there are some inexpensive tricks.

We've discovered that a few, short, spring-loaded curtain rods (about $3 each at Walmart) will keep most lightweight items like cans and bottles from rolling around. They're available in a variety of lengths and are easy to place, adjust and remove. Heavier items might slide in rough weather, but they'll still be separated.

To organize and protect food, we use an assortment of plastic containers from such brands as Ziploc, Rubbermaid and Sterilite. With drinks at the bottom, the containers can be stacked to the top of the box so no space is wasted. They keep fragile items from getting crushed and make everything easy to find—no more digging around looking for that bruised and soggy onion.

Our icebox drains into the bilge, so we fill some containers with ice instead of dumping loose cubes all over. When the ice melts, we pour out the water and keep our bilge more dry. If we have something that we want to keep frozen, like fish fillets, we'll pack it in ice inside a small, cheap foam cooler, which we stick down into a corner (we call it "the freezer"). As the containers become empty, they can be used as spacers to keep things in place.

Since our icebox has no refrigeration and is totally dependent on ice, I've added some insulation to help keep things colder longer. I bought a roll of a foil-and-foam home insulation that's about ¼ inch thick at Home Depot (Lowe's sells the same product), and used heavy-duty, indoor/outdoor double-stick tape to attach it to the outside wall of the icebox that faces the engine. We usually motor about half an hour to start any trip, so the extra layer of insulation keeps the engine's heat out. I also cut a square and taped it to the underside of the lid, as well as made a little blanket to lay on top of everything—useful for keeping the cold contained as the icebox nears empty.

– Chris Ferro

The new 5-inch-thick lid for the refrigerator is virtually all insulation. Wood trim around perimeter provides rigid sealing surface.

photo by Quent Kinderman

price. We were able to find the popular Carel digital thermostat, which does everything necessary for about $150, at www.rparts.com. Visit the website to read the manual or check out Rpart's excellent instructions on how to install and wire the thermostat.

Each circuit has two adjustments, a temperature set point and a differential that determines how warm the holding plates or the refrigerator can get before the compressor starts. On the second circuit, adjust the differential down, but leave the temperature setting the same. The object is to turn on the compressor early and freeze the holding plates but not freeze the veggies.

A battery combiner will work to sense charging if the charging source can hold the voltage up when the refrigeration runs. It is a problem if solar panels raise the voltage but the compressor load pulls the voltage down. Using an oil pressure switch on the engine avoids this problem.

On a water-cooled system like ours, some might think that an 8 amp, 6 gpm cooling water pump is overkill. A smaller pump would use a couple of amps less, but the compressor would run harder, and a few minutes longer. The refrigerant would enter the refrigerator box a little hotter. Because the compressor draws 30-plus amps, even a few minutes' less run time saves more than the pump uses, and the better cooling reduces compressor head pressure and power requirements.

We use small computer fans to move air around the box when the compressor runs. They don't cost much, draw little power and fit by the holding plate. Cooling everything slows down the melting of the holding plates and extends the interval between compressor runs. These compact blower type fans, available from www.surpluscenter.com, cost only a few dollars and last a few seasons. They fit nicely against the inside wall of the refrigerator.

THERMOMETER DIAGNOSTICS

An infrared thermometer, or "heat gun," is a great tool for maximizing refrigerator performance. It shoots an infrared beam that reads out temperature and will quickly tell you how hot the compressor is running, how well the condenser is cooling the refrigerant, and if your holding plates or evaporator are freezing properly.

A good test that we use for the box lid is to place a couple of pillows on top of the lid. After awhile, remove the pillows and take the temperature of the lid. If it cooled significantly, you need a better lid. Looking around the outside of the box, use the thermometer to find spots that are cooler than their surroundings. These are places that need better insulation.

Remember, the object is to keeps things cold inside the box, not outside of it. **DIY**

Onboard Espresso

turn the page >>

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ESPRESSO, ANYONE?

A Little Imagination Means a Morning Latte for One Sailor and His Crew

By Marlin Bree

Every morning when I am cruising, I wake up to the aroma of an espresso machine hard at work making me a latte. What's that? Yes, this is in the micro-galley onboard my 20-foot sloop, *Persistence*—and my question is this: Why shouldn't every proper little boat have an espresso maker?

Frankly, almost anyone can enjoy a cup of latte in the morning, even if you don't have the power or the space to run one of those giant home machines. The basic parts cost less than $50. All you need is a fist-sized espresso maker and an old tin cup. Sound OK so far?

The heart of my lashed-together operation is a camp espresso maker, which can be found on the Internet and costs about $18. This little cast-aluminum pot consists of a bottom into which you put water (your best spring water from a bottle), and a top into which you pour your pre-ground espresso coffee beans. I like Starbucks, but that's me.

After tamping down the beans, you screw the top onto the bottom, and then place the pint-size espresso maker atop your stove. I have a one-burner butane stove with piezo lighter, which turns on quickly and burns like a little blowtorch. I usually put a campfire toaster—a round metal plate that costs about $4—between the burner and the espresso maker to secure it atop the flames, which is useful if the boat is rolling.

As you wait, your little blowtorch stove goes to work as steam and scalding water bubble up, extracting flavor and subtracting bitterness, and the rich brew sputters.

Next you spoon about three tablespoons of powdered milk in your cup, and then add about a third of a cup of spring water. Stir. Experiment a bit. A little more milk offers a richer brew. Place the mug atop the espresso maker. Before long, the hot dark liquid will bubble up through the nozzle and into your heated cup. If you're quick, you can even do two cups of latte, one for you and your partner, by switching back and forth and using half the milk recipe.

No, it's not a venti skinny soy with an extra shot and almond foam. But the resulting coffee never fails to impress, and if you tell me that it isn't exactly latte, I will tell you it ain't bad. For a real coffee lover, little things mean a latte. **DIY**

photo by Marlin Bree

Marlin Bree built his own 20-foot wooden boat Persistence *and has chronicled his adventures in* Broken Seas, Wake of the Green Storm, Call of the North Wind *and* In the Teeth of the Northeaster. *He is a two-time winner of Boating Writers International's Grand Prize Award.*

Adding a Microwave

turn the page >>

GO AHEAD, NUKE IT

A Microwave Can Turn a Frigid Ride into Paradise at Sea

By Quent Kinderman

It's 3 a.m., and you're several hours west of the warm waters of the Gulf Stream. The damp chill of the Atlantic has found its way into your foulies. The boat pitches and rolls as the autopilot carves an almost straight line toward the still invisible lights of Newport harbor. Your watch mate shivers, and then suppresses a yawn. Dawn is still hours away.

You glance down the companionway to the cabin's dim red lights and the gentle snoring of the off-watch crew. You don't want to disturb their well-earned rest—but you do want a warm eye-opener. Then you remember that this boat has a microwave oven! You catch your watch mate's eye. "Would you care for a spot of tea?"

Adding a microwave is an economical project that can be done by many DIY boaters. And, while traditionalists may sneer, there is much to recommend one. If you are willing to put up with a little work—and some trial and error—you may be glad later, on some cold, dark night.

LOCATION, LOCATION, LOCATION

Most sailors opt to put the microwave in the galley. After all, that's where the food is. However, putting the microwave anywhere near the companionway is a bad idea.

Kitchen appliances do not like water, either seawater or rain. If the galley is near the companionway, it is better to mount the microwave forward in the cabin, in a dry spot.

If the galley is forward, as it is on our boat, it will make a fine home for a microwave, so long as it is clear of the stove and the sink.

We borrowed some storage space in the left corner of our galley, paying careful attention to the way the microwave door opens. Most microwaves are hinged on the left side so that you can open it with your left hand, and handle the food with your right. If the microwave on is the left side of the galley, then the door won't get in your way. With hot food and a moving boat, this is important for both convenience and safety. Ideally, the microwave should also be at countertop level and close to open counter space.

Lots of boat show beauties have microwaves

mounted at eyeball level or above. Copy this plan at your own risk. A face full of hot chili when the boat pitches would certainly make for a memorable cruise.

If you plan to use the microwave offshore, have food and drink containers suitable for rough conditions. Wide bases and vented lids are good, as is a pair of insulated kitchen gloves for extricating hot containers from the microwave, especially if the oven door is heeled down toward you.

Securing the microwave itself in place is also essential, but not difficult. We built a shelf from scrap wood and secured the microwave with a long hose clamp, but there are any number of ways to secure the unit. Play around with what works on your boat.

photo by Quent Kinderman

The author installed the microwave on the left side of the galley so that the microwave door would not block access. The shelf and hose clamp that position and secure the microwave are visible.

POWERING

You could use the microwave only at dockside, or crank up the genset each time you use it, but this is incompatible with the instant gratification that makes microwaving food so special. Microwaves are on/off machines. At lower power settings, they switch on and off a lot. This will drive many small gensets crazy. They also draw large amounts of power for brief periods of time. This profile is ideally suited for an inverter and a capable battery bank.

Of course, it's not quite that simple. Many inverters produce an approximation of AC current commonly referred to as "square wave." Some electronic devices find this choppy current difficult to digest. There are true sine wave inverters that might avoid this problem, but they are more expensive—and we already had our square-wave inverter in place.

We found a nice microwave that works with square wave, but we also found a half dozen that did not work right. The keeper was an 800-watt GE unit that we found at Home Depot. It works fine but produces slightly less power on the inverter than it does on shore power. It has provided several years of service so far and has proved to be quite reliable.

The other units would cook, but their timers did not work properly on square wave power. The only foolproof method to find a microwave that is compatible with your inverter is trial and error. Keep the box and packing until you are sure it works. Of course, if you can find a unit with the old-style mechanical timer, that might work, too.

SIZE MATTERS, REALLY

I favor the so-called compact countertop microwaves of about 800 to 900 watts. They fit better than bigger ones, and they leave more space for ventilation. They are within the capacity of a 1,000-watt inverter such as the Freedom 10. Our 2,000-watt Freedom 20 handles it easily. The 90 to 100 amps DC that the inverter draws from the batteries when running this size microwave is a manageable load.

In fact, a microwave might be the biggest load for your inverter. Be sure that your battery bank is up to the challenge, that the battery-to-inverter cables are properly sized and that the cable connections are properly maintained. It is possible to augment the batteries by running the engine alternator. Be sure to run at least a fast idle to cool the alternator.

Boat-sized microwaves will probably draw about 10 amps AC. This is entirely dependent on how powerful the microwave is and will always be more than the cooking watts rating. Most modern boats have 30 amp shore power so a microwave will run smoothly at the dock. Most inverters switch on or off depending on the availability of shore or generator power.

photo by Quent Kinderman

The microwave is mounted in space we borrowed from galley storage, a safe distance from the sink and stove.

Should you run a separate AC circuit to just the microwave so you can shut it down? You can do that, or just plug it in to the galley outlet. We compromised and added an extra socket out of sight but downstream of the GFCI outlet.

Because a microwave is designed to draw power for the display whenever it is plugged in, it is best to have a way to disconnect it when not in use. You can simply pull the plug on the inverter, turn off the galley circuit breaker, or turn off a separate AC circuit for just the microwave if you installed one.

However you choose to wire it, be sure that there is a GFCI in the circuit. GFCI stands for ground fault circuit interrupter. It is a safety device required on all boats with AC power and on all AC circuits. It does not matter if you intend to use the microwave only with an inverter. Inverter AC power is as deadly as shore AC power, and there must be a GFCI in the circuit and the wiring must meet marine standards and codes.

COST AND EFFORT

Installing a microwave is not expensive. The microwave will cost less than $100, perhaps considerably less. If you need it, a new GFCI-protected outlet, circuit breaker and wire will probably cost another $100. For an installation like ours, add a few more dollars for a large hose clamp, a few pieces of wood and marine plywood for the shelf. If the space already exists, and you plug into an existing outlet, this project will take only a couple of hours. Be sure the microwave is firmly secured in a dry spot.

There is only one exception when it comes to expense: Should you not already have an inverter and choose to add one, expect to spend $1,000 or more. A hard-wired inverter requires some expertise to install.

Wiring also requires some technical knowledge. If you do not have the appropriate skills, or if you are not familiar with the appropriate electrical codes (American Boat and Yacht Council and U.S. Coast Guard) and you wish to add a new circuit, it is best to have a qualified person do it.

Do not underestimate the danger of electricity—especially near water. **DIY**

THINK OUTSIDE THE BOX

One experienced skipper we know never uses his microwave oven at sea. On his yacht, the microwave has found a higher calling as a grounded metal box to store an extra GPS.

The screening designed to keep the microwaves in may also serve to keep wild electricity out. This is a type of Faraday cage, a device to protect vulnerable electronics from lightning-induced surges.

A modern sailing yacht is only one lightning strike away from having a Christopher Columbus navigation system, and there is plenty of lightning in the Gulf Stream.

The extra GPS is for getting home when all else fails. The captain thinks that this is as important as a cup of tea on a cold night watch. He's right.

– Quent Kinderman

SIZE DOES MATTER

In the Galley, Where Smaller Is Better, A Few Bucks Can Save a Lot of Space

Upgrading the galley does not have to mean structural work. You can also make better use of space—and there are a bevy of strategies and products to help.

First, take stock of what you have, and eliminate items you don't use. Take items used only occasionally and put them in a sealable tub, which can be carried on and off the boat.

Then, walk through a housewares store with an eye toward the galley—and replacing gear, not adding it. The goal is to substitute kitchen-sized accessories with smaller items and create more space.

The options are vast. You'll find flexible silicon baking pans, lay-flat spaghetti colanders, adjustable measuring units, napkin-sized cutting mats, stacking plastic and metal canisters—even miniature appliances. All can help you do more in less space.

Steer toward affordable places (not high-end kitchen stores), and it need not be expensive. You may find that $50 to $100 frees up several cabinets and lockers—and that's a lot cheaper than renovation.

– Glen Justice

MORE ONLINE

Installing a Stove and Propane Locker

No galley issue would be complete without addressing how to install a stove and a safe and efficient propane locker—and DIY did that back in February.

In case you missed it, we have made both articles available free on the DIY website. The articles walk you through one captain's installation and inspection, including how he complied with ABYC standards for safety. Simply visit either of these two pages:

WWW.DIY-BOAT.COM/STOVE
WWW.DIY-BOAT.COM/PROPANE

Escape the Galley Cook Outside
turn the page >>

photos by Tim Flanagan

COOK TOPSIDE

Escape the Galley and Prepare Your Meals Where the Action Is

By Tim Flanagan

Magma Kettle barbecue grills are nearly ubiquitous throughout North American cruising grounds. I've owned one for a couple cruising seasons now, and I've learned a lot about the ups and downs of these units.

Let me say right off that this grill has enhanced our cruising experience more than any other single improvement. Moving cooking operations out to the cockpit removes the steam, splatter, and spills from the cabin entirely.

Even more significant, though, is the elimination of the bottleneck at the cabin door, which is where the galley is on our boat. The rest of the crew can come and go as they please while I cook astern. It sounds silly, but cooking out back seems to make the boat physically larger. On a 22-foot boat, a change like this is almost as good as buying a boat 3 feet longer.

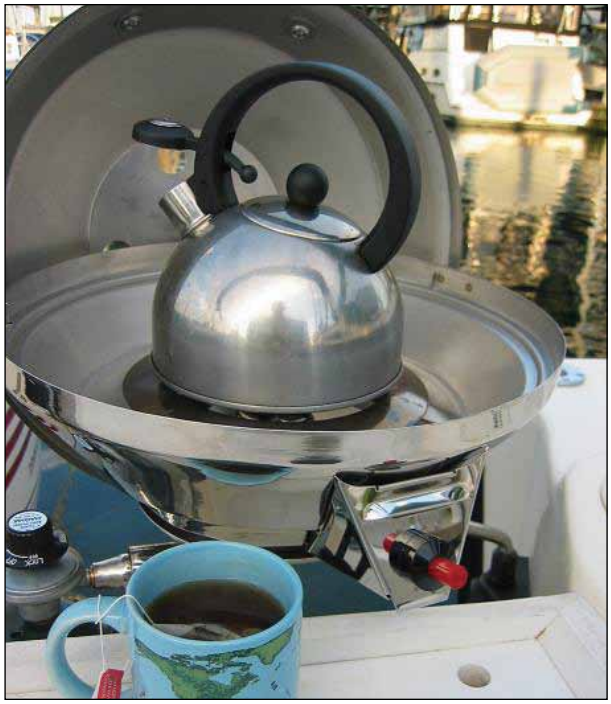
It serves as a strong general example of how we can stretch the utility of our boats by buying the right gear—and stretch the utility of that gear with a little work and thought.

Tim Flanagan is the author of Navagear.com, a gear and gadgets blog for cruising boaters.

KETTLE AS STOVE

I've got a Magma Marine Kettle 2 combination stove and gas grill in the "original" (smaller) size. I have some tips that are worth sharing.

The kettle works fine as a stove, and you can use it as both a stove and a barbecue while preparing one meal. Of course, you need to do your "stove" cooking first, and then carefully restore the (cool) cone and grill



Cooking outdoors with tools like the Magma kettle can often make the boat appear to be physically larger by avoiding a bottleneck at the galley entrance.

pieces to their normal location within the (hot) kettle. You can't do the reverse, because the hot grill and cone are not easily removable. The grill isn't the problem; it's the cone that's virtually impossible to remove unless you place your hands right on it for traction, which you can't do if it's, yes, hot.

While using the kettle as a stove, you can leave the radiant burner plate in the normal position or, if it's very windy, you can invert it, which will place your cooking pot directly onto the top of the burner. I suspect that it's not as efficient this way. But when the wind is pulling a lot of heat away from your pot, or threatening to extinguish the flame altogether, closer is better.

You can also close the lid while using it as a stove, but be aware that the entire pot will become incredibly hot, and components that are anything less than "oven safe" can be damaged. You'll need hot pads to lift the pot off the stove, unless you've got cookware with removable handles.

REGULATOR VALVE

The Magma regulator valves leave much to be desired, but I haven't identified an alternative that works better.

My complaint is that it has two basic settings: "low" is what I would call "high," while "high" is roughly equal to the temperature of the sun. I was told that the incredibly hot "low" setting represents grill manufacturers' need to address customer complaints about having the flame blown out on windy days while on low.

Whatever the reason, when using the kettle as a stove to cook my nearly famous Bagel Eggels properly, I need to modulate the heat manually, by turning the stove on and off. Luckily, I've gotten good at this, developing a sixth sense about when it's time to turn it off, or that it's been off too long.

MOUNTING AND FUEL

Magma has so many mounting options, and every boat is different, so it's impossible to say that there is one ideal mount. But I've found the one I like best: the A10-165 "Socket Type Fish Rod Holder Mount" fits Scotty rod holder sockets. This is clever because those Scotty sockets work when mounted on either a horizontal or vertical surface, and they're cheap enough that you can easily add mounts wherever you want them.

Even if you don't fish, this mounting option is worth considering first. You may find that your situation requires some other solution, but I see a lot of barbecue mounts on boats that would have been easier with the A10-165.

Then there's fuel. I explored several fuel options for my Magma kettle, and aboard my boat, the best solution seems to be to continue using those disposable 16-ounce propane cylinders. They are an expensive way to purchase propane, about $3 for 16 ounces at most discounters, and more than twice that at popular cruising destinations. Note that the ABYC requires that reserve cylinders not be stored inside the boat, but only in the boat exterior, protected from the weather and physical damage, where escaping vapors can flow overboard.

For those with more onboard space (i.e., a larger boat), another option is to install a permanent propane system with a large refillable tank in a properly ventilated locker and simply connect a flexible supply hose to the grill when needed. However, this setup requires additional equipment and safety procedures.

DIY

HEAT WAVE

For One Couple, Life Aboard in the Frozen North Means Installing a Diesel Heater

By Andy Schell

I bought *Arcturus*, my 1966 Allied Seabreeze yawl, in 2008. It was docked that winter in front of Fawcett Boat Supplies, the iconic marine store then located on "Ego Alley" in historic downtown Annapolis.

That winter was cold. But perhaps more important, my fiancee, Mia, hails from Sweden, where we plan to sail the boat next summer.

We agreed that adding a below-decks heater would more than come in handy in Stockholm (if not Annapolis), which lies above 60 degrees north.

We refitted *Arcturus*' interior with several bookshelves to house our extensive library, many of which include cruising classics, from Hal Roth and Moitessier to David Lewis and his exploits in Antarctica. While Lewis, incredibly, didn't even have heat, many of the others had diesel or kerosene, and I was intrigued by the traditional idea. Our boat already had a diesel engine, and we could plumb the unit from the same tank. And while a diesel heater is a bit more trouble to light, once burning, it's hotter and dryer than propane, and more efficient.

I wanted the largest unit practical, since as liveaboards, we'd be enduring real winter, not just needing to take the chill off of a fall day. Dickinson Marine had a floor-mounted unit available that burns at 18,000 BTU, its largest heater unit. (For bigger boats or serious arctic winters, Dickinson also makes diesel stove / oven / heater combos, but we already had a propane stove and felt the standalone heater was large enough for our 35-foot yawl.)

Andy Schell lives aboard Arcturus *in Annapolis, where he works as a yacht rigger. He's also a licensed captain, and runs sail training programs and celestial navigation workshops. He writes regularly for numerous publications.*

photos by Andy Schell and Mia Karisson

A friend of the author lounges by the completed heater system.

PLACING THE HEATER

On most small boats, the heater's location will be obvious—there is usually only one spot where it can possibly fit. On *Arcturus*, that spot is amidships, just aft of the main bulkhead supporting deck-stepped mast. American Boat and Yacht Council standards require mounting the heater in a location that provides an airspace around the entire unit to allow full air convection.

Our heater is mounted far enough aft of the main

bulkhead to provide this space, as well as keeping clear of any combustible materials on the adjacent settee. The unit sits on the floor on three legs, secured with ¼-inch self-tappers. Initially, we installed it directly on the cabin sole. However, after further interior modifications, we are going to raise it up and install it on a half-inch mahogany platform, which I intend to laminate to the original cabin sole. This gives the heater a small nook of its own and makes for a cleaner installation.

For boats that have several mounting options, logic dictates mounting the heater low (remember, heat rises). One must plan for the chimney pipe, and the required hole in the deck, striving for the straightest possible run, yet also positioned to minimize the chance of exhaust getting back into the boat through dorade vents or other openings.

The completed "Charlie Noble," or ship's chimney. Note the red heat- resistant sealant between the teak and the stainless collar, as well as between the teak and the deck.

Forty-five degree bends are acceptable, but a straighter run equals more airflow, and more airflow means a hotter and cleaner burn. Additionally, the pipe itself gets super hot and can be a danger to the crew if it's not properly located and shielded.

INSTALLING THE CHIMNEY

Once I placed the below-deck unit, I did a full dry-fit installation. I hung a plumb bob from the coach roof to the center of the heater's chimney fitting. Then, I drilled a tiny pilot hole from the inside of the boat out, being sure to drill straight and true.

I cut the actual hole with a 5-inch hole saw on my electric drill. I drilled from the outside in, using the pilot hole as my center. I highly recommend having someone below decks at the ready with a Shop-Vac to avoid the inevitable dust cloud. (I should have taken my own advice on that one.) I proceeded to seal the deck with thickened epoxy to avoid water intrusion into the balsa core.

ABI used to make the ideal through-deck "Charlie Noble," the seaman's term for a ship's chimney. It was solid bronze, and on the inside were baffles that dissipated the escaping heat. Above deck, it mounted flush, with a screw-in deck plate to keep the water out when not in use. When the fire was blazing below decks, a handy Charlie Noble stood atop a two-foot piece of pipe that threaded into the fitting, akin to how a dorade vent threads into its fitting. What resulted was a solid, watertight, seaworthy chimney fitting.

Unfortunately, ABI went under, and these fittings are impossible to find. If you can find the piece secondhand, buy it. I got lucky and happened to find the through-deck fitting at Bacon Sails, a secondhand shop in Annapolis. We were unlucky with the Charlie Noble, however, and had to have a custom unit made by our local welder.

PLUMBING THE FUEL

The most efficient way to plumb a diesel heater is directly from the boat's main fuel tank, provided the engine burns diesel.

Arcturus has a 35-gallon tank mounted under the cockpit sole—enough fuel to run the heater 24 hours a day for more than a month at dockside. Like any engine, a diesel heater will be happier with clean fuel. On *Arcturus*, the heater's fuel line (which should be bought at a marine store, using USCG-approved fuel hose) runs under the saloon settees, where it passes through a charcoal Dickinson filter through the galley and aft into the engine compartment. It's connected to a small, low-PSI fuel pump, which in turn is plumbed into a Y-valve at the engine's primary Racor filter. With the Y-valve on the heater side, the pump draws directly from the main tank, through the Racor and again through the in-line filter, providing very clean fuel to the heater. The only downside is the inability to simultaneously run the engine.

An alternative arrangement, space permitting, would be to fit a secondary tank that would feed the heater alone. This "day tank" could be two to five gallons, fit nicely in a cockpit locker, and could be plumbed into the main tank and refilled when needed. This would allow both the engine and heater to run simultaneously. A shutoff valve at the tank is needed, and an isolated electric fuel pump needs its own on/

off switch.

A two-tank arrangement also allows for the heater to run off kerosene, as *Arcturus'* currently does. However, the single-tank arrangement makes the best use of space and fuel efficiency, while allowing the heater to burn much longer before requiring a refill. In my opinion, this is the way to go.

LEARNING YOUR HEATER

The single most challenging aspect of installing our heater was getting the unit to burn cleanly. The key to a clean burn is the perfect mix of air and fuel. Too rich, and the decks will soon be covered in soot. Too lean, and the flame will look sickly and the inside of the unit will quickly fill with hard carbon that, though contained within the unit, is 10 times harder to clean than the soot that escapes.

Other than experimenting, there is really no easy way around learning what your heater likes. I've found the easiest way to light it is with two capfuls of stove alcohol poured into the burner, after filling it with just a touch of diesel by opening the valve for a few seconds. Read the heater's specific instructions on lighting, as each unit may be different, and there is a specific procedure to follow.

The best way to experiment with the flame once lit is to change only one variable at a time. I leave the air vent wide open at the base of the unit. More air requires more fuel, which in turn will burn hotter, but also cleaner. You can always vent heat through a port or hatch located an adequate distance from the chimney, so exhaust fumes do not re-enter the boat. With the air wide open, slowly increase the fuel in very small increments, every few minutes, until you have a consistent, brilliant, blazing flame. I no longer have any soot or carbon buildup and have to clean the heater only once a season. ABYC requires that dampers not be used in a liquid-fueled heating system, so that is not an option.

FINISHING TOUCHES

I immediately installed a carbon monoxide (CO) detector in the saloon. I also got very conscious about ventilation. Diesel heaters consume oxygen, which needs to be constantly replenished by sufficiently ventilating the area through an open hatch or port. If the oxygen is not replenished, the heater will not only burn inefficiently, but it also will start to produce deadly CO gas that can fill the cabin. This colorless, odorless gas is a serious health threat—when Alvah Simon was wintering above the Arctic Circle, his steel boat froze in the ice, and he nearly died from exhaust leaked from the diesel generator into his cabin. It took him nearly a month to figure out why he was exhausted all the time, and no wonder: He simultaneously wasn't getting enough oxygen, and the CO was poisoning him. A worse leak would have surely killed him, and he would have been none the wiser. CO prevention is of utmost importance.

The ABYC recommends that heaters with non-room sealed combustion chambers using liquid fuels have an oxygen depletion sensor that cuts off the fuel supply to the heater should the cabin oxygen level fall below 95 percent. Dickinson does not supply these with its units, but they are readily available at most hardware stores. If the stove comes with an operation warning label, ABYC requires that it be permanently installed on or in the vicinity of the heater.

Keep in mind that LPG cooking stove burners also consume oxygen, so if both appliances are burning at once, more ventilation is required to replenish the cabin with fresh air. Be proactive. A CO detector provides a last alert that you need to get out on deck as quickly as possible.

A Note about Deck Coring

Too many older boats have soft spots on deck from previous owners (and sometimes the builders themselves) neglecting to "core" the deck when installing fittings.

Coring is a tedious process, but one that shouldn't be neglected.

First, mark hole centers where you're drilling with a correct-sized punch. Then, using a Forstner bit, over drill the hole. For example, a ¼-inch hole would require a ½-inch Forstner bit. A Forstner bit will provide a smooth hole with a flat bottom, essential for preserving the lower fiberglass layer in a deck with typical sandwich construction. When using the Forstner bit, stop before drilling through this bottom glass layer—the flat bottom of the bit will allow you to feel when it strikes glass (the soft core material is easily detectable).

Backfill the enlarged hole with thickened epoxy such as West System's new Six10. After allowing a day for curing, re-drill into your new epoxy plug with the correct size bit to mount your hardware. Finally, countersink each hole before mounting the hardware with sealant. The countersunk hole provides a moat for the sealant to lie in around the fastener threads, preventing water from seeping through.

Coring serves two purposes. For mounting hardware that will see substantial loads, such as winches or rope clutches, the core plug creates a compression post for your fastener. When you crank down on the nut from below, the deck will not compress and distort as it would with a soft balsa core, causing damage. The plug also prevents water intrusion into the fragile core material.

Ideally, all older boats should have all deck hardware removed and reinstalled this way. But if you can't do that, at least be sure to mount all new hardware properly. **– Andy Schell**

Also note that an appliance that requires an operator is considered an "attended appliance" and should never be left on without someone on the boat monitoring its operation.

CONCLUSIONS

Though initially daunting—drilling a 5-inch hole in my cabin top was not without worries—I completed the installation in a weekend.

I still haven't gotten around to tiling around the heater, which would be the ideal—and prettiest—solution for the liveaboard cruiser. A thin sheet of stainless, attached with at least ½-inch standoff bushings to create an airspace between it and whatever it is protecting, would also work just fine. Manufacturers such as Dickinson also recommend an additional ¼-inch high-heat insulation board on the surface behind the stainless steel or tile.

I purchased my Dickinson unit for about $700 as an older, unused unit. Including accessories such as extra chimney pipe, the teak pad to trim the exterior, epoxy and hose, I spent about $1,000 on the project. **DIY**

POWER-UP

Install a Simple Shore Power System

By Peter A. Robson

My Catalina 27 sailboat was typical of many older boats of its size when it was built 30 years ago. Its electrical needs were few. A single 12-volt DC battery started the outboard and powered everything in the cabin. An extension cord from shore provided 120-volt AC.

Today, of course, we need more juice than a single 12-volt battery can deliver. In my case, I had already installed a second battery. But the AC side needed work.

I had a job that kept me away from home for several days each week and decided to use my Catalina as a home away from home. I now needed power for at least one and sometimes two electric heaters, a circuit to keep the 12-volt batteries permanently topped up and a couple of outlets for running power tools, a radio and other items. Rather than adding a spider's web of extension cords, I decided to install a simple but proper shore power system. More complicated AC electrical needs require further consideration beyond the scope of this article.

photo by Peter A. Robson

The shore power fitting was installed inside a cubbyhole in the cockpit coaming.

The first step was to figure out how many amps I needed. On high-heat settings, portable cabin heaters (with auto shutoff for overheating and tipping over) draw about 12 amps, meaning 24 amps for two. The battery charger and radio would use about four amps together. Therefore, I decided on a 30-amp system, which is standard on recreational boats. I'd need three separate 15 amp circuits: one for the battery charger and one for each of two standard 120-volt outlet boxes (one forward, one in the salon).

PARTS AND COMPONENTS

Sketching out a wiring diagram turned out to be much more fun than paying the bill at the marine store. I could have gone cheap, but I wanted to do this right and follow best practices. The American Boat and Yacht Council (ABYC) is the recognized industry authority, and while I didn't purchase its AC & DC electrical standards, I'd seen its guidelines cited enough in magazine articles and on the Internet that I felt confident about the materials I needed and how they should be installed. Additionally, most marine electrical devices come with manuals that use ABYC or equivalent standards. Combined with advice from the guys at the marine store, I managed to find out all I needed.

The main components were a 30-amp marine shore power cord, a 30-amp shore power inlet fitting, a 120-volt distribution panel, a battery charger, two outlets, and assorted wire and terminals.

For the distribution panel, I bought a Blue Sea panel (maximum 50 amps) with a main power switch, enough space for three separate 15-amp circuits, and a digital readout for incoming voltage,

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Peter Robson is a freelance writer whose recent work has appeared in numerous publications.

hertz and system draw-in amps. The panel uses circuit breakers instead of fuses and has a built-in reverse polarity indicator light and alarm, should a marina have its shore power hooked up backwards (it happens). It was pricey—almost $500 on sale—and the project's biggest-ticket item.

For a battery charger, I chose a 10-amp Xantrex Truecharge three-stage unit that would charge both 12-volt batteries independently.

I went with ground fault circuit interrupter (GFCI) outlets, which are much more sensitive to ground faults and shut off the power much faster than a standard circuit breaker. They are required by ABYC only when installed in a head, galley, machinery space or weather deck. However, being in a small boat in bad weather is a little like being in the shower, so I went for them. Some manufacturers are now incorporating the GFCI function right into their electrical panels. Another option is to install the GFCI at the first outlet in the circuit, which provides all the other outlets downstream in the circuit with GFCI protection.

Whereas GFCIs protect people from faulty plug-in devices, for additional protection the ABYC now recommends that an equipment leakage circuit interrupter (ELCI) be installed within 10 feet of the AC shore power inlet to detect ground faults in hard-wired appliances and the entire AC system. Should the ELCI detect a fault, it immediately switches off the AC system. However, GFCIs are still necessary as well. For a good description of how an ELCI works, go to Blue Sea's website: http://bluesea.com/viewresource/1381.

The manufacturer specified 10 American wire gauge (AWG) for the wires connecting the shore power inlet to the distribution panel (the manufacturer's specs trump ABYC's standards, even if ABYC allows for smaller wire). And while I could have used smaller wire on the "output" side of the distribution panel, to keep it simple I decided to stick with 10 AWG throughout. If you choose to use a smaller wire gauge, you'll need to consider the allowable amperage for the insulation temperature rating for that size wire.

photos by Peter A. Robson

Wiring up the Xantrex battery charger. The 12 volt DC battery charging output wires are to the left (common ground but a separate positive wire for each battery) and the 120 volt AC input from the distribution panel is to the right. All ring connectors have been heat-sealed.

Although it is not mandated by ABYC as the only option, I used marine-grade, three-wire, stranded tinned copper UL 1426 Boat Cable, which has an insulation temperature rating of 105 degrees Celsius (dry) that can carry current up to 60 amps outside an engine space and 51 amps within an engine space with 10 AWG wire—more than ample for my needs. It was pricey, but much better suited for moist environments where corrosion, flexing and vibration are significant concerns.

Solid copper house wire is not permitted under ABYC standards. Whatever wire you use, it should have a minimum rating of 600 volts. Once again, I bought pricey—about $1 each—crimp-style marine ring connectors, which won't vibrate off, with heat-shrink sleeves to keep out moisture. Note that crimping requires a crimping tool to ensure a proper connection.

LOCATION AND INSTALLATION

Working on an AC electrical system requires extreme care. Never work on the system when the boat is plugged into shore power, and be sure to take all necessary precautions that apply to conducting safe electrical work.

I spent an evening figuring out the best place to install the bits and pieces. My shore power fitting had to be installed where I could get behind it to run the wires and where it would be out of the way. The distribution panel also needed to be out of the way, yet accessible from behind. At the same time, all AC-energized parts must be guarded against accidental contact by enclosures or other protective means that require tools to remove, even if the AC and DC panels are combined.

In my case, the charger would have to be mounted outside the enclosed battery space to avoid the corrosive effects of hydrogen gas that can vent during charging. However, most marine battery chargers are "ignition protected" and can be safely mounted in large, well-ventilated battery spaces, including engine compartments, as long as the charger is not mounted directly over the batteries. Then I had to figure out where to place the two outlet boxes. They, too, had to be tucked out of the way and yet have easy

ABOVE: Wiring the main distribution panel.

LEFT: The front of the Blue Sea distribution panel after completing the project. The meter is showing a power draw of 11.5 amps (the heater is on full power). It is important to locate the distribution panel in a relatively out of the way location, but it must also be easily accessible.

access in order to run the wires.

After much head scratching, I found the right places and all the wiring could be run through existing lockers and storage areas, taking care to secure the wiring out of harm's way at least every 18 inches. If damage from loose objects is a concern, you can insert the wiring within plastic conduit or more flexible loom in exposed areas.

With all the pieces on hand, I set to work. Using a hole saw, I drilled through the cockpit coaming, then wired in the shore power fitting. I then used a jigsaw to make the cutouts for the breaker panel and outlet boxes. The interior fiberglass was only about ⅛ inch thick and very flexible, so the jigsaw jumped around quite a bit. My work wasn't beautiful and fiberglass dust got everywhere, but with the help of a flat file, everything eventually fit (and I stopped itching about a week later).

After several evenings of work, all the wires were run and everything was connected. I didn't have a heat gun for the heat shrink tubing, but by carefully holding and turning them over a flame of a kerosene lantern, they sealed up well.

The final step was adding a green AC grounding wire from the distribution panel to the negative bus of the 12-volt DC system. This is mandatory under ABYC standards. The idea is to create an electrical current path back to the shore power ground should current in the AC system come in contact with the DC system. Without the ground connection in place, for example, if an AC hot wire chafed or melted against a DC wire or any DC-powered device, the AC current could stray over to the DC side and cause a dangerous shock hazard. Moreover, AC current that strays onto the DC ground system and the engine can pass out the prop shaft and into the water, where as little as 15 milliamps of AC current can paralyze and drown a swimmer.

Often, the green AC grounding system is led to the engine block. However, because my boat has an outboard motor, I ran it to the negative bus of the 12-volt DC distribution system. That way, any AC current that strays onto the DC system will have a direct path off the boat. If my boat were larger and had a bonding system and an inboard motor, I would have given thought to adding a galvanic isolator or isolation transformer to protect against trespassing DC stray current from a neighboring boat.

The power was switched on and, to my surprise, everything worked!

The project was more expensive than I thought at about $1,300 and took quite a bit longer than I estimated (about a week of evenings). But much of that was spent scratching my head or running back to the marine store for another terminal. In the end, having a 120-volt system has proven to be a real bonus when it comes to getting comfortable, and I have the additional benefit of thoroughly knowing my AC electrical system. **DIY**

Wayne Kelsoe, VP of Electrical Engineering for Blue Sea Systems, provided technical advice for this article.

THE FINELY FITTED BOOKSHELF

Why Install a Shelf When You Can Build a Library?

By Andy Schell

"A yacht without books is a sad place indeed."

Those were the words of Ferenc Matéin *The Finely Fitted Yacht*, an essential volume for the do-it-yourself sailor. I can't disagree.

Arcturus, our 1966 Allied Seabreeze yawl, was named for a 1930s-era John Alden schooner that I'd sailed on in New Zealand. The schooner *Arcturus* was perhaps the truest representation of the word "yacht," a mahogany and varnish masterpiece, which embodied the design theory, "if it looks right, it is right." The yawl *Arcturus*, I was determined, would emulate that idea, and we'd start with a bookshelf.

Ah, but no ordinary bookshelf this would be. We were in search of something greater, something grander—we'd turn the cabin of *Arcturus* into a library! Yes, a library. Books would surround us on all sides, endless volumes from the classics of literature to modern adventure stories, nautical almanacs, sailing directions and travelogues. It would be our own slice of heaven, a place to spend the cool fall evenings cuddled up next to the warmth of the little flame dancing inside the diesel heater, only an arm's length away from countless journeys of the mind.

But when your home is a classic 35-foot sailboat, substantial thought and a big effort is required for any project—it took my fiancee, Mia, three days to come up with a viable solution for where to put the paper towels—let alone one that requires some major remodeling. You see, to build our shelf, we first had to destroy the couch.

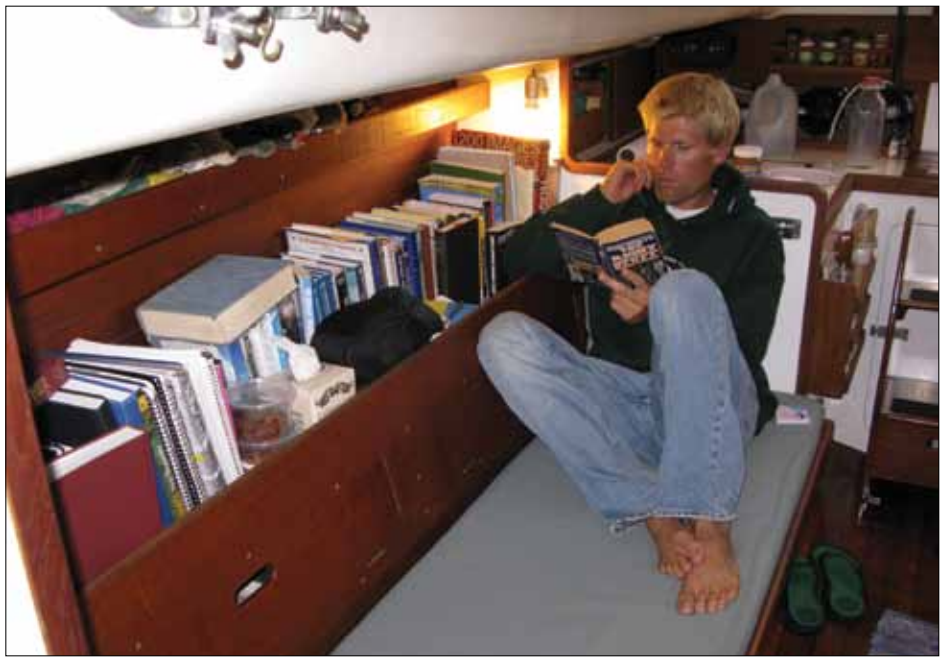
Halfway through demolition of the starboard side, the author cut back the pilot berth and added an angle for the new backrest, leaving intact the lockers that were originally built in.

DESIGN AND RECONSTRUCTION

In the 1960s, the CCA Racing Rule was in effect, and it popularized the graceful curves and long overhangs of many cruiser-racers designed in that era. The Seabreeze was a spinoff of the record-setting Sparkman & Stephens yawl *Finisterre*. It was heavily built of fiberglass, with mostly wood on the interior, and was designed for distance racing, cramming six berths into a tiny interior. Two in the forepeak, a convertible dinette on the portside, plus a pullout single and pilot berth on the starboard side. While this worked great for racing, it left lots to be desired for living aboard or cruising, wasting valuable stowage space and making for uncomfortable seating around the table.

For liveaboards, any boat project interferes with the living space on a boat, especially when the project involves rebuilding that space. So we crammed everything we had stowed in the main saloon into the vee-

Andy Schell lives aboard Arcturus *in Annapolis, where he works as a yacht rigger. He's also a licensed captain, and runs sail training programs and celestial navigation workshops. He writes regularly for numerous boating publications.*



photos by Mia Karlsson

With the starboard bookshelf complete, the author also gained an instantly useable settee without reconfiguring the cabin layout.

berth—books, magazines, errant stuffed animals, my Didgeridoo from Australia, cushions, pillows, charts, my sextant, everything. Junk was piled to the ceiling, and in anticipation of the upcoming mess, we simply shut the door.

Our goals were twofold; first we wanted to remodel the settee backs with bookshelves—each side was 77 inches long, so we'd end up with more than 12 feet of shelf space. Our secondary goal was to create two identical sea berths port and starboard, berths that required no messing about to set up (like dropping tables or rearranging cushions). We'd be able to reuse the cushions, each 24 inches by 77 inches, perfect for us, as we are each 6 feet tall and wide-shouldered ("standard" berth plans call for 22 inches in width). Our long-term plans include a trans-Atlantic voyage to Sweden next summer (Mia is from Stockholm) and a longer-term circumnavigation. I consider the sea berths a necessity.

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Deconstruction started on the starboard side. Thankfully, Allied built the boat well, so the demolition was limited to (mostly) simple removal of self-tapping screws and cleat stock, on which the plywood seat and face rested. We removed the starboard settee back, which was aligned vertically to make room for the pilot berth, subsequently creating an abysmal backrest for anyone seated there. Our design called for setting back the settee back some 12 inches and adding a three-degree angle, making seating more comfortable. This would eliminate the pilot berth in favor of the bookshelf, but make the settee berth instantly usable.

photo by Andy Schell

The author's fiancee, Mia, putting the first coat of Bilgecoat paint.

With the wood rough-cut, we set the circular saw blade at the required angle, screwed on a temporary saw guide and cut the berth fore and aft to our designed measurements. At the bulkheads of each end, we used a small baseboard handsaw to cut flush. Then we reinstalled the settee back, bunged the holes and applied a fresh coat of teak oil.

The portside was much more involved, because the dinette arrangement required a complete redesign. Unlike the starboard, we couldn't reuse anything, and it became clear that taking a go at salvaging any existing construction simply wouldn't be doing the job right.

Our new design was inspired by tradition—we'd simply mirror the starboard side, creating a usable sea berth, with lockers behind and below, and a bookshelf running fore and aft above the seatback. I would then create a drop-leaf table mounted on the boat's centerline. It'd be a lot of work, but ultimately I decided the boat should have been built this way in the first place, and so I set out to make it look like it was.

After a trip to Annapolis Exotic Lumber, where I sourced two ¾-inch, 4-by-8 foot sheets of exterior-glue birch plywood, the major reconstruction began. Using the old settee as a pattern, I traced the curve of the hull onto one of the sheets and rough-cut it with a saber saw. I fit the piece in the boat, barely getting it down the companionway. The hull, with its wide beam and shallow draft, is very full at the turn of the bilge, which required me to grind away the outboard edge at an angle to achieve a perfect fit.

I installed new cleat-stock of ½- by-½-inch white oak, using the shadow of the old settee as a guide on placement and height. The face board was square, 14 inches high fore and aft, or so I thought. Apparently the cabin sole slopes gently downward from stern to bow, and my newly cut face board was one inch short at the forward end of the new settee. I reaffirmed yet again the age-old "measure twice, cut once" rule, and started anew.

LOCKER DOORS, TRIM AND FINISHING TOUCHES

Arcturus' portside settee remains in an unfinished state. The new bookshelf is glassed into the hull, after scribing and fitting the plywood for it. The settee seat is in place, and the face board is cut, but the bare wood remains, and the storage access-doors have not yet been cut.

Fred Bingham, in his book *Boat Joinery & Cabinetmaking Simplified*, has a superb section on cutting and fitting locker doors, recommending a larger-than-stock cutout to maximize access to the space beneath the settee (indeed, the starboard side cutouts from Allied are only 12-by-12 inches, virtually unusable). We'll match the two large teak doors on the face of the starboard settee and cut out lids with a saber saw to gain access from above, under the cushion. Bingham suggests aligning the lids so they rest on the athwartships supports, or risers (which are plywood glassed into the hull, thereby creating divider as well), to give the lids added support. Finally, we'll paint the inside of the lockers and non-showing wood with white Interlux Bilgecoat, trim with oiled teak, and re-coat the bulkheads with matching semigloss white Brightside Polyurethane paint.

As liveaboards, our main form of entertainment and information is our book collection. The new portside bookshelf is dedicated to the seafaring classics and reference books—Hal Roth, Moitessier, Hiscock, plus sight-reduction tables, *The Rigger's Apprentice*, Bowditch and others. The starboard side is reserved for a revolving collection of pleasure reads, plus some photos albums, boat binders and a nice little nook for my sextant. In the process, we created two great sea berths that need no modifications and a much more traditional yacht interior. **DIY**

Finding Sanctuary in the Galley

Sanctuary, a semi-custom 33-foot John Kaiser Gale Force, was built in 1977 in Wilmington, Del. The cutter was commissioned by Suzi and Nelson DuRant for long-range cruising. The DuRants love to cook and eat good food, so they wanted plenty of storage and counter space. Suzi worked with Kaiser on some of the specific storage areas, such as the double spice rack, the drinks locker, and the divisions in the outboard lockers for dinnerware. Since building the boat, she has worked as a charter yacht chef on up to 75-foot boats or sailboats, and still finds this to be her favorite galley when it comes to layout and cooking underway.

– Leef Smith Barnes

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