Installing an anchor windlass

It's a big job, but easier if you first do your homework

by John Danicic

When I told my much younger sibling that I was going to install an electric anchor windlass on my Cape Dory 36 cutter, he asked, "What's wrong? Are you getting old?" He's right. I am getting old. Some time earlier he had convinced me to buy 50 feet of chain to go along with the 35-pound CQR anchor that hangs from our bow. That's a whole lot of weight to pull up and then drop down that little hole in the deck.

But, being of the generation that still expects miracles by harnessing the power of electricity, I knew this messy, sweaty, time-consuming job could be brought to the civilized level of a true yacht at the flick of a button. I wouldn't have to loosen my ascot, stain my captain's hat, or pop the buttons on my blue linen blazer to accomplish the task.

I love being able to weigh anchor and get under way without fussing with wet chain and line. I rank the windlass right up there with mainsail lazy-jacks and headsail roller furling as the best additions to our boat. It makes for a more pleasant operating experience when my wife is on board, and is even more valuable when I'm singlehanding. What I didn't expect was how much I had to learn in the installation process.

Each boat is different regarding mounting location, wiring, and rode needs. So I can't offer a step-by-step process for your boat. But I can explain how to research a windlass installation, how to determine what your options are, and how it worked for me. As it turns out, the windlass itself is just one part of the installation. Most of the manufacturers' brochures tell you how easy their product is to install. Essentially, they are right. It's the "details" that tend to get complicated.

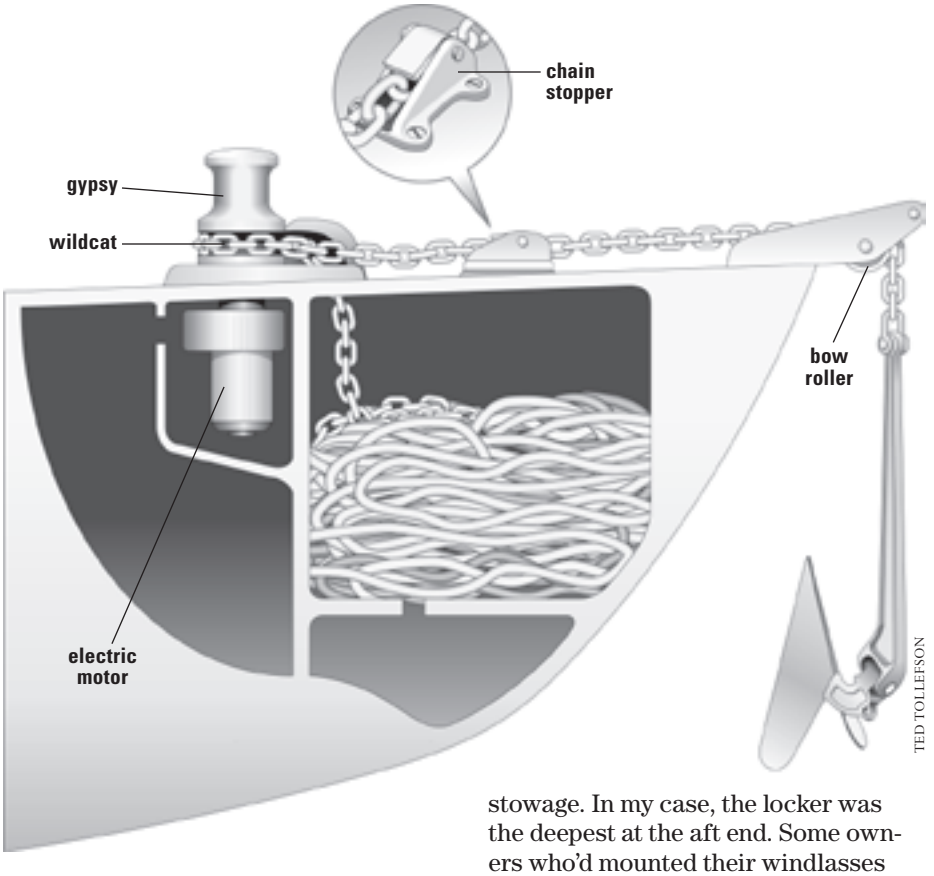
John's Cape Dory 36, in top photos, before and after the installation of an anchor windlass. He selected a vertical windlass after considering both types. A horizontal windlass is shown above.

Choose a windlass style

Manual windlasses exist, but I found that the advantages of electric windlasses outweighed the advantages of manual ones. I also preferred a self-tailing windlass so I don't have any contact with the rode.

Windlasses may be vertical or horizontal, depending upon the axis of the drum. The vertical type is more properly called a "capstan," but you will find the term "windlass" used in many catalogs and books describing either type; thus the term "vertical windlass" is in common use. Windlasses may be configured to handle chain on a drum, called a "wildcat," or rope on a drum, called a "gypsy," or they may have a combination drum with chain pockets on a perimeter and a V-groove for the rope in the center. The combination drum requires a rope-to-chain splice.

The rode makes a 180-degree turn around a vertical windlass and is fed down the hawsepipe. This arrangement puts the rode in contact with about half the capstan's circumference, giving a good grip with a small area and keeps the mechanism almost completely covered. It keeps hands and feet safely out of harm's way, but carries the potential hazard of hiding jams and kinks in the rode. In addition, the vertical windlass has its motor installed belowdecks. This gives the windlass a low profile on deck. Some verticals can be ordered to do all-chain, chain and rope, or all-rope.



On some, you can order an extra rope gypsy that sits atop the chain sprocket to haul in another line.

The selection of horizontal windlasses is not as great. The driveshaft is parallel with the deck and turns a gypsy that grips the rode for a 90-degree turn and sends it down through the hawser hole. The whole unit, motor and all, is mounted abovedeck, making it easier to install and service. Some horizontals come with port and starboard shafts allowing the operator to haul up two anchors, all-chain, all-rope, or combinations.

I chose a vertical type because of the unobtrusive design.

Above-deck details

Investigate, investigate – To choose what style works best for your boat, determine whether it will fit on your deck and work with your rode. Study other windlass installations on similar boats and ask questions. Learning what works and doesn't for others will help you determine the acceptable compromises for your boat and may prevent a costly mistake.

Examine your deck structure – How thick is it? What kind of obstacles will you run into by cutting holes? Is the anchor locker deep enough? Belowdeck verticals need deeper lockers because the motor can take up a foot or so of space you need for rode stowage. In my case, the locker was the deepest at the aft end. Some owners who'd mounted their windlasses forward, so the chain fell closer to the slope of the forepeak, said they had more trouble with the chain jamming. If your locker is shallow or you have no access to it belowdecks, you may have to go with a deck-mounted horizontal or get into some creative carpentry. Also find a place for the reversing solenoid, which needs to be close to the windlass, and for a beefy, high-amp circuit breaker that must be within 2 feet of the battery. Both need to be in dry locations. The circuit breaker should be easily accessible to use as an isolator or on/off switch.

What's your load? – How much weight are you going to lift off the sea floor? Each manufacturer has a different way of calculating that, but the manufacturers' rule of thumb seems to be three times the weight of your anchor and total rode. Get a windlass rated above, but close to, that number. The more powerful the windlass, the bigger the electrical system needed to run it. Size it right and you can keep the cost down for all the "corresponding details."

In his book, *Things I Wish I'd Known Before I Started Sailing*, John Vigor says: "The manufacturers of anchor windlasses warn people not to expect too much from them, but that doesn't stop many sailors from abusing them. Windlasses are designed to lift only the weight of the anchor and its line. They aren't meant to drag a heavy cruising boat up to her buried anchor in choppy seas against a strong current or heavy wind. But it happens all the time. The makers try to salvage their reputations by advising sailors to choose much bigger windlasses than they really need, so they won't wreck the machinery before the warranty runs out. Nevertheless, the windlass slaughter continues."

Too much choice – There are a lot of windlass manufacturers and many models. Prices vary wildly. Some windlasses come complete with reversing solenoid, circuit breaker (isolator switch), and remote switch and/or foot switches. Some offer stand-alone units. Some allow for manual raising of the anchor with a winch handle in an emergency. Others allow for dropping the anchor without the use of the motor. Most belowdeck models can be ordered to fit different deck thicknesses.

John used scale models to try out possible areas on the deck for the location of the windlass. The chain stretching aft pointed the way to the best location for the equipment.

Make a choice – Armed with the information you collected about your boat, narrow down your choice by comparing the manufacturers' specs and features. Don't rely on the manufacturers' sales-oriented websites. The more research you do, the better off you'll be . . . with fewer surprises once you've cut those big holes in your deck. If possible, get copies of installation instructions and operation manuals for your top candidates. Because I have a bowsprit raised off the deck, a staysail jib boom mount, staysail shrouds, cleats, and other deck obstacles, I made full-scale models of several windlass types. This helped me experiment with different locations and visualize whether any could interfere with sail operation. I recom-

A bow roller is vital. The anchor must be stored on the bow ready for use. The original roller was replaced by a self-launching roller that could contain the rode, preventing it from popping off during anchor retrieval.

mend this step. It gives you much more confidence once you start cutting holes in your deck.

Once you've made your decision on type and make, just cut the hole and pop it in, right? Well, you *could*. But wait! Don't get out the saw just yet. There's more investigating to do on deck, and you need to figure out how to get all those amps to safely run your new powerful motor.

Anchor stowage – The last above-deck item to look at is how your anchor is stowed and what kind of damage could be done to the deck from the rapidly moving rode. There's little point in having an electric windlass if you have to mess with pulling your anchor from a locker and then attaching it to the rode. The anchor should be in a secure location that will allow it to self-launch and be stowed without your help. Not all boats are set up for that. Luckily, there are bow rollers that you can bolt on. The bow roller at the end of our bowsprit was an open affair that made it difficult to keep the line and chain from popping off during retrieval. It was framed with teak that tended to get chewed up by the chain . . . even by our slow and careful hand-over-hand hauling. I cut out the old roller and installed a new assembly with guides to capture the anchor and rode.

Sacrificial skid plate – Since my anchor line runs over a raised teak bowsprit 2 inches off the deck, and the installation location was on the deck,

The raised teak base was constructed using the stainless-steel deck plate from the manufacturer as a pattern.

I needed to build a base to raise the windlass to that height. I also had to add a bronze skid plate to protect the bowsprit teak from being chewed up by a chain moving at 60 feet per minute. (I told you this got complicated.)

Installing the skid plate was a satisfying job. I used a bronze plate because most of the deck hardware on a Cape Dory 36 is bronze, but you can use stainless steel. Bronze is a lot easier to work, cut, and shape than stainless steel, and you can always order the crew to polish it when they are whining about having nothing to do. I found a good source for silicon bronze, Atlas Metal Sales in Denver.

Eighth-inch bronze plate can be cut easily by a jigsaw with a bi-metal blade. A fine metal file smoothes the edges. Regular steel drills and counter sinks can be used on it, although new ones result in neater work. The plate

The voice of reason

by Jerry Powlas

Nothing much is said about the dangers of powered winches or a powered windlass, so they seem to be treated casually. You don't have to be in the business very long before you start to hear stories about people being maimed by these things. I don't have statistics to cite, but I've heard too many stories.

A windlass becomes necessary at some point because of the weight of the anchor and rode. There are aftermarket manual windlasses out there, but they are not numerous. The preferred type is powered.

I consider a foot switch to be very convenient — but far too dangerous to be an acceptable configuration. Having switches in the cockpit and on the foredeck may not be as safe as only having one switch on the foredeck. That way the person working the anchor on the foredeck will have fewer miscues and surprises.

Most people agree that cars, trucks, airplanes, and all manner of other powered devices are both necessary and dangerous. For all of these, the sensible approach is to promote awareness and give training in the use of inherently dangerous equipment, such as a windlass.

The ground tackle on most large boats requires mechanical assistance. This is not a concern with small boats. Somewhere in between the two there are boats on the borderline. Some do not need a powered windlass as long as they use light ground tackle. Here are some ways to avoid having to install a powered windlass.

- Don't use all-chain rode unless you absolutely need to.
- Consider the use of high-strength aluminum anchors, such as the Fortress brand.
- Motor up to your anchor if conditions are such that you would have to strain yourself to pull the boat up to the anchor.
- Cleat off and break out the anchor with the engine.
- In the fairly rare situations where you need to apply a great deal of force to the rode to break out or lift a deadhead, put a rolling hitch on the rode and lead a clean and dry line back to a primary winch.

should be large enough to protect anything that the rode could contact as it travels from the windlass to the bow roller. If you have all-chain rode, don't forget that a chain stopper needs to be mounted between the roller and the windlass. Details, details!

Between decks

Strengthen the deck – Most manufacturers' instructions tell you, usually in capital letters: DO NOT USE THE WINDLASS AS A BOLLARD! Take the strain off the windlass while anchored. And don't use your windlass to drag 8 tons of fiberglass and lead though the water against a 30-knot wind and a 2-foot chop. Use discretion here. This is how unintended skylights are made. Back down on the anchor while the rode is attached to the main cleat. Use your engine to motor to-

Battery-cable lug connections that last

by John Danicic

Unless you have access to a professional battery cable-crimping tool ($200-300), attaching the terminal lugs to the cable will be one of the unexpectedly big jobs of your windlass installation.

If you can get such a tool, use it. But if you use other means to mechanically fasten lugs to cables, you must make sure that the cable and the lug remain securely attached. What better way to do that than to combine mechanical fastening with the power of solder?

All this stuff? Yep. Clockwise from bottom left: heavy wire cutters or a hacksaw to cut the cable, hammer-style crimper, flux for the solder or use rosin-core solder, utility knife, brush, hammer, solder, propane torch, three progressively longer lengths of heat-shrink tubing, cable, lugs, and needle-nose pliers or forceps. Not shown is the heat gun.

Hack or snip? The first step is measuring and then cutting the cable to length.

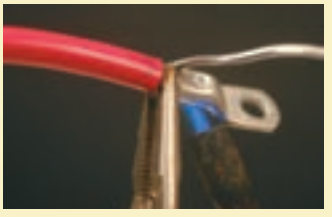
Big wire cutters work best, but if you want a vigorous workout use a hacksaw. Battery cable lugs have a flat surface that mates with the terminal. Once you run the wire, determine how you want the lug to fit on the cable for the best orientation to the terminal. Once it is firmly attached, it's very hard to bend the cable to fit.

Mark the top of the cable with an arrow during placement and length measurement. Cut the insulation with a utility knife and leave enough gap between the lug and insulation to clamp a pair of pliers or forceps to act as a cable holder and heat sink.

Clean, then brush the flux. Slip the three progressively longer heat-shrink tubes on and well down the cable. Clean out the inside of the lug with fine steel wool and coat the inside of the lug and the cable with rosin flux. Never use acid flux. You may use rosin-core solder with no other flux.

Strike a blow. Using an inexpensive hammer crimper will put a dimple into the lug and form a mechanical fastening. It's set up to accommodate various cable gauges. If done correctly, this should be all you need. If you lack a hammer crimper, use a blunt chisel to form the dimple. Work on a surface that will absorb the considerable forces and prevent the cable from moving.

Hot, hot heat. Heat from the lug end to the cable with a flicker-through-the-flame motion until solder will melt if touched to the lug. We are talking about mere seconds of heating. You could also use a large electric soldering iron, but that would deduct too much time from sailing.



Bubble and boil. Apply solder to the seam. It should melt quickly and be drawn into the cable and socket. If it doesn't, heat up the lug some more . . . It doesn't take much solder to form a good connection.

Cool it! Let it cool a bit, but not too much. The insulation will be rather soft when warm and can be pushed down to cover your heat-sink gap. Let it cool completely and use a fresh rag to clean off residual flux.

Easy as 1-2-3. I like to use three layers of heat-shrink tubing, with each layer longer than the last to cover the seams. I found heavy-duty black 3M tubing at a surplus electronics store. Draw the first layer up and over the lug and use the heat gun to shrink each layer separately.

Layer two. Keep the heat gun moving so as not to burn up all your hard work.

Good documentation. It's a good idea to write what the cable is for and where it goes on a piece of tape. Cover this with clear heat-shrink tubing. You now have an impressive, safe, and informative cable connection.

ward the anchor while weighing. You are attaching to your deck a heavy piece of machinery that could be under great strain. Not all boats have a sturdy, solid deck that you can simply drill into and bolt down a windlass. It's far better to reinforce the windlass mounting than lose the windlass along with the rode and a big chunk of deck.

As part of my deck investigation, I examined the hawser hole and determined that my deck was ⅜-inch thick solid fiberglass. Wrong. When I began my installation just 12 inches away, I discovered the deck at that point was ½ inch thick, part solid plywood and part balsa core. The whole foredeck on my boat varied in thickness from side to side and fore to aft. When I moved the main cleat, I found that location to be balsa cored as well.

The best strategy is to include a backing plate. Since I was at the extreme edge of deck thickness my windlass could handle, I used a piece of 3⁄16-inch stainless steel from a scrap yard. This was a very difficult piece in which to cut the 4-inch hole necessary for the motor to poke through. A good solid piece of marine plywood, ½ inch or thicker, epoxied to the underside of the deck would be easier to work. The more area it covers, the better. Fiberglass on the underside of the plywood will add stiffness and strength without the additional thickness of thicker plywood. Remember, if the forces are great enough, something's gotta give. The idea is to make the deck strong enough to take on most normal boat forces. Don't skimp here.

Belowdecks

Battery location – The electrical demands of a windlass are pretty high. If you haven't already updated your boat's electrical system, this might be the time to do it. (See how this "simple project" is expanding? But what do you expect? It's for a boat, after all.)

You have two choices for powering your windlass. Either install two heavy battery cables almost as big as garden hoses with enough copper in them to light up the eyes of a pirate, or install a dedicated battery at a location near the windlass and run smaller battery cables to the battery.

A dedicated battery installation adds the weight of a battery to the bow in addition to the combined weights of rode, anchor, and windlass. With

The windlass drive shaft (without the motor installed) protrudes through the stainless-steel backing plate. The chain drop hole is in the center. The previous hawser hole is the oval hole at the right. Notice the reinforcement plate for the windlass.

all this new stuff, you're adding the weight of half a person forward. Can your boat handle this?

Since a bow battery needs to have a way to charge, you still have to run substantial wires to it. My thought was to add an Echo Charger that would charge up this battery whenever the house bank was being charged. They typically run at less than 20 amps, so the connecting cables need not be too large, say the size of a pencil. The trouble with this arrangement is that if you need to raise and lower the anchor a few times at a tricky anchorage, you could draw this battery down. Once you are finally hooked, you have a battery that can't be charged until you run the engine again. Finding room to secure a battery in the forepeak can be a challenge as well. And consider maintenance.

The heavy battery cable route is the most common solution and was the most economical for me. Cable that's tinned and corrosion-resistant can be purchased by the foot from a marine supply store, but it carries the dreaded marine cost: high. The other alternative is welding wire, which looks the same as the marine variety from the outside but is not tinned. This is available at automotive or welding supply shops. Decide how much you want to spend and how far down the road you want to do this wiring job again.

Significant expense

The cost of either type of wire is a significant expense, so pre-planning your route will save you money or another trip to the store and a big butt joint. You'll need plenty of extra cable to make the shorter runs between the solenoid and the motor and the circuit breaker and the battery. Figure that in.

Depending on the distance from your batteries to the windlass, it is important to get the right gauge wire that will handle the expected heavy

> **“Keep in mind that you are installing a “hose” full of rapidly moving fire that, should it escape, can destroy your boat.”**

amp loads. The windlass manufacturer should supply a chart for wire gauge and distance traveled. To determine how much wire you need, you need to know exactly how the cable will be routed. More under-the-deck investigations are in order. Every boat is different when it comes to routing wire.

Let’s face it, with cable this large and stiff you are not going to be able to fish it through like you might with wiring for a cabin light. You want it to be secured firmly every 6 inches or so and to remove any sharp edges that could, over time, wear away the plastic wire covering. My boat had a very good route for the cable from the batteries in the cockpit locker to the forepeak under the hull-to-deck joint. It had easily removable teak panels and substantial gaps between the bulkheads and the deck. I didn’t have to drill or cut a hole. I consider myself lucky.

Take your time, examine every inch of the route for sharp edges, pull the wire carefully, and attach it as often and securely as you can. Use long, heavy-duty cable ties with screw holes in the ends (called mounting ties). This is the preferred method of attachment. On the underside of my hull-to-deck joint is a lot of lumpy fiberglass and a lip that is perfect for drilling small holes for self-tapping sheet metal screws, which I used for attaching the ties. Keep in mind that you are installing a “hose” full of rapidly moving fire that, should it escape, can destroy your boat. Treat it with respect and install it right the first time. You rarely get a second chance, at least not with that boat.

A new skill you may need to learn is how to attach the multitude of battery cable lugs. I needed 10 tinned copper lugs to connect batteries, motor breaker box, and solenoid. You don’t want these to shake loose. If you can’t get a professional battery lug crimper, get the hammer tool and solder needed to securely attach the lugs to the cables. Use heat-shrink tubing to cover the crimp. Label all the lugs so you know what goes where (see sidebar on Page 54).

Forward control?

One of the nice things about an electric windlass is the ability to motor up to an anchorage, release the anchor, and power down the rode . . . all from the comfort of the cockpit. That ascot and captain’s hat may help your image as well, but let’s get real: you can’t see much on the bow from way back there, especially with dodgers, dinghies, and such in the way. If the reason you’re getting the windlass is too many seasons under the belt, your eyes can’t be sharp enough to see any potentially catastrophic wear on your rode. It is best to be forward to watch and control the process, so some form

of remote up/down switch is needed at the bow.

"Remote" is a misleading term here; the cockpit switch is really the remote one, requiring a set of wires that lead back to the cockpit from the solenoid. With a control at the bow, you can make a visual check of the condition of your rode and the rope-to-chain splice. And you are available to unravel the anchor rode from any sunken tree stumps.

There are two choices here as well: a plug-in, hand-held remote or a permanently installed foot switch. I chose the hand-held unit. Sure, it is another thing to lose overboard or in a deep locker, but the plug's socket is unobtrusive. I needed a much smaller hole for installation than what is required by foot switches, which come in pairs and need to be mounted where you can step on them. The downside of foot switches is that they can be inadvertently stepped on. We keep the hand-held with its 8-foot cord in the cockpit locker while underway, but for unexpected midnight getaways we leave it connected and clipped securely to the rail when at anchor. Most manufacturers are pretty proud of their hand-held remotes, so expect to pay accordingly. Gearheads can get a thrill with remotes that can digitally read out the number of feet of rode deployed. Wireless controls are in the future. "Now where's that %@&^* remote?"

Nothing to it

It's time for your power tools, hole saws, bedding compound, and crimping tools. Every contingency has been considered. As my boat mentor once told me, "When it comes to boat projects, take any time plan and multiply it by pi." I have found that to be good advice.

This is a big project. You need to draw on many skills: wiring, carpentry, and metal work. But the biggest skill is the ability to visualize the project before you start. If you can master that, then actually doing it is a breeze.

The more you study and visualize this project, the better it will turn out. The reward for this hard work is less stress at anchorages and no sweaty ascots to wash.

There is just one more — very complicated — detail: the smooth rope-to-chain splice so your anchor rode will move easily through the windlass. I'll cover that in the January 2007 issue.

Once all the decisions have been made, it's time to cut holes in the boat, above, and install the equipment, below. The aft hole is for the motor shaft. The forward hole is where the chain will pass through for storage below.

Resources

Atlas Metal Sales
Division of AMIC
800-662-0143
jsimms@atlasmetal.com
<http://www.atlasmetal.com>