

Replacing the Vega's Standing Rigging

By Chuck Rose

I have now replaced the standing rigging on Lealea, V1860, twice. The first time only because a number of years had passed since the original rigging was set up and I figured that it was better to renew the rig before the mast came crashing down. The second time was because the wire I had used the first time turned out to be defective and started unraveling half way between Honolulu and Cape Flattery. I am not an expert rigger but I am capable of learning from my own mistakes as well as from the experience of others.

- Lessons learned:
1. Newer isn't necessarily better.
 2. Inspect new wire (And all critical gear) carefully before use.
 3. Rigging is not rocket science.

I learned that all stainless steel wire is now made in Asia. Even though the spool may be marked "Made in USA", that only means that the wire rope was laid up in the US. The strands used and the steel they are made of comes from offshore. Caveat emptor. The original rigging was made in Europe and is vastly superior to anything available on the market today, as are most of the original equipment pieces on the Vega. We must keep in mind, however, that even the best quality rigging will eventually reach the end of its useful life and must be replaced. As a result of our experience and after examining the wire we replaced after our Pacific crossing in 2007, Brion Toss now recommends that new wire be examined inch by inch under a microscope before use; a tedious and time consuming process.

To inspect your existing standing rigging, the best way is to take it down so you can easily access both ends and the entire length comfortably and safely. This may not be practical. A good alternative is to carefully inspect the areas most subject to failure which are the lower end fittings and the first few inches of wire. First clean and polish the fittings then examine them with a powerful magnifying glass. You are looking for cracks or deep pitting. If you find any, in any of the swaged end fittings or in any of the individual strands of wire it is time to replace the rig. While you are at it, check the turnbuckles, toggles and chain plates. It is my opinion that if you still have the original turnbuckles on your Vega, it is probably time to replace them but it will be difficult, if not impossible to obtain replacements of equal quality steel today.

If the rig checks out you are probably good for another season of day sailing and weekending in local waters. If your plans include serious racing, extended voyaging to distant shores or if you found defects in your rig it is time to replace it. This is no place to scrimp or cut corners.

While it is possible to replace the rig with the mast standing, it is much easier and safer to work with the mast on sawhorses at waist level. If you are preparing for cruising or a season of racing, you should already have the mast down as part of the inspection process. This is a good time to completely inspect and recondition the mast. I'll cover that another time.

With apologies to Bree, there is more than one way to skin a cat. This article assumes that you are not going to simply call the boat yard and tell them to replace your standing rigging but there are several options for the do-it-yourself Skipper. Which option you choose will depend

on your budget, how involved in the process you wish to be or how much of the work you want to do yourself, what geographic area you sail in and what your long term sailing plans are. The easiest way would be to simply take your old wire to a rigging shop and have them make up new stays and shrouds with swaged end fittings. The lowest cost would be for you measure the old rigging and order new stays and shrouds with swaged end fittings from a chandlery (West Marine offers a rigging service that has proved satisfactory for many sailors). The highest cost and most work would be to buy the wire and cut and assemble the rigging your self using mechanical end fittings.

The advantages of swaged fittings installed by a rigging shop are that the end product is less costly and less work for the boat owner. You have no doubt noticed that all new boats come with swaged end fittings on the standing rigging. This is not because they are better. It is because they are cheaper, both in materials and in labor, providing you have the machine and a trained operator. If you decide on swaged fittings, shop around. Swaged fittings are as good as the swage machine used and the skill of the operator. Properly done they are as strong as the wire itself but there will be no way for you to tell. Choose your rigging shop wisely.



Original swaged eye fitting on City Zoo

The other option is to buy the wire and make up your own rigging using mechanical end fittings like Sta-Lok or Norseman brand. These two are slightly different but work on the same principle. The same skills and tools are required and the same procedures apply. We used Sta-Lok fittings on Lealea but everything here applies equally to Norsemans.



Sta Lok eye fitting on Lealea

After you have decided on swaged vs. mechanical fittings comes the choice of wire. The stainless steel alloys most commonly used in rigging are 304, stronger and cheaper, and 316 more corrosion resistant but more expensive. If your long term plans include sailing in the tropics, choose 316. If in doubt, check with your local chandlery, rigger or marine surveyor which is best in your area.

I have been asked for the specifications as to length of the shrouds and stays for the Vega. Yes, it would be nice if you could just look up the specs and order the whole rig. Unfortunately, it doesn't work that way. All the professional riggers I have talked to prefer to take measurements from the boat they are working with. They have learned from experience. The boat may have been re-rigged or modified by a previous owner. There may have been differences between individual boats during production. Take the measurements from your own boat.

Before you take the mast down make sure the mast is straight and the shrouds are properly tensioned. The stays are less critical if your Vega has an adjustable back-stay. Measure and record the pin to pin length of each turnbuckle. If any are "Two blocked" or

let all the way out you will have to take this into account in your measurements for the new wire. If you are replacing turnbuckles or adding toggles don't forget to take that into account. When the new rig is adjusted the turnbuckles should all be approximately at the mid point of their adjustment range. If your rig does not include toggles at the bottom of the shrouds, consider adding them. Don't forget to factor them into your measurements.



Original stainless steel turnbuckle, City Zoo



Bronze turnbuckle with toggle, Lealea

Once the decisions are made and the mast is resting on sawhorses the first step is to get a roll of masking tape and tag each shroud and stay. Mark them: "Port Aft Lower", "Port Upper" and so forth. In theory, and no doubt in the manufacture of new boats, both sides are the same length. Yours may or may not be. You need to know. Mark them before you take them off the mast. Once they are marked, get a one quart yogurt or cottage cheese container and a pair of needle nose pliers. You will probably need a can of penetrating oil or WD-40 and a non-metallic mallet and drift as well.

Starting at the masthead, remove the cotter pins from the clevis pin that holds the head stay to the toggle. Leave the toggle there but soak the pin that holds the toggle with penetrating oil or WD-40. We'll get to that later. Throw the cotter pin away. Put the clevis pin in the cottage cheese container and coil the stay. Secure the coil with masking or duct tape and lay it aside. Easy, wasn't it? Now that you've built some confidence remove the pin from the back stay at the masthead and soak the large pin like before.

You will have to disassemble the split backstay so move back down to where the upper and lower backstays are connected and take a look. I have seen two or three different set ups for the connection. Lealea originally had a micro-press fitting forming a loop in the middle of the lower backstay wire with swaged fittings on the ends. We replaced that the first time we re-rigged with two triangle plates and two separate lower backstays. However your backstays are arranged, they will be held together with clevis pins and cotter pins. Remove the cotter pins and throw them away. Put the clevis pins in the cottage cheese container. Coil and tape the wires. OK. Now you know the drill. Remove the shrouds. Throw away the cotter pins and save the clevis pins. Coil and tape the wire.

If you are having your new rigging made up at a rigging shop just bundle up all the wire and take it to them along with the notes and measurements you took of the turnbuckles before you took the mast down. Let them know if you plan to replace the turnbuckles or add toggles. Put it all in writing and make sure you both clearly under-



Split back stay, City Zoo

stand what is to be done. If you are going to order your rigging made up from a chandlery or West Marine, its time to take some careful measurements.

If you are lucky, you have access to a wooden wharf or pier where you can lay out your old rigging, get some large nails and a hammer. Drive a nail into the wharf leaving an inch and a half or so sticking up and put the eye of the end fitting over it. Stretch the wire out tightly along the wharf and nail the other end. Measure. Record. Repeat. Put on your thinking cap. Get out the notes you took when the mast was up and the rig adjusted. Do the math. Don't stress out too much. This is not rocket science. A half inch one way or the other won't make much difference but there is no reason to be sloppy either. Be as accurate as you can, check your work and go with it. Are the measurements of the shrouds, left and right, the same? Close? Within an inch? Good. You know what to do. Fill out the form or whatever and place your order.

OK, You two guys just chill out for few minutes. I'll get back to you in a bit.



This is what you will need to assemble mechanical fittings

You are probably wondering: If swaged fittings are both less expensive and easier and are universally used as original equipment on new boats, why would anyone choose anything else? The main reason, and it is a big one, is that with mechanical end fittings you don't need a big machine to make up new rigging or effect repairs. You can do it yourself. Also, if you keep your boat long enough to do the job twice, the second time is vastly less expensive than any other option because the end fittings are re-usable. You can re-rig the boat for just the cost of the wire and new wedges.

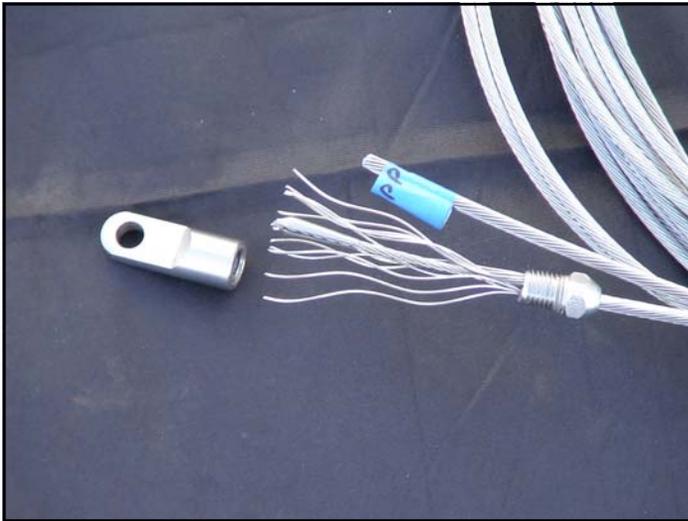
If you have decided to go with mechanical fittings, lay out your old rig and measure the eye to eye length of each piece, do the math, make the adjustments and record the results.

Go to the chandlery or rigging shop and buy

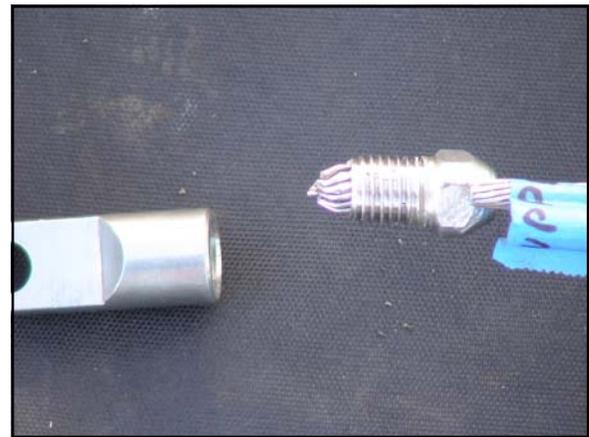
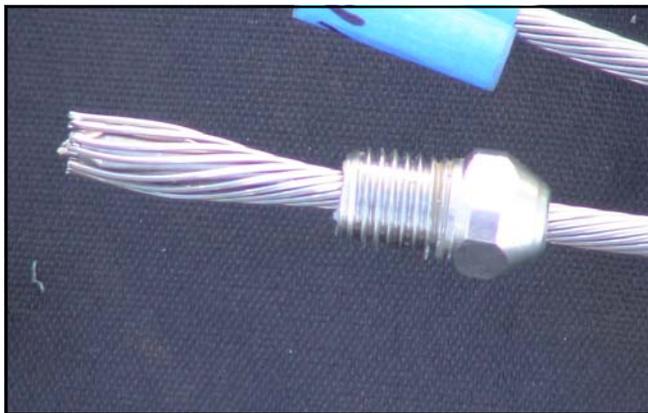
the wire and end fittings. You may want to discuss the project with the riggers. It can't hurt. They may have some advice or be willing to help. Port Townsend Rigging was a big help to us. They insisted on cutting the shrouds and stays for us, let us use their shop and inspected Lealea's old fittings to make sure they were good enough to re-use. After we finished they came to the boat and checked my work.

If you come back with one long coil of wire instead of individual shrouds and stays pre-cut to length. Here is a way to cheat a little: Drive two nails side by side in the wharf about two inches apart. Slip the eye of one of your old wires over one of them, stretch it out and nail down the other end. Install a new fitting on one end of the new wire and slip it over the other nail, stretch it out alongside the old wire. If the old wire is the correct length, just cut the new wire and install the new fitting. If not, make the adjustment.

A clean cut is essential. If you have to cut the wires yourself, you will either have to buy a heavy duty, good quality cutter; or use a guide block and hacksaw. A guide block is nothing more than a piece of 2"X2" lumber with a hole drilled lengthwise and a guide cut halfway through bisecting the hole. I have had the best results with the hacksaw and block method and it has the advantage of not requiring a tool you probably will need to go out and buy. Tape, measure and mark the wire. Slip the end to be cut through the hole in the block. Line up the mark with the guide cut and cut off with the hacksaw.



Now that you have a good clean cut, disassemble one of the new end fittings and slip the nut over the end of the wire. Un-lay the outer layer of wire from the core and slip the wedge over the core. Re-lay the outer wires over the wedge, sliding the nut up as you do to hold the wires in place while being careful not to get any of the strands in the slot in the wedge. This will prevent the wedge from compressing and the fitting will not assemble properly. Once the wire is neatly re-layed, screw the



other half of the fitting, the eye, down over the wedge and the wire to form the outer layer over the wedge. Not too tight, Just enough to begin to form the outer wires. Remove the end and check to make sure the strands are evenly spaced around the wedge and none of them have fallen into the slot. Fill the socket of the eye end with sealant. I used silicone, the riggers from PT Rigging use Sikaflex. Take your pick. Screw the fitting together. This time hold the nut in a vice or large adjustable wrench and



use a wrench to tighten but don't use anything longer than six inches to crank the fitting down. Too much force could deform the relatively soft 316 stainless steel fitting and render it unsuitable for re-use later. Sealant should squeeze out around the wire at the base of the fitting. Wipe the excess off with a rag. Good job. One down, nineteen more to go.

Back to the mast. At the masthead we left the pins that hold the toggles for the head stay and back stay soaking in penetrating oil. With luck, they will now come out without too much effort but you may need a mallet and a drift. First remove the cotter pins and throw them away. Then remove the large pins and the toggles and put them in the cottage cheese container. Leave the toggles that secure the upper shrouds in place. Moving down the mast to the spreaders, remove the bolts that hold the spreaders and put them in your container. Put the spreaders someplace where they won't get stepped on, tripped over or sat on. Now remove the toggles for the lower shrouds. These are just stainless steel tabs that fold over pins swaged or peened into aluminum ears welded to the mast below the spreaders. Just push them off with your hand. You may need to spread them a little but it shouldn't take too much effort.

If you are going to re-use your turnbuckles, go get them and bring them and your cottage cheese container full of stainless steel bits back to your garage or workshop. Bring along the spreaders too. For this next step you will need a bench motor with a buffing wheel and some jeweler's rouge and a polishing disc (like a green pad only brown). Don't forget your eye protection. (You can do without the power tool but the process will be very time consuming) Clean and polish all of the toggles, turnbuckles and the large pins until they look like new. Using a good magnifying glass, carefully examine each piece for cracks, excessive pitting and deformed or elongated holes. If you are too cheap to buy new clevis pins start polishing them too. When you're done inspect for pitting and cracks. Otherwise, throw them away and buy new ones. On Lealea there are 36 3/8 inch pins in the standing rig. At \$5 each as of September 2007, it's worth considering. You may find that some or all of the clevis pins have been replaced sometime in the past with pins of an incorrect size; too long or of too small a diameter. If this is the case you will have to buy new pins of the correct size. Pins that are too long can foul running rigging. Pins that are too small will cause the holes they are in to elongate, weakening the fitting.

The spreaders need a bit more care than the stainless steel stuff. Being made of aluminum, they are a bit more fragile. Remove the steel bales from the tips and the bolts that hold them. Clean and polish the tips and bases and inspect for cracks. Some corrosion, especially at the tips is inevitable. The spreaders are nothing more than aluminum tubes with end fittings attached. If the end fittings are cracked or badly corroded you will have to repair or replace them. This could present a problem as new replacements are not readily available. You may have to have them fabricated. I was able to have a machine shop weld up and re-machine a cracked in-board spreader fitting. The machinist commented "Lucky they used such high quality alloy in this". You may have to get creative to find alternative solutions if your spreaders are damaged beyond repair.

When you go to pick up your new rigging from the shop, don't forget to pick up new clevis pins if needed and a box of cotter pins sized for the clevis pins you will be using. If you are re-using your old clevis pins, bring one along so you can be sure to get the right size cotter pins. If

possible spring for the higher price 316 stainless cotter pins. You will be glad you did. Regardless, use a magnet to test the cotter pins before you use them. When buying in bulk, it is not uncommon to find mild steel (Which will quickly rust away to nothing) mixed in. Pick up marine grade stainless steel replacements for the bolts that held the spreaders and spreader tip bales and stainless steel nylock nuts to secure them. Before you leave the chandlery there is one more thing you will need: A tub of Lanocote, AKA “Sheep grease”. Pick up some ice and beer on the way back to the boat.

Time to re-install the pins and toggles at the mast head, re-attach the spreaders and the toggles for the shrouds below them. Remember how hard it was to get those pins out at the masthead? Use Lanocote liberally anywhere stainless steel comes in contact with aluminum as well as on the threads of your turnbuckles.

Attach the shrouds, head stay and upper back stay to the mast. You may or may not want to assemble and attach the lower back stay at this time: Your call. It depends mostly on how high above the deck your upper and lower back stays connect. I attach my lowers to the chain plates and connect the upper and lower last. In part, how you do this will depend on whether you raise your mast yourself using a tabernacle or call for the crane.

Run the upper shrouds over the spreaders and attach the bales. Spreader boots will protect your sails from chafe and hold water against the spreader tips causing corrosion. Port Townsend Rigging recommended leather boots. If you use plastic boots make sure they are slit open on the underside of the spreader to allow moisture to drain. Regardless, coat the spreader tips liberally with Lanocote. When the rig is set up, the spreaders should be angled upward slightly. The angle should bisect the triangle formed by the shroud and the mast and is fixed by the in-board spreader base fitting. On the Vega, the spreaders are free to fold upward. Tug on the signal flag halyards to ensure the spreaders are seated against the mast at the pre-set angle. If you don't have flag halyard blocks on the spreaders, you will have to rig a light line over the spreader to seat it or go up in a bosun's chair to push it down.

Once the mast is up and everything is connected, set up the shrouds to the desired tension by holding the eye fitting on the end of the wire with a wrench so as not to disturb the lay while you turn the body of the turnbuckle. You may think that this is obvious but I have seen too many boat owners setting up rigging by twisting the body of the turnbuckle with a screwdriver and ignoring the wire. You may want to have a rigger check the tension of your rig but beware the rigger or anyone who wants to tune the rig as if it were a violin. Too tight is not good and can contribute to mast step compression. Everyone has their own idea of how tight the rig should be so I won't go into that here. Once you are satisfied with the adjustments, safety wire or cotter pin the turnbuckles.

That beer should be nice and frosty by now.



With the mast down, the author took the opportunity to rig blocks for topping lift and spare jib halyard, taking advantage of the hollow pins used for the stay toggles.