

Catalina 27

Lower Shroud Chainplate Eyebolt Retrofit Kit Installation

By Carl Schaefer
C27 Hull # 2021, s/v "Extra Special"

The original chainplate eyebolts used to anchor the forward and aft lower shrouds to the deck have been known to fail catastrophically, often as the result of crevice corrosion cracking. Crevice corrosion is a corrosion process accelerated by the presence of stagnant fresh or salt water trapped in crevices, in this case the bolt threads of the chainplate eyebolts. The bolt will eventually fail in fatigue as the result of repeated high lower shroud loads to an already weakened component.

Fortunately, Catalina Direct (<http://www.catalinadirect.com>) offers two retrofit kits to replace the original eyebolts; either heavier eyebolts or the more robust U-bolt kit. For those that sail in predominantly light air (the Chesapeake Bay and its protected tributaries, for example), the eyebolt upgrade should be more than adequate. However, for those that routinely sail in heavier air (San Francisco Bay, for example) or otherwise sail in harsh salt-water environments, it is recommended that you replace the old eyebolts with the U-bolt upgrade. I chose the eyebolt upgrade since the Chesapeake Bay, where I sail, averages wind speeds of less than 10 knots over the course of the sailing season.

The eyebolt upgrade, Part # Z2041, can be ordered from Catalina Direct at (<http://www.catalinadirect.com/chainplate%20eyebolt%20kit.html>). The U-bolt upgrade, Part # H1700, can be ordered from Catalina Direct at (<http://www.catalinadirect.com/chainplate%20ubolt%20kit.html>). The cost of the eyebolt upgrade and U-bolt upgrade kits, at the time of this writing, are \$67.95 and \$70.00, respectively. Although the U-bolt kit is more robust than the eyebolt kit, it does have the disadvantage of raising the lower shroud turnbuckle clevis pin approximately 5/8" higher off the deck. If your lower shroud turnbuckles are currently tightened all the way, then the shrouds will need to be shortened or replaced altogether.

When you receive the new eyebolts you will immediately notice the physical differences from the eyebolts they replace. Specifically, the new eyebolt shank diameter is 1/2 " while the shank of the old eyebolts measures 3/8". The new eyebolts are also slightly longer and have large, circular flanges to prevent the eyebolt bearing surface from compressing into the deck and to provide a large surface area for sealant. Two screw holes are drilled into the flange for a pair of wood screws that are used to set the new eyebolt into the deck. These screws prevent the new eyebolt from twisting and prevent breaking the caulk seal bond between the deck and the eyebolt flange. One disappointing aspect of the retrofit eyebolt kit is that the cabin backing plates provided with the kit are smaller, both in surface area and in thickness, than those that they replace. The smaller

surface area of the new backing plate does not allow a wider distribution of the lower shroud loads over a larger bearing surface. Some C27 owners have retained their old backing plates as a substitute for the new ones or they use both plates in combination and sandwich them together with the larger of the two plates bearing against the cabin roof. If the old plates are retained for the new installation, be advised that you will need to increase the diameter of the backing plate holes from 3/8" to 1/2" to accommodate the new eyebolts. A picture showing both the old eyebolt (installed) and the retrofit eyebolt is shown in Figure 1.

Although I agree that the larger backing plates are preferred, I decided to use only the new plates in the retrofit for a number of reasons: first, I have to assume that any retrofit to the Catalina line would have been reviewed and approved by Catalina engineering as a safe retrofit; second, two of the old plates had corrosion pitting (see Figure 2); and, third, I sail in predominantly light winds and I do not race the boat, hence the rigging loads are not as high. The two old backing plates with corrosion pitting can be reused if the corrosion is ground out. However, the blended repair to remove the pitting must not exceed more than about 10% of the thickness of plate lest the repair significantly degrade the strength and stiffness of the plate.

The installation of the new eyebolts is straightforward. However, if it is discovered that the plywood deck core is saturated with water, the installation of the eyebolts should only proceed once the core has been permitted to dry. One C27 owner I know had a saturated core and captured the flow of water from the eyebolt deck holes with a bucket in the cabin! Fortunately, I did not have that problem as the deck core, at least in the area of the lower shroud eyebolts, was dry. However, if you need to dry out the deck core, there are many good boat maintenance and repair books that describe in detail the process for drying and repairing cored decks; two that I highly recommend are both by Don Casey: [This Old Boat](#) (International Marine, Camden, Maine, 1991) and [Sailboat Hull and Deck Repair](#), (International Marine, Camden, Maine, 1996).

Replacement of the new eyebolts does not require that the mast be pulled from the boat. If the eyebolts are replaced with the mast still up, slightly loosen the upper and lower shrouds on both port and starboard, then remove only one lower shroud at a time and replace that eyebolt, leaving the others in place. Although probably not necessary, you can support the mast on the side being repaired using your mainsail halyard: cleat off one end of the halyard to the mainsail halyard mast cleat and lead the other end of your mainsail halyard through your Genoa sheet turning block and take up the slack with your primary winch. If the halyard is not long enough, use a single or double sheet bend to join an additional length of line to the halyard. But be very careful not to induce an excessive side load on the mast as you take up the slack on the main halyard as even a small amount of side bend in the mast could result in a mast failure at the spreader sockets.

Begin the retrofit by having all your tools and materials handy. In addition to the new eyebolt hardware, you will need the following:

- 3M ScotchBrite green scrub pad (never use steel wool on a boat),
- Acetone,
- 3M Marine Adhesive Sealant (Fast Cure 4200) or equivalent,
- Lint-free rags,
- Hammer,
- Electric or battery-powered drill,
- ½" and 5/32" Carbide drill bits,
- Drive socket wrench and 9/16" and ¾" sockets,
- Phillips-head screwdriver,
- Pencil,
- Straightedge

Once you have assembled your materials and tools, use the following as a guide to assist you in the retrofit.

1. If you haven't already, begin by removing the lower shroud from one of the eyebolts to be replaced. Of course, if your mast is down, you can skip this step.
2. Using your pencil and straightedge, carefully mark the orientation of the original eyebolt before removing it from the boat (see Figure 4). This will ensure that the new eyebolts will be oriented exactly as the bolts they are replacing. This step is important since even a small deviation from the ideal orientation relative to the mast will place a twisting moment on the new eyebolts, possibly shearing off the eyebolt flange wood screws (or worse, ripping out a small section of fiberglass deck). Do this for each eyebolt before proceeding with the retrofit.
3. When you have marked the orientation of each eyebolt, move to the cabin and remove the eyebolt nut using a 9/16" wrench or socket. Remove the locking washer and backing plate. You may notice, as I did, that the backing plate has corroded somewhat from moisture trapped between the plate and the cabin ceiling. The resulting rust stain on the cabin ceiling is very difficult to remove but should be done before you install the new eyebolt (see Figures 7 and 8). While removing the rust stains left by the old backing plate, you may want to leave the old eyebolt in place to avoid water trapped in the core from draining into the cabin while you're working.
4. When you have removed any stains and have thoroughly cleaned the area beneath the old backing plate, gently tap out the old eyebolt using a hammer. If water is trapped in the core, it will drain into the cabin as soon as the eyebolt pops out on deck. Have a bucket handy and make sure your cushions, and other items you do not wish to get wet, have been removed from the work area. Should you have water trapped in the core you should dry out the core before proceeding with the next step.

5. Once the old eyebolt has been removed, remove any remaining sealant from the deck using a putty knife and liberal use of a 3M ScotchBrite pad. Clean the area immediately around the eyebolt hole using acetone, being careful not to remove the pencil alignment marks you made earlier.
6. Using a 1/2" carbide drill bit, carefully enlarge the existing eyebolt hole. Thoroughly clean the hole and surrounding area of fiberglass chips and core shavings.
7. Insert and dry-fit the new eyebolt into the enlarged hole but do not apply sealant at this time. Align the new eyebolt with the alignment marks and, using the eyebolt as a template, carefully drill the two holes for the eyebolt flange screws using a 5/32" drill bit (see Figure 5. Note the alignment marks to the right of the 1/2" hole and the two 5/32" holes for the flange screws). Hint: to avoid drilling completely through the deck for the 5/32" screws, it would be prudent to carefully mark the drill bit with a piece of masking tape as a depth gauge.
8. It is good practice to use a chamfer bit to chamfer both the 1/2" and 5/32" holes to allow sealant to flow down into the holes. Again, clean the area surrounding the hole using acetone to clean away any dirt and debris. Using a dry, lint-free cloth, carefully wipe and dry the area surrounding the bolt hole.
9. Squeeze a dab of sealant or caulk into each of the 5/32" deck screw holes. Liberally apply sealant to the bottom of the new eyebolt flange and around the smooth shank of the eyebolt itself. Don't be stingy with the sealant. Because sealant and caulk is messy to work with, it might be wise to wear surgical gloves for this step. Be careful to confine the sealant to the work area!
10. Carefully insert the new eyebolt into the 1/2" hole making sure to align the eyebolt with the alignment marks; the flange holes and the deck screw holes should automatically align. Insert the two flange screws and firmly tighten. Be sure that you do not over tighten the screws and strip the deck screw holes. The sealant should squeeze out from beneath the new eyebolt completely around the circumference of the flange. If there are any gaps in the sealant squeezed out from beneath the flange, this is a good indication that you did not use enough sealant. It would be prudent to remove the bolt, apply more sealant, then reseal the eyebolt.
11. Back down in the cabin, quickly install the backing plate, the flat washer, the locking washer, and the nut, in that order, before any sealant in the eyebolt threads has a chance to cure. Thoroughly tighten the eyebolt nut. Go back on deck and completely tighten the eyebolt flange screws. The newly installed eyebolt is shown in Figure 6 before the sealant has had time to cure.
12. Do not wipe up the sealant from around the flange; let it cure first. When the sealant has cured, use a sharp razor blade to carefully trim and remove the sealant that has squeezed out from beneath the flange.
13. Repeat the procedure for each of the remaining eyebolts.

The entire job took approximately 3 hours without assistance. Of course, my time was dramatically shortened compared to others because my deck core was dry.

Inspection of the old eyebolts revealed that none of them had any significant sealant or caulk remaining. It was a surprise to discover that the deck was dry despite the absence of caulk. I also noticed that, for whatever reason, the aft eyebolts and plates were corroded whereas the forward eyebolts and plates appeared were virtually blemish-free and looked nearly new.

This retrofit is one of the easiest to do and one of the most important. Because the failure mode of the eyebolts does not lend itself to inspection, it is prudent that this be one of the first upgrades you tackle.

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Figure 1 Old vs. New. The new eyebolt has a much larger flange, a larger cross section, and two screw holes to prevent eyebolt rotation.



Figure 2 Old eyebolt backing plates. Starboard aft plate top, starboard forward plate bottom.



Figure 3 Some needed items for the retrofit.



Figure 4 Marking the orientation of the old eyebolts prior to removal.



Figure 5 Old eyebolt removed. The hole has been enlarged to accept the new eyebolt and the two screw holes have been drilled through the deck and core using the new eyebolt as a template.



Figure 6 New eyebolt installed with 3M 4200 sealant squeezing out from beneath the flange. Cure time varies.



Figure 7 Old eyebolt backing plate, aft starboard.



Figure 8 Rust stains left on cabin ceiling from old backing plate – clearly water had made it into the cabin and core at one time.