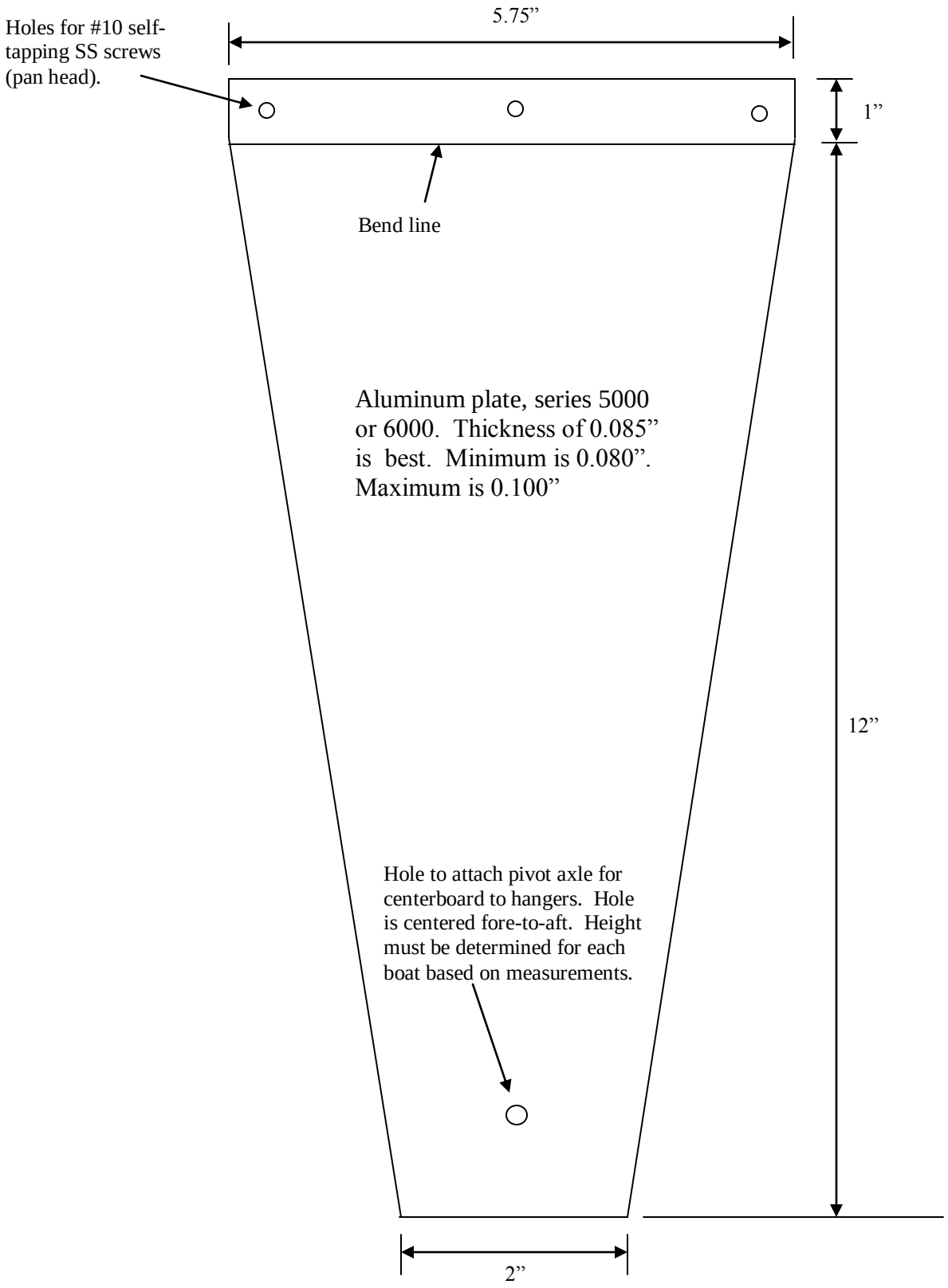
MUTINEER AND BUCCANEER TOP-MOUNTED CENTERBOARD HANGERS

Note, drawing not to scale Bob DeRoeck May 31, 05



Construction Instructions

1. Cut each of the two top-mounted CB hangers from the sheet aluminum to the drawing dimensions shown. Use either an electric jigsaw or a hacksaw. If using an electric jigsaw, lubricate the work frequently with oil or water and work slowly to avoid the aluminum melting into the gaps between the teeth of the sawblade. When finished cutting smooth the edges and corners with a file and 80 grit sandpaper.

2. Put one hanger in a 6" or longer wood working bench vice. Insert the top of the hanger into the vice, facing downwards, for a distance of 1" until the "bend-line" is located at the top of the jaws. Put the endgrain of a piece of 2 x 6" scrap wood (about 6-12" long) up against the side of the hanger and hit this wood gently-to-somewhat harder to bend the hanger over to a 90 degree bend at the bend line. If you do not have access to a vice with a 6" wide head, use "C" clamps to attach the metal to the end of a stout working table with the bend line at the edge of the table.

3. Bend the second hanger as you did the first.

4. You need to determine the location of the pivot axle mounting hole in the hangers. Place the hangers into position with the hanger flanges sitting snugly on top of the wooden CB cap. Have a helper hold these in place. Next, temporality install the CB between the two hangers such that the CB is in the fully "up" position, the bottom of the CB is flush with the bottom of the CB slot where the CB gasket would be located. Using the bottom of the CB (actually the leading edge of the CB) as a straight edge, mark the CB hangers with a pencil across the full width of the hangers. Remove the CB and the hangers. Now place the pencil line on one hanger along the front edge of the CB in the same relative position as when you drew the pencil line. Trace the outline of the CB pivot hole on the hanger with a pencil. Next determine the center of the circle drawn on the hanger. This will be the center of the hole to be made in the hanger for the axle fastener.

5. To make the hole in the hanger for the axle fastener, take one hanger and using a sharp-pointed punch and hammer, put a ding at the center of the hole. This is to provide a starting point for the drill bit so it doesn't "walk". Put this ding on the outside side of the hanger. Next, place the two hangers back-to-back so that two inside sides are against each other. Line up two hangers so that they are directly above each other with the bottom of the flange on one hanger lined up with the bottom of the flange on the other hanger. This is to ensure the holes are at the exact some level in each hanger when they are installed. Clamp the two hangers in this position, then place on a horizontal surface. Drill through both hangers at the same time with a drill press (to keep the drill bit vertical) or two helpers looking on from right angles to guide the guy with the drill to keep the hand-held drill's bit vertical.

6. CB Pivot Axle. There have been numerous failures of Buc and Mutt CBs at the pivot hole. This area is relatively weak because of the foam core and the small amount of fiberglass "meat" between the edge of the hole and the front and bottom edges of the

board (with board in "up" position). The large diameter of the pivot axle in the original Chrysler design directly contributes to the lack of "meat" around the hole.

I recommend reducing the size of the hole (and pivot axle) to provide more meat around the hole for greater strength. The diameter of the pivot axle will determine the minimum practical hole size. This diameter will depend on your choice of design for the pivot axle.

The design of the pivot axle will depend primarily on two issues, (1) do you have access to a machine skop? and (2) will you sometimes be sailing the boat in salt water?. If you have access to a machine shop, then you can make the axle out of metal. If not, I suggest making the axle out of PVC pipe.

If you have access to a machine shop, then the axle could be made out of SS or aluminum. The Nichols top-mounted CB hanger pivot axle is made of aluminum rod, with tappings on either end for #10 flat head SS machine screws. On each CB hanger the pivot hole is countersunk on the "outside" to accept the head of the machine screw so that it is flush with the outside face of the hanger. This design should work fine if you only sail in fresh water. If sailing in salt water the aluminum axle will eventually fuse with the SS machine screws and become difficult or impossible to undo for maintenance. If you decide to make a metal axle and will sometimes sail in salt water, I recommend you make your axle out of SS, preferably 316 SS. This will prevent the machine screws from fusing with the axle. If you only sail in fresh water, then an aluminum axle is fine. I recommend making the axle 5/8- ¾" in diameter and using ¼" SS machine screws. The flat head of the ¼" machine screws is thicker than the CB hanger metal, so the tapped hole on each end of the axle will also need to be countersunk slightly.

If you do not have access to a machine shop, I recommend making the axle out of ¾" PVC pipe, which has an OD slightly less than 7/8". Get a ¼" SS coupling nut (Jamestown Distributors is one source). This nut is slightly less than 1" long. The CB should be about 1" long, which is the design dimension. The axle should be slightly (say, 1/32") longer than the maximum thickness of the CB. So, each end of the coupling nut will be slightly recessed within the PVC pipe. This will eliminate the need to countersink the ends of the coupling nut. The coupling nut is held within the PVC pipe with epoxy/colloidal silica mix. The secret to a good result is getting the coupling nut centered in the PVC pipe, both axially and side to side. I did this by using a washer of the correct diameter and thickness so that it fits within the PVC pipe and the thickness is ½ of the difference in length between the PVC axle and the coupling nut. Lay the washer on a sacrificial horizontal surface, then cover the washer with a thin coating of hot candle wax. Also, use hot candle wax to seal each end of the coupling nut. After the wax has hardened remove all traces of wax from the outside surfaces of the coupling nut. Then sand the outside surfaces of the coupling nut with 80 grit sandpaper. Also, sand the inside of the PVC pipe with the 80 grit paper, then remove all sanding residue.

Place the PVC axle in the vertical position over the washer. Gently place the coupling nut into the PVC axle and let it sit on the washer. Take some time to make sure that the coupling nut is exactly centered in the middle of the PVC pipe, both at the top and the

bottom. Mix up a small batch of epoxy resin with colloidal silica filler. You want this mixture to be just barely liquid, about the consistency of 90 wt gear lube. Pour a small amount of the mixture into the top of the PVC pipe so that it fills the annulus, starting at the bottom and coming up about 3/16" from the bottom. Make sure the coupling nut is still centered in the PVC pipe. Let the epoxy set and remove the PVC from the table. Pry the washer off the bottom and inspect. Is the coupling nut still centered in the PVC pipe, both at the top and at the bottom? If not break up the PVC and epoxy and start over with a new piece of PVC. If it is centered, then put the PVC pipe vertically back on the horizontal surface (no need for the washer anymore) and mix up a larger batch of epoxy/silica. Fill the remainder of the annulus with this mixture. After the epoxy cures, remove the candle wax by using a machine screw to force it out. The axle is now finished.

IMPORTANT. Whether you use a SS axle or a PVC/SS coupling nut, in either case there will be a SS machine screw screwing into a tapped SS piece. One problem with SS fasteners, especially in larger sizes (#10 and greater), is "galling" or "cold welding". This is caused by the friction of the fastener causing enough heat (though relatively little) to cause enough thermal expansion to bind the nut to the screw. When this occurs the result is usually a screw that is effectively "welded" to the nut. The force required to break this bond is usually more than the screw can take and the screw will break before the bond will. Not good!! The best way to prevent galling is to slowly install the screw to the nut and to use copper-based industrial anti-seize compound. You'll have to buy this from an industrial supply store or from the web.

7. Reducing the size of the pivot hole in the CB. Assuming you've just made a pivot axle that has a diameter somewhere between 5/8" and 7/8", you now have to reduce the size of the CB pivot hole from the original 1.25" diameter. For maximum strength I recommend using fiberglass and epoxy resin to reduce the diameter of the pivot hole in the CB. Cut strips of fiberglass cloth slightly over 1" wide. The first strips should be about 5" long. Using straight epoxy resin (no filler) apply the first fiberglass strip into the hole mating it with the outside rim of the hole. The 5" strip should overlap end-to-end about 1". Add the second strip and then the third. Let the resin cure. Then sand with 80 grit and clean with lacquer thinner. Add the next three layers then let cure. Continue this process until the CB pivot hole diameter is less than the pivot axle diameter. Then cut a wooden dowel off about the right diameter to length and epoxy it into the CB pivot hole. The purpose of this dowel is to provide a solid base for the centering bit of a hole saw. Determine the exact center of the CB pivot hole and use a hole saw the same diameter as the axle to drill the new CB pivot hole. Make sure this hole is exactly perpendicular to the CB or the CB will not fit into the trunk. Use a drill press, if you have one. If not, use two helpers looking on from right angles to guide the guy with the drill to keep the hand-held drill's bit vertical.

If the fit between the axle and the CB pivot hole is too tight, use sandpaper to slightly enlarge the hole diameter.

8. Final Installation. Apply anti-seize compound to both machine screws and attach the pivot axle to the both hangers. Install the CB into the CB trunk from the top until the hanger top flanges are flush with the top of the wooden CB cap. Use #10 pan head SS self-tapping screws to screw each hanger through the wooden CB cap, the fiberglass top CB trunk piece and into the plywood flanges on the top of the inner CB trunk. These screws should go at least ¾" into the plywood. This usually requires 2" screw length. Drill pilot holes first to reduce the risk of splitting the wooden CB cap.

9. You may find that the CB binds in the CB trunk due to the thickness of the CB hangers causing interference with the CB. If so, remove the high spots on either side of the inside of the CB trunk using a wood rasp, followed by sandpaper. This can be tedious. Take your time. The objective is to not remove anymore fiberglass then is necessary. Do not try to shortcut by removing material from the CB itself. The CB is already weak enough due to the foam core. Removing fiberglass from the CB is asking for trouble.

10. Step back, admire your work, and open a cool one.