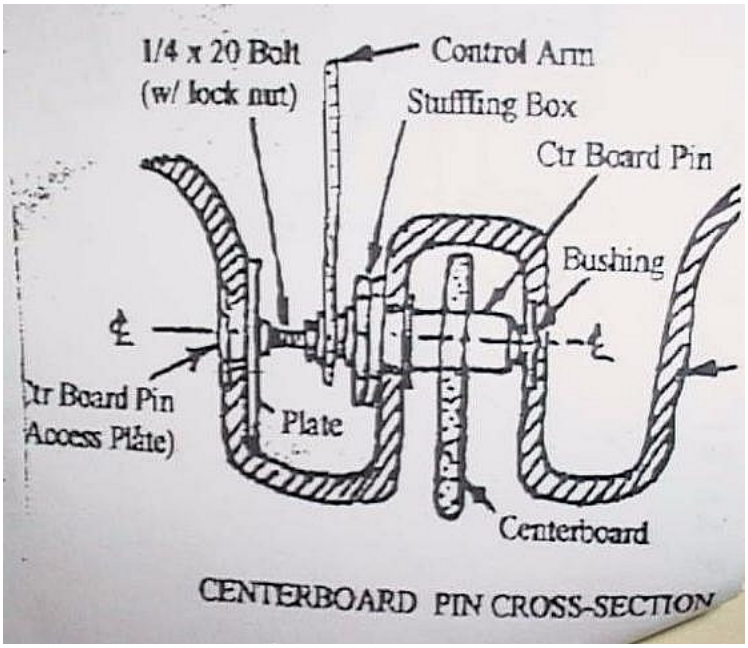
Restoration of the T34C Centerboard and Associated Mechanisms

Compiled from material by Tartan, Dan Batchelor, Neal Musto and Laird Bruster. Edited and procedurally sequenced by John Harvey.

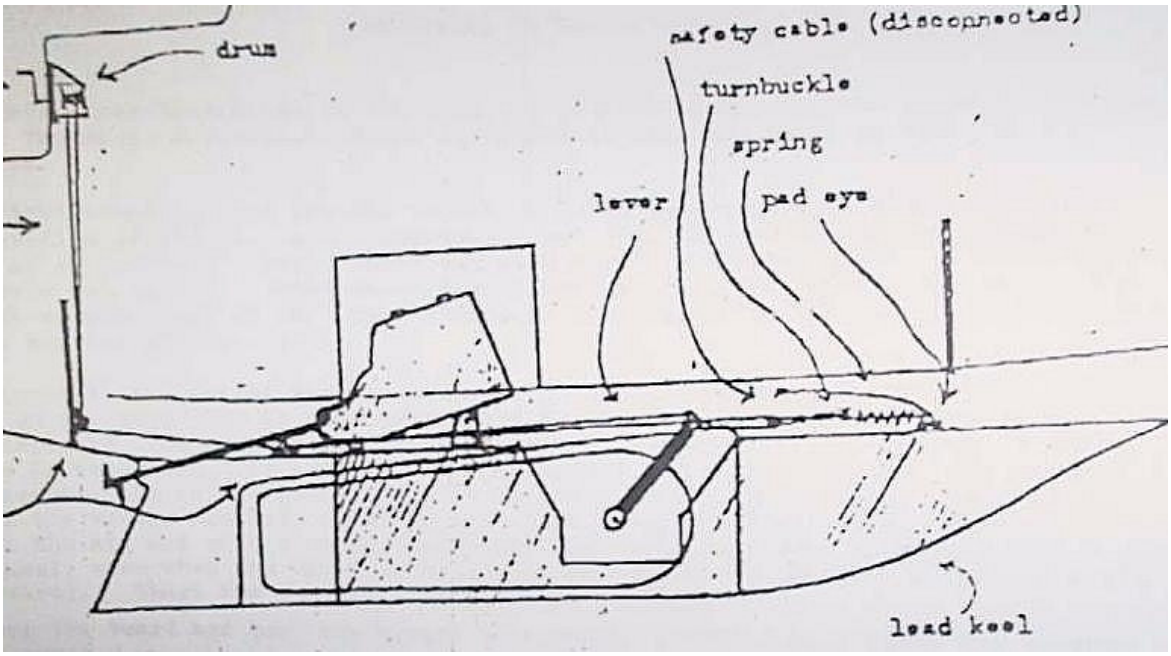
Overview

The Tartan 34C is equipped with an easily operated centerboard control system giving positive control in both raising and lowering the board. The nature of the system allows precise control of the centerboard position, permitting you to take full advantage of the Tartan 34C's fine sailing qualities on all points of sail and in all wind and sea conditions. Due to rating considerations at the time the T34C was designed, the board is of minimum weight, therefore a positive system is needed to make the board go down, as well as pull it up. The board is therefore fixed in place and does not "kick up" on grounding. The heart of the system is a 15" stainless steel lever (the Control Arm) rigidly attached to the centerboard at the pin through a stuffing box in the trunk. A well is cast into the starboard side of the lead keel that allows the lever to rotate freely. Any rotation of the lever thus results in a precisely equal rotation of the center-board.



Control Cable

The lever itself is controlled by means of a continuous circuit of 1/8" stainless steel cable, which is lead to and winds around a drum located just behind the forward wall of the cockpit. A removable handle turns the drum from the cockpit. **Counterclockwise raises the board. Clockwise lowers it.**

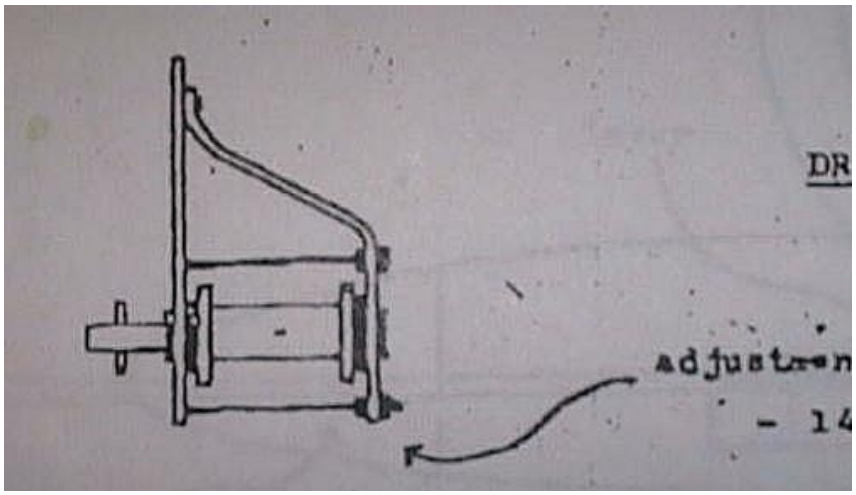


A look at the accompanying diagram will reveal that, if the ends of the cable circuit were fixed, a greater cable length would be required at the half-up position (with the lever vertical) than in either the full-up or full-down position. Consequently, the forward end of the cable circuit is not fixed but is attached through a turnbuckle to a stainless steel spring. The spring allows the system to accommodate itself to any position of the lever. When the turnbuckle is set properly, proper tension is maintained on the cable at all times. The centerboard cable turnbuckle is set at the factory during building, but due to the effects of use on the system, this setting should be checked occasionally.

Excessive slack will be apparent in the full-up and full-down positions, and would result in imprecise control of the board setting. Excessive tension would be most obvious in the half-up position, and would result in difficult operation of the system and possible component failure. Therefore, the turnbuckle should be adjusted at the full-up position so that there is only a slight extension of the spring (1/4 " to ½"). Then tension should be checked manually at the half-up and full-down positions, and the system checked for smoothness of operation. Access to this part of the system is through the lift outs in the main cabin sole.

It is important to insure that there is sufficient friction in the system to prevent the board from changing position on its own because of its weight or wave action. This is done by adjusting the pressure of the drum bracket on the drum by means of the two nuts on the lower bolt on the bracket (see diagram). Backing off on the after nut and tightening the forward nut will increase the pressure on the drum end consequently the friction on it. At the proper setting, the drum can be

turned easily by the handle but will not move at any other time. This setting is done at the factory, but should be checked when the owner receives the boat and occasionally thereafter. Access to the drum and drum-bracket is gained though the hinged door just aft of the top of the companionway ladder.



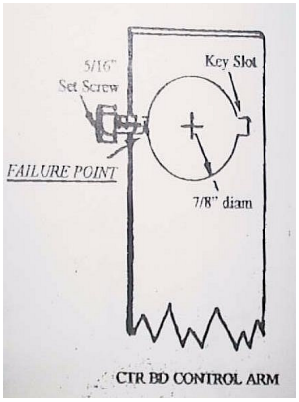
As a safety measure, an additional separate length of cable with shackles at both ends has been provided. Whenever the boat is hauled, this cable should be shackled to the pad-eye at the forward end of the spring and to the shackle already present at the forward end of the centerboard lever. This will insure that the board is securely locked in the up position.

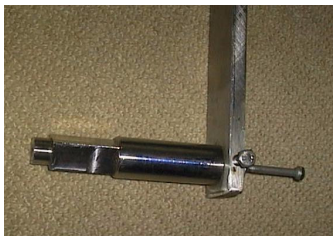
Two ways to bring the centerboard up in an emergency:

1. Use your soft vang/preventer as a block & tackle in the bilge attached from the forward eye to the centerboard arm and pull it up manually.
2. The old rodeo move - tie a line to a midship cleat or main winch and from the bow, scrape the bottom from the other side to catch and lift the c/b, then tie it off until proper repairs can be made.

Lift Mechanism

The control arm visible in the bilge is connected to a horizontal axle. The arm in the early boats have a square hole in it matching the square end of the axle. Later boats had an arm with a round keyed hole, and a round axle with a keyway milled in. On all models, a set-screw is incorporated to hold the arm from sliding off the axle.





Beware: The tiny, tiny, tiny little bronze key which locks the shaft to the lever arm. Consider replacing the bronze key with one hand machined from stainless because the original bronze one may have sheared -- perhaps from a grounding by a PO. The original bronze key was used just like a shear pin on the older outboard props--the idea being that it would be better to shear the key than damage the board, etc. But probably the best retrofit would be to machine a square shoulder on the pin and a square hole on the control lever arm and make that joint absolutely RIGID. Keep the bilge as dry as possible to prevent crevice corrosion.

The horizontal axle passes through a stuffing box and through the centerboard trunk to a bushing on the port side of the centerboard trunk. Where the axle passes through the centerboard, the axle is square, and there is a square hole in a piece of brass embedded in the board, completing the assembly.

Eventual Wear

In time, a few thousandths of an inch of wear will happen to the square hole in the piece of brass embedded in the centerboard. Because the sides of the square are only about an inch on a side, the small amount of wear will let the aft end of the centerboard drop lower than the bottom of the keel (the dreaded droop) even when the board is hauled up all the way (e.g., the vertical arm all the way forward). Alternatively, if you can move the arm through nearly 30 degrees without the board moving, either the axle needs replacing, or the hole in the board is worn round. There are two remedies for the out-of-square condition:

1. Remove the board and bush the square hole in the board to be a tight fit on the axle again.
2. Remove only the vertical arm and cut it and re-weld it with a dogleg so the axle turns further before the arm hits the forward end of this travel. The disadvantage of this fix is that the board will not go down all the way.

Removing the Centerboard

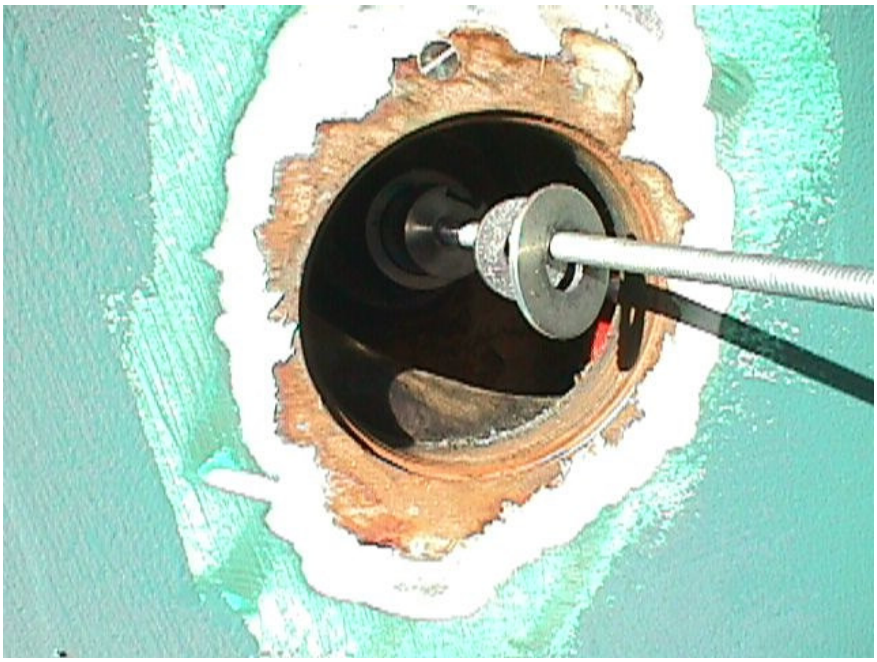
This can be done with the boat supported by normal jack stands and a center support under the keel, just forward of the centerboard slot. Dig an 18” trench under the centerboard deep enough so the centerboard will drop out horizontally. Disconnect the cables from the vertical arm. There is an inspection plate in the hull on the starboard side of the keel. The inspection plate is glassed over with a layer of mat to help insure watertight integrity. If you cannot find the plate visually, the metal in it will cause a different temperature to be felt in the area of the plate. You can hit the area with a CO2 fire extinguisher, and the frost pattern will tell you where the plate is. Another approach is to place a straightedge up inside the keel until it strikes the horizontal axle and then measure the distance to the base of the keel (approx. 8 inches).

Move the ruler and measure up on outside of the keel and mark the location so you can sand away the fiberglass until you locate the plate. The middle round section will unscrew. It has two holes in it that are filled with a non-hardening putty. Remove this putty so the holes can be used to help turn the plate. Unscrew the inspection plate or remove the entire bolted on plate. Once open, there will be a ¼-20 hex head machine screw visible on the end of the axle. Back out this

fastening, loosened the set screw and then the vertical arm can be slid off the end of the axle. On some models the arm is attached to the horizontal axle with a machine screw.

Removing the Shaft

Thread a long ¼-20 piece of threaded rod into the tapped hole in the end of the axle in order to pull the axle out. Slide a piece of ½ x 8“ pipe on the threaded rod. Place a large washer and nut on the end of the threaded rod. Sliding the pipe and hitting the nutted washer will act as a “slap hammer” making it easier to remove the axle. If possible, support the centerboard before pulling the axle.Remove packing nut and replace packing with 3/16” or ¼” packing.



Squaring the Centerboard Hole

Route away 8” diameter of fiberglass from around the hole in the centerboard on both sides. The interior is constructed of a central steel plate about 6 inches wide, ½” thick and most of the length of the board. This steel blank is covered with FRP to give the correct airfoil shape. The hole in the board that accepts the axle is a bronze or brass investment 3-4 inches in diameter. Thus, the hard stainless axle bears on a relatively soft metal (brass or bronze) which is only ½” inch wide, a recipe for wear.

One repair is to add material back to the hole and file it back to the original square dimension. Then weld ½” square bar stock around the perimeter of the hole to increase the thickness of the bearing surface to 1 inch.

Another repair is to cut out the brass/bronze investment and replace it by welding in a 1 inch thick stainless steel donut with a square hole cut in the center dimensioned to fit the axle. Take care to not heat the steel blank so hot that it significantly chars the surrounding FRP. Position the donut such that its flat surface is below the plane of the board so that when re-constructing the FRP in this area the SS donut will be below the surface. To repair the hole first cut and fit pieces of ½

inch plywood to fill in the empty sections adjacent to the steel core. Seal them with epoxy and epoxy in place. Taper the edge of the hole cut in the board and lay up fiberglass/epoxy to build up the board to the appropriate thickness. Do on both sides. Finally fill and fair the area back to its original thickness. This can be expensive; $375 for welding in 2002. [Seems like overkill – what about Tartan's suggestion of a bushing insert?]

Take this opportunity to sound the board with a plastic hammer for voids. Some may occur as a result of the core material burning out during the welding. Others are likely due to original poor lay up. Fix these by drilling multiple 1/8" holes in the area of the voids and injecting slightly thickened epoxy resin until it oozes out of all holes. As each hole begins to ooze plug it and continue until all holes are oozing. Also repair any dings in the leading and trailing edges of the board.

Replacing the Centerboard

Chalk a cross on the starboard side of the board at the axle hole, so that the direction to the hole can be seen while your assistant wrestles with the board. This can also be done by one person; place a line through the centerboard hole and pull it through the axle hole in the keel (starboard side) to move the board into position. Hold it in position propped up on bricks or wood and position it with a dowel or long screwdriver. Put a little waterproof grease on the end of the axle. This end fits into a bushing and a little lube won't hurt.

NB: Be aware that the bushing on the port side of the CB trunk accepts the small end of the CB axle. This bushing may not be secured and some time between the removal of the board and its reinstalling it can drop out and disappear. The unfortunate aspect of this is that it is not a standard size bushing either in the outside or inside diameters. As a result it may have to be custom made. Not expensive ($40) but a pain in the butt because the ID of the hole that receives the bushing is difficult to measure. Once it fits, cut grooves around the diameter then epoxy it in place by lathering the hole in the CB trunk and the outside of the bushing with thickened epoxy then use the axle to locate it into the hole. Generously cover the axle with wax and mold release so that the bushing and axle come apart after the epoxy has kicked.

Preventing Axle Side-Slip

If the bolt in the starboard end of the axle is not properly installed with the locking nut on it and not hard up against the access plate the bolt may back out, allowing the axle to move to starboard enough so the square in the axle disengages from the square in the board. This side-slip may be evidenced by visible polished metal on the axle which had previously been inside the packing gland. Additionally the setscrew which holds the SS arm onto the axle can come loose. If this should happen under way, pass a line under the boat, and haul up on both ends to partially raise the board. Disconnect the cables from the vertical Control Arm. Use a crowbar, or in an emergency, a winch handle and a block of wood in the bilge as a brace or bearing fulcrum to apply pressure to the end of the axle. Wiggle the arm while supplying the leverage, and if you hold your mouth just right, you will be able to get the square on the axle to line up with the square in the board and slide back into place. The control arm may now not be fully forward.

Install a longer screw held with extra nut(s) and/or epoxy a piece of fiberglass or strong wood to the inside of the hull to take up the rest of the gap between the screw head and the inside of the plate.

Lifting Drum & Crank Removal and Repair

Recall you raise the centerboard by inserting a crank into a pinned shaft located on the vertical part of the bridgedeck which moves the cables which raise and lower the centerboard. The crank arm fits over a solid steel rod with two "pins" or "ears" which protrude at right angles to the axis of the rod at the center of this mechanism to which the crank attaches. The crank grabs onto those "pins" but they can disintegrate until there is nothing for the crank to grab onto. The pins can shear off because you never know when the board is fully up, and you tend to keep cranking--and the excessive cranking pressure is what shears them off.

The fix is to remove the entire drum assembly. Standing at the ladder looking aft the CB drum/wire is attached to its mount with four bolts. The bolts hold an aft plate which also acts as a CB tensioning device and therefore have double nuts on each bolt. To remove the drum, first disconnect the wire thimbles from the CB control arm. Pull both ends of the wire back through the bilge, noting how they are run. Remove the nuts on the aft plate and pull the drum forward. Remember how both ends of the wire flaked off the drum. The forward run (the wire that pulls the board up) is longer than the other end.

Take the lift drum assembly to any machine shop and have them knock out both pins and drill out the pin holes oversize, then tap in new pins slightly larger diameter than the original ones.

- **Improvement**: Install a waterproof contact switch in the bilge so that when the centerboard pin arm is in the fully up position (extreme forward position) it makes contact with the switch and turns on a light which can be located on the vent stack housing where it is clearly visible while cranking in the cockpit. This takes all the guesswork out, and is important because sometimes the cables do not lay exactly flat on the spool and can slightly bind. Crank up until the light comes on, then back off just a tad to let the light go out.

Or -

– Hear it hit home. You'll know about when it's about fully up by the number of revolutions and the position of the handle (same as where you started).

While you have the cables out, this is a good time to inspect the wire and think about replacing. The cables have about a ten year life. If it is appropriate to replace the cables, here is the procedure, courtesy **Laird Bruster**.

Centerboard Cable Replacement

Depending on whether the cable is broken or just worn you may or may not be able to do some of the following. See previous centerboard operation, diagram, and wire tuning instructions.

Tools / Parts:

- 30' 7x7 or 7x19 Cable*
- Wire cutters
- Electricians Tape
- Replacement thimbles
- Stainless Steel wire clamps
- Socket drive with 3/8" x 6" extension
- Wrenches
- Screwdrivers
- Flashlight
- Lubricating oil
- Penetrating oil

*The preferred cable is 7X7 or 7X19 since these are designed to run through blocks and are much more flexible although not completely immune from going BOING.The 1x19 wire is 19 individual wires that are twisted to form the cable. The 7x7 wire is laid up of 7 groups of 7 small wires each - 49 wires total. The smaller individual wire diameter in the 7x7 as well as the lay of the wire makes it more flexible.

Tip: Solder the free end of the cable so it won't unlay as you push it through the hole in the drum.

1. First step is to sketch the cable routing, turnbuckle position (taping existing extension facilitates the re-install tensioning).
   a. Note the routing of the wire off the block behind the ladder. Clearly sketch the direction (port/starboard) and which side the wire feeds to the arm (from the bow to aft) and (which attaches from the aft forward).
   b. NOTE that the wire is a single continuous piece. It threads thru a hole in the drum and then is wound up. Several (4-6 WRAPS) wraps in each direction need to be on

the drum before you start threading the wire to the blocks TO the CB arm. MAKE SURE YOU NOTE THE DIRECTION (CLOCKWISE / COUNTER-CLOCKWISE) EACH END OF THE CABLE GOES ON THE PORT AND STARBOARD SIDE OF THE DRUM.

c. There may be a small metal wedge located in the hole in the drum that keeps the cable in position. You may need to drive this out from the opposite side. Drive the wedge in the direction with the shortest distance.

Tip: A replacement wedge can be gotten by buying a #1 by 1-1/2" tapered key and cutting 1/4" off the fat end.

2. Lock the CB arm in the up position. Most models have a lanyard that can be used to attach to the CB arm. This is REAL important if the boat is in the water. If the lanyard does not exist, improvise.

3. Remove / unthread the existing wire from the drum, thru the blocks under the drum (access is in the wet locker) behind the companionway ladder and thru the blocks in the bilge - starboard side aft from engine. Save all pieces for measurement.

4. Measure and buy new SS cable, SS clamps, and SS thimbles.

5. Have fun at the boat store???

6. The CB drum is bolted to the forward side of the bridge deck bulkhead. The fitting is attached to the bulkhead and the drum is attached to the fitting with 3 “studs” and double bolts on each stud. The bolts are also a tensioning device to provide friction such that the board will not just “free wheel” into the down position. The tighter you thread the nuts, the more friction.

7. You may be able to unthread / rethread the cable WITHOUT removing the drum (it is easier with it removed). If you need to remove it, back off on the 3 sets of double nuts on the studs surrounding the drum. NOTE THE ROUTING OF THE CABLE ONE LAST TIME paying particular attention to how the wire threads over / under the 3 studs which hold the drum. Remove the two bolts at the top of the bracket which are screwed into a metal plate attached to the bridge deck bulkhead. Once the 2 bolts are removed the L-shaped bracket can be pulled off the hub of the drum and the 3 studs.

8. As noted in 1c above the drum has a hole in its center and the cable MAY be wedged in place via a small metal or wooden wedge. Drive the wedge out via the shortest distance. Un-wind any remaining wire and remove from the drum.

   IF the drum was NOT removed:

9. Mark the center of the NEW cable with tape.

10. Re-thread the cable thru the center hole until the tape is inside the drum.

11. Referring to your sketch created in Step 1 above, manually wind A MINIMUM of 4- 6 turns in each direction.

12. Thread the wire into the bilge towards the first set of blocks but DO NOT thread thru the block yet.

13. Replace the drum and plate while ensuring the cable feed of the drum and over / under the wire studs as you found it initially and noted the sketch in item 1 above.

14. Re-thread the wire to the forward part of the bilge.
    a. While you are down there oil the blocks!

15. Refer to the sketch you created and thread each end to the appropriate block at the turnbuckle and to the CB arm.

16. Using the SS wire clamps and thimble make fast the wire to each end location. It is a good idea to use TWO clamps at each thimble.

17. Adjust per original tartan instructions which can be found on the T34C Library.

Length? Figure on a 30' piece of cable. With eight turns around the drum (whose circumference is 4"), you will end up with about two feet left over. This proves handy when adjusting the tension using the two-piece brass thimble which is assumed to be original equipment; with the bolts adjusted to the right tension, you can pull the cable through it in either direction, but it won't slip. Then just tighten down and you're set.

Issue: Don't put on the swaged thimble first before threading through the hole in the drum because then you are working backwards from the centerboard lever to wraps around the drum, then through the hole in the drum, back to the lever etc. The question then will be: can you get the wedge back in?

Alternatives:

(Bob Reed) You can solve the board droop problem by having either the crank arm or the center board pin machined to allow an additional 5 ot 10 deg of rotation. What that means is that there will be enough throw in the crank arm to raise the board all the way up even with some wear on the arm, pin or board hole. Down side is that lowering the board will be shy of full down by the equivalent 5 to 10 degrees. Centerboard exposure of 45 deg is usually fine. Lowering it further doesn't expose that much extra board.

(George Colligan) The best way to solve the droop problem is to machine a bolt to replace the allen screw. The end of the bolt is machined to fit snugly into a hole in the centerboard pin. Using "Loc-Tite" on the threads which sit in the arm body, the bolt can be tightened by means of a long socket extension. Check for tightness periodically. The arm will never again become wobbly. It is an easy fix.

Tip: Run a line under the centerboard to make sure it stays in place while the boat is on the travel lift. If the cable is slack you may find the block that is located below the drum on which the cable turns has pulled out of the bulkhead.