

# SILHOUETTE **MAKE & MEND** Sheets

## No.4 THE BALLAST KEEL

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The MkII Silhouette ballast keel will weigh up to 300lbs. It is usually made of cast iron, but some home builders may have used lead or lead encapsulated in concrete. The keel is 'boat' shaped, sloping upwards with the line of the hull at the front, and 'pointed' at the rear end. It is attached to the hull with four 1/2" dia. bolts whose hexagon heads are recessed in the underside, and on Hurley boats, may be covered flush with a hard sealing compound.

Sandwiched between the flat top of the keel and the hull is a hardwood deadwood which is veed out to mate with the angle of the bottom of the boat. In position, the deadwood also traps the plywood hull panels against the hog plank.

The keelbolts pass through the deadwood and hog plank with 2x2x 1/4" plate washers let into the hog, and then hexagon nuts. The arrangement is similar in GRP MkII's, except that the hull is moulded with a flat panel on the underside, against which the keel is bolted, so there is no need for a veed deadwood. On the inside the plate washers, and sometimes also the nuts, are sometimes recessed deeply into the fibre-glass so that it may be necessary to grind or chisel them out. Many owners won't ever see their keelbolts, but it is prudent to have a look at one, and an insurance survey may require you to have one drawn.

### Keel bolts

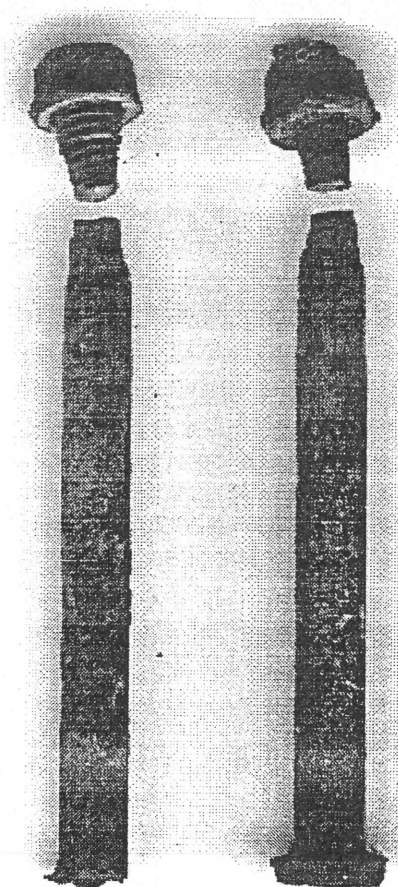
Nearly all Mark II Silhouettes will by now have had attention to the bilge keels, either by way of replacement, or various 'patching up' repairs like pieces folded and rivetted to the bottom edges or welded bits here and there.

However, not many ballast

keel bolts will have been removed and replaced, and it is recommended that you consider this as a winter project, before you 'lose weight' in a drastic manner.

If you don't wish to do this, replacement of just the keel bolts one by one should be a relatively easy job. The bolts on the GRP hulls are 6" long and so you need to jack up on blocks either on the ground or on the trailer until you have 6in clearance under the bolt positions.

The photograph below illustrates the degree of corrosion that may occur in a keelbolt, and explains why surveyors may require you to inspect them from time to time. In this case, two of the four bolts were corroded down to less than 1/4" from the original 1/2" (i.e. having only one



quarter of the tensile strength) and in fact they sheared when trying to remove the nuts. You need a lump hammer and a drift to punch out the bolts, once the nuts have been removed, or have sheared off.

What was quite worrying was that in addition to the bolts being necked down just below the nuts, the heads were also nearly non-existent, as the photo shows.

When replacing the bolts you will probably have to get 12mm instead of 1/2" ones, so put plenty of sealant on the shank of the bolt as you put it in, to take up the 0.7mm (30 thou.) slack.

### Renewing the keel bolts

1. Remember that Silhouettes are tough little things, especially if built by George Hurley, and, generally anything fitted to them is FITTED! Keel bolt removal is therefore not going to be just a matter of undoing nuts and pushing the bolts through, they may have to be removed using heavy blows with a heavy hammer

2. Jack the boat up, and, if it's on a hard surface allow enough height to remove the full length of the keel bolts (which vary between about eight and eleven inches long). If on a soft surface small holes can be dug to give clearance. Concrete building blocks are easy and cheap to buy and transport. Ensure that the boat is firm on the bilge keels and preferably level with one block and wood wedges under each end of the ballast keel, keeping at least two blocks spare. The full weight of the boat should be on the ballast keel, as the bilge keels are not intended to bear the full weight of the boat.

3. Inside the boat take out the cabin floorboards, and, using WD40 or similar (Diesel fuel is particularly good as a freeing agent), thoroughly spray the nuts and washers holding the keel. Repeat the treatment for at least two days, this gives a chance for the rust to be penetrated and hopefully allow the nuts to be more easily undone.

4. In the meantime, obtain the following - note that as the boats were built in the days of imperial measurement, these are used throughout, but if you can't obtain imperial replacements, the nearest lower diameter will have to be used, unless you can drill out the holes in the keel to a larger size.

a) a length of mild steel bar 7/16th inch diameter and about 18" long

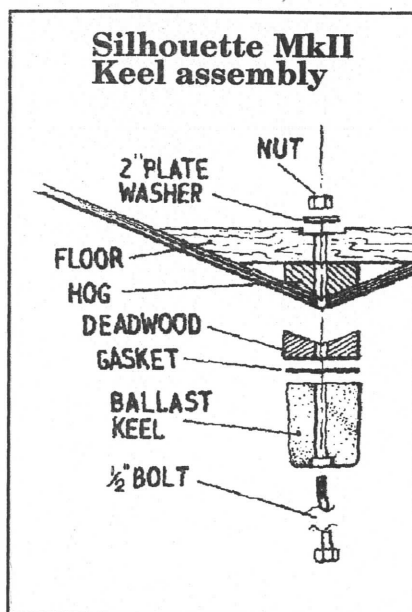
b) a length of mild steel bar 7/8th inch or 1 inch diameter - either round or hexagon - (mine is hexagon) and about 9" long. Drill and tap one end 1/2 inch Whitworth.

c) a tube of silicone based jointing compound. A D.I.Y product is effective and less costly than marine specials.

d) some resin based filling compound.

5. Under the boat, on the underside of the keel, scrape out the hard sealing compound used to seal the bolt heads, an old sharpened screw driver is ideal, then, using the spare concrete blocks and wood wedges, put one either side and close to the first of the bolts to be thumped, making certain everything is safe and tight.

6 Back into the cabin, and using a socket hexagonal spanner, extension bar and a long handle, - a socket handle can be extended by the use of a piece of tube, - slowly remove the nuts, keeping downward pressure of the extension bar to prevent the spanner slipping. An extra pair of hands to so this can be an advantage.



7. When all four nuts are off, you will need your pieces of bar and a hammer - for preference a lump hammer, weighing about 4lbs. Simply screw the threaded bar onto a keel bolt - the hexagon shape helps here, leaving approximately 1/4 inch of the bolt showing, and the HIT IT! You will now be able to really vent any frustrations you may have as, keeping the bar upright, you rain blows on it. As the base of the bar touches the washer (left in places for this reason - clever see!) Unscrew the bar another 1/4 inch and attack it again. As the hammer blows need to be heavy, the end of the bar will 'mushroom' out, if this becomes excessive, grind or file back into shape - and start again. PLEASE do this, or a particle could be broken off, and your eyes are very close.

8. when the bolt is level with the bearer, remove the bar, washer and any packing around the bolt, then using the 7/16 inch diameter bar. drift the bolt through. Make a note of which bolts go where, as the lengths differ - and you have three more to go!!

9. Even with all bolts out, the keel will probably stay put, certainly so if the boat is sitting on it as it should be. Now the main thumping is done, jack her up a little higher to put supports on the centre keel line

just forward and aft of the ballast keel. Adjust the bilge keel supports with a little packing to keep her level.

10. These boats were well built, and a few thumps with the lump hammer and a piece of wood will be needed to release it. DO NOT try to prise or hit the deadwood, - the filler piece between the keel and hull, - this is screwed to the hull (with silicon bronze screws) and these screws will come out quite easily, - probably put in with grease or tallow - just another touch of class! If the keel bolts alone require attention, this piece need not be touched, except perhaps to repack the joints with sealant.

11. Replacement bolts may be made by purchasing a length of 1/2 inch diameter steel bar, about three feet or so long, plus eight 1/2 inch Whitworth hexagon nuts and eight 1/2 inch washers. The bar is cut to size and threaded each end. Put both nuts on, and weld over one. Painted with anti rust paint (not galvanised), they will last another 25 - 30 years or so - Keep the bars used and you can do it all over again, - something to look forward to! Take photographs of your old and new bolts, they may be useful for your next survey.

12. When replacing the keel the 7/16th inch steel bar will help in the location, put one bolt in, say the front, and then using the bar in the rear holes as a guide. Jack the keel up using plenty of mastic. After all is bolted up, using a few turns of caulking cotton mastic under the washers, refill the bolt head holes in the keel with a resin filler and paint the inside nuts washers and threads.

13. Do this, and any other necessary work with care, remembering that the boat you are working on is past her first flush of youth, has given enjoyment to many people, and that

with care and attention equal to that with which she was first designed and built, can continue to do so for many years to come.

## Dealing with stubborn keel bolts

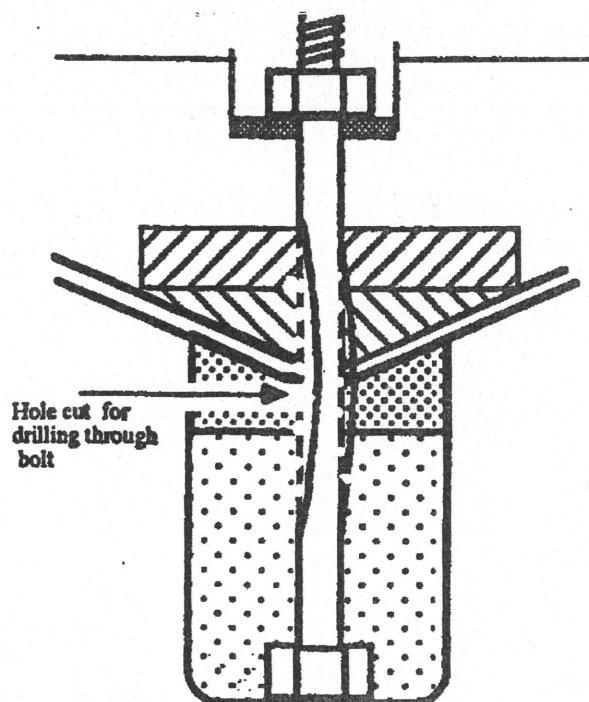
The above method is only good if the keel bolts are in good condition. If you are considering taking out the keel bolts, and think there is a good chance that they are in a poor condition i.e. wasted away in the centre section, it is possible that with heavy blows from a lump hammer you could split the boat down the middle!

If a wasted keel bolt is subject to heavy blows, it will bend where it passes through the hog and deadwood area - it is usually held tight in the ballast keel just below.

As you can see from the sketch on page 3, as soon as the bolt bends it becomes impossible for it to go down the hole and through the keel, so increased hammering will only cause sideways damage. The deadwood is particularly vulnerable to sideways damage as it is fabricated from two 'mirror' pieces of hardwood, doweled and glued together. The sideways bend in the bolt may therefore split it. Having said what could go wrong, here is one way of dealing with the problem.

1. Move the boat forward on the trailer to get at the keelbolt from the side.
2. Cut a small hole through the side of the deadwood in line with the keelbolt, following the top edge of the keel to avoid cutting into the hull, until the bolt can be seen.
3. Centre-punch and drill a 3/16" hole through the bolt and open it out to 3/8", leaving a 1/16" wall to the bolt either side.
- 4 Move the boat on the trailer to get at the other bolts.

When all the bolts have been drilled through as above, and



the boat is brought back into the proper position on the trailer, lift the boat about one inch (or jack the whole lot up and then lower the trailer). Cut through what is left of the bolts with a cold chisel. The ballast keel will then drop (or can easily be released with the lump hammer), bringing the lower parts of the bolts with it. The bolt heads may then be drawn out easily from inside the hull.

made of lead, some builders have encased it completely in fibreglass to insulate it from dissimilar metals.

## Electrolysis

There is a school of thought that says that stainless steel is not suitable for underwater fittings, and therefore should not be used for keelbolts, due to its reaction with dissimilar metals already fixed to the hull. Given the present age of most Silhouettes today, and the increased difficulty of working with stainless steel (plus its extra cost) it is probably not worth using it anyway. Provided that mild steel is properly sized, primed and painted (many owners use two part epoxy paint for this, there is no reason why mild steel bolts, rudder fixings etc. should not last out the remaining years of the boat's life - and maybe yours, too.

When the ballast keel has been