

Keep Your Boat... Cut your Keel



My wife, Linda, and I didn't know how important shoal draft was until we began cruising in Florida and the Bahamas. Simple Gifts, our Crealock 37, was advertised as having 5-foot, 3-inch draft when we bought her in 1983. In 1994, while hauled out to install a new depth sounder, we discovered that equipped and loaded for cruising, she drew a solid 6 feet! Suddenly, areas that appeared do-able became high-tide-only ventures. Part of this was physical reality, and part was perception. We know cruisers who go everywhere with 6 feet of draft and a "no-problem" attitude. I couldn't relax when the depth-sounder read under 7 feet it was taking the joy out of our cruising experience.

We considered buying another boat, with shoal draft and, of course, a bit more space. But the economic realities of buying and selling to reduce draft by 12 inches proved to be prohibitive. Furthermore, the boats we saw in our price range were not as well equipped and maintained as Simple Gifts. We knew that whatever we did would require stripping Simple Gifts and upgrading the new boat, not a pleasant prospect.

I called Simple Gifts's builder and discussed the possibility of replacing our keel with a shallower Scheel (bulb) keel. They were not encouraging; besides the prohibitive cost, they indicated that the task would be very difficult because of the way the keel was attached to the hull. With that option virtually closed to us, we continued our boat search.

A new idea-cut it off

I'd read about reducing draft by cutting off a portion of the keel and bolting on two lead-bulb halves to restore the lost ballast and maintain the righting moment. We found a company, Mars Metal of Burlington, Ontario, that specializes in this type of project and persuaded us it could be feasible. But the prospects of cutting a large piece of keel was daunting. Would we ruin the boat's sailing performance? What about resale value? Forget resale value, what about stability? Another concern was cost; we wanted to evaluate the expense of this modification versus the purchase of another boat.

***If deep draft is limiting your
cruising options, you may be able
to change direction***

Bill Crealock, the designer of the Crealock 37, couldn't have been more gracious or helpful with our questions. He agreed that it wouldn't make sense to try to swap keels but thought the bulbs were a workable way to reduce draft. "No promises, mind you," he said, "but if you create a bulb that has a flattened section, you may get some tip effect similar to that of a Scheel keel. At worst, I'd expect that the boat might heel perhaps a half-degree more than it would without the draft reduction, and you might lose about one degree of pointing ability." At this point we started to get excited, doubting that we would notice such changes.

Bill noted that we could cut 10 inches off the keel and still leave the bottom of the rudder skeg half an inch above the keel. We did not want to cut the skeg and rudder, so we agreed that this was a reasonable approach. With an aggressive "clean-out-the-boat" program, we thought, we could get Simple Gifts's draft close to 5 feet. Loaded for cruising, Simple Gift's stern tends to "squat," so Bill suggested that we concentrate the weight of the bulb on the keel's forward section, bringing up the stern and getting the boat back on her design lines.

Bill provided us with a cross-section design of the bulb at its maximum dimension and an estimation of the weight of the ballast to be removed and the weight of the replacement bulb. I faxed the information to Mars Metal, who quoted a price of \$3,500 including the lead mold, predrilled bolt holes, the hardware for attaching the bulb halves to the keel, and freight. Because we found the price reasonable and Mars's experience reassuring, we gave them the job. I discarded the options of having a more geographically desirable foundry manufacture our keel bulbs or having a full-service yard handle our entire project.

Converting a standard fin keel to a bulb keel is one way to significantly reduce draft

This type of project is not as difficult as it sounds, but it's important to make sure the boatyard knows how to saw and drill through lead. We found a yard only 15 miles south of our home in Florida with experience in draft reduction. The yard manager referred me to Larry Hoffer, of Treasure Coast GelCoaters. "Sure, I've cut keels off," said Larry. "I just did that CSY 44 over there." I showed Larry drawings of Simple Gift's lines and told him that the keel was external lead (see "Keel Questions"). He proposed a flat fee of \$1,000, plus materials.

Making the cut

We arrived at the yard for the last scheduled haulout of the day. To avoid blocking and re-blocking, they held Simple Gifts in the Travelift overnight. That way, the keel could drop away from the boat as it was cut, avoiding the potential of binding the saw if the boat were held in jackstands. We used a wood batten and yardsticks to scribe the cutting line 10 inches from the keel's bottom and extended the same batten aft to the rudder skeg to assure that it wasn't going to hang below the keel bulb. Everything lined up as Bill Crealock had indicated, so, taking a deep breath, we told Larry to start cutting.

Larry tried to cut the keel with a Skilsaw and a carbide-tipped blade, then with a Sawzall, but neither was up to the task. Linda and I were beginning to wonder if we should quit, when we heard the whine of a chain saw, "You know what Tim the Tool Man says," grinned Larry as he revved the saw, "more power!" With that, he attacked the keel. Chips flew, oil splattered. It was slow going indeed, but 40 minutes later, with a

cut that was within 1/8 inch of the scribed line, the offcut dropped from Simple Gifts's bottom.

The next step was to prepare a full-size outline of the keel's section. We laid a length of heavy brown wrapping paper on the top of the keel offcut, covered it with a piece of plywood, and traced the keel's section from the underside. We sent the outline off to Mars Metal so they could make the bulb halves. With the template complete, we had no further use for the 1,500-pound keel offcut; a recycler removed it and paid us 15 cents a pound. Bill had estimated we would remove 1,513 pounds ñ there could easily have been 13 pounds of material lost in all the cuts. We now had assurance that his calculation of 1,600 pounds for the bulbs was in line with what we had removed.

While Mars Metal was casting the bulb halves, Larry removed the bottom paint from the lower part of the keel, grinding back to bare metal. Slightly over two weeks later the bulb halves arrived predrilled, from the foundry. There were six fastening bolts in all; five were 3/4 inch in diameter, and the sixth at the trailing edge was 1/2 inch in diameter.

Larry used plywood skids, railroad ties, and jacks to position the bulb halves on each side of the keel. With the bulb halves in position and leveled, he drilled a pilot hole for the forward bolt. Mars Metal recommended drilling a hole 1/4-inch larger than the mounting bolts, to accommodate any slight variation in alignment. The holes aligned perfectly, and Larry was able to drill holes that matched the bolts' diameters, thus getting maximum strength. Drilling was more tedious than the original keel cut. In spite of liberal applications of lubricating oil, the drill bits quickly dulled and bound in the lead. Extension shafts snapped and tempers flared. Finally Larry resorted to slow in-and-out drilling, cutting a bit away, then backing out the lead filings from the hole. All in all, it took several days, with time for equipment repairs and trips to the machine shop to sharpen the bits.

With all the bolt holes drilled and the bolts in place, Larry backed off the nuts and slid the bulbs away from the keel, leaving them supported only by the bolts. The bolts supported the weight without sagging, so we were sure the bolts were strong enough. He forced a mixture of epoxy and filler between the bulb halves' top and bottom edges and the keel. Finally he torqued the nuts tight. The epoxy filled the small gaps between the bulb halves and the keel and provided additional strength by bonding the two surfaces together; rounded scrapers created a smooth fillet between the keel and the bulb halves.



After the epoxy hardened, Larry cut off all the bolt threads protruding from one side of the keel and packed each hole with more epoxy, forcing the mixture around each nut. Thus, in addition to using lock washers (which were used to keep the nuts from backing out), each nut was encapsulated so it couldn't work free and would be sealed from saltwater. Finally, he faired the epoxy, producing a smooth surface ready for priming and bottom painting.

The results

Back in the water, we didn't notice any difference in the boat's motion. In retrospect, before we did "the cut" we could have hung a weight from the boom, measured the heel with an inclinometer, and then compared the before and after. But frankly, what would have been the point? Our only recourse would have been to tear the entire keel off and start fresh. Not likely!

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As I write this, we're swinging an anchor in Hope Town, a Bahamian harbor we've previously entered only at high tide. Cruising buddies have commented that we seem to be anchoring closer in to shore than we had on prior cruises. Their eyes widen when we tell them about the chain saw. But how does she sail, they ask? After a boisterous motorsail across the Gulf Stream, we entered the Little Bahamas Bank and set a course to Great Sale Cay. Killing the engine, we close-reached across the azure waters, under main and working jib. The staysail lay in its bag on deck ñ I was too lazy to hoist it. We were doing 7 to 7 1/2 knots, something Simple Gifts had never done on a consistent basis. Night fell, a full moon rose over the bow, phosphorescence trailed astern as we streaked across the bank through the night. We knew we'd done the right thing.

KEEL QUESTIONS

Although we were fortunate to work with our boat's designer, don't worry if you can't. A qualified naval architect can help you determine how much of your boat's keel can safely be removed and how much ballast needs to be added to maintain your vessel's designed stability.

According to [Mars Metal \(tel. 800-381-5335\)](tel:800-381-5335), over 90 percent of their bulb installations are on boats with external lead keels, which are common on production boats. Check with your manufacturer if you're unsure about you keel.

If your boat has an iron keel you can install bulb halves, but cutting it will be more difficult. Encapsulated keels present several problems, not the least of which is finding out what kind of ballast is really inside the keel. You may find yourself cutting into lead shot, solid-lead blocks, iron blocks, or concrete. Contact the builder to learn what you're facing. Having to seal the hull will also increase the overall project's complexity and cost. Moreover, many encapsulated hulls are of the "full keel" variety, with a fiberglass "deadwood" either in front or aft of the actual ballast. This complicated the mounting process. Plan on spending more time with the builder and naval architect planning the project.

As appeared in SAIL Magazine, August 1998



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