

# Practical Sailor®

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# Headings

## Olaf Harken Sounds Off

*The co-founder of one of the leading—and most innovative—sailing equipment manufacturers offers his outlook on the mechanics of trickledown technology and its future.*

**H**arken Yacht Equipment offers 500 types of blocks in its catalogue, well over 100 winches, and host of other products—most devised for sail handling. In recent years, the Pewaukee, WI.-based firm has won industry awards for several of its products, many that have evolved through its research and design for America's Cup clients. *PS* got on the phone with co-founder Olaf Harken recently to learn his views on trickledown technology and to see what he anticipates for the future of sailing equipment. (Confidentiality agreements with current America's Cup clients preclude Harken from talking about some of this research.)

Both Olaf and his brother Peter (also a Harken co-founder) are active sailors and they regard this as important in their work. Their interest in designing and building sailing equipment grew out a fledgling boat building business—Vanguard Sailboats—they founded in 1967. Olaf owns and sails an A-Scow while his brother Peter sails an MC Scow. They both sail iceboats in the winter, and while Peter often travels to compete on large mega yachts, Olaf tries to steal away to spend time aboard his 32-foot sloop.

**Practical Sailor:** It's generally understood that your company grew out of your and Peter's passion for competitive sailing dinghies—build-



*The Harken brothers—Olaf (left) and Peter (right)—have been pioneering new equipment for sailors for 37 years.*

ing them at first and then the equipment for them. Were you both trained as engineers?

**Olaf Harken:** When we started, I had an engineering degree and Peter had economics degree. Then we switched. Initially, I was doing all the financial and administrative stuff up until 20 years ago, then Art Mitchell came on board. Peter is the president and he's in charge of engineering and production. I'm the vice-president, and I'm in charge of marketing. Art is the Treasurer and Director of Operations. We now have about 220 employees.

**PS:** It seems the majority of Harken's R&D work now centers on the Ameri-

ca's Cup realm and larger offshore boats, with lessons learned there filtering down to the products you offer for more mainstream sailors. Is that a fair assessment?

**OH:** Not really. We spread the R&D along different teams working in different areas. We have people working on small boat equipment, furling systems, and custom work, which includes mega yachts and the America's Cup. The America's Cup does require a strong amount of R&D; if you don't do that you won't be in that business long. And the demands are extreme. Clients in that area are primarily looking for superior strength-to-weight ratios and good perfor-

mance. If they can get an edge in anyway, that's a big plus.

Here's an example, two Cups ago, the norm was to have the grinding team on the genoa consist of two pedestals with four guys. A tack took approximately 5 to 6 seconds. Then one of the teams—working independently—added another pedestal to the system (using an existing pedestal), so that gave them a six-man input. But they did this in secret and they didn't do the engineering correctly because the gear boxes they used weren't built to take the added loads. Then they got us involved, we figured out a way to accomplish that, and the tacking time came down another second or second and a half. Essentially, with the extra power, they could keep the winches in the high speed much longer. Now they are designed for 8-man input to get even faster tacks. Those are the kind of things that are coming out of our involvement in the America's Cup. Of course when you change these systems, you can't increase weight, so you have to extract gains from better materials and improved technologies. Before we finish one Cup, we're looking at gear for the next one. R and D is an ongoing thing.

Our chief engineers—Steve Orlebeck and Andrea Merello—determine who does what. Someone with a lot of experience in traveler design might move over to design travelers on an AC project. We simply pick the skills to suit the job.

**PS:** How long has the company worked in the America's Cup realm?

**OH:** Our first entrance was in 1977. We put a brand new type of block on *Sverige*, the Swedish boat. This was a block that utilized the same bearing systems we had in our smaller boat blocks, but those used Delrin, which wasn't strong enough for the loads on AC boats. Through research we found a material called Torlon that could take extremely high loads. The Swedes were the only group that wanted to take the risk of this experiment, so that was our test platform, and it turned out to be extremely successful. It was a

good start for us in the America's Cup.

We didn't get into winches until the 1995 America's Cup. We felt at that time that we were ready to take this very dangerous path. The difficult part about America's Cup involvement is that failure is really damaging. It could harm your company, but the rewards are reasonably good if you succeed. In 1995, we had new winches on two boats: New Zealand's *Black Magic* and *Young America*. It turned out that the defender that year—Dennis Conner—changed boats for the actual Cup races and used *Young America*, so in that series the defender and the challenger were both using the new Harken winches.

The surface of the winches was a major area of experimentation. Some different coatings were used and we ended up putting very thin aluminum sleeves on the drums. But we did all this because we felt we had a team that was up to the task—that's why we entered it. Bill Ottoman was on that design team. He joined us after he left Barient Winches when that company closed. In Italy, Luciano Bonnasi and Andrea Morello were involved. Andrea was fairly new, but brilliant, and he has become perhaps the best winch engineer in the world. We had this team of really talented winch experts, so we felt we were up to the task of designing and building winches for the AC. That was a big step forward for our company.

**PS:** Can you describe the trickle down from that arena?

**OH:** The trickle down comes in many, many areas. A lot of it is in materials. This kind of work is going on right now, at this stage, well before the actual competition. When we introduced Torlon, that was the result of months and months of development.

Now, the different methods of manufacturing carbon, which is in a lot of the equipment, are important. And we work with true specialists in this area, which helps us gain knowledge.

Another big thing that we get out of the America's Cup work is testing. An America's Cup boat will test a prod-



*One of Harken's newest products, the Switch Track, keeps flaked mainsails at a manageable height.*

uct about 10 times faster than we can do by putting it on a normal racing boat. One AC campaign is like 10 years of very heavy testing. So it's a wonderful place to test the durability of products.

One of the big new developments now is what we call soft attachments. All the big racing catamarans are using them. I'm talking about the use of straps and lines instead of shackles to attach blocks and other gear to a boat. We helped develop a product called Loups with Tom Yale and Aramid Rigging, but now you have additional products from Tylaska and EquipLite. These products line up the loads better than shackles, they're stronger, and they eliminate weight. That's a good example of trickle down, though you probably won't find them on too many cruising boats because they do require maintenance; you have to change

them. But it's mainly the testing and the materials where the big gains can be had that affect the more mainstream products that other sailors will purchase.

And it's important to note that we get feedback primarily from the sailors and shore crew, because what's needed on board comes from them. They're the ones operating the AC boats. We have an in house committee called the PDC—the product development committee—made up of an international group of people very loyal to the company. This group goes through the products category by category and looks at what we feel the sailing world needs.

**PS:** How much does the development of other products, like advancements in line or sails or rigging, have an effect on the development work of your company?

**OH:** That is very important for us, especially changes in line. When we designed this whole new line of Carbo Blocks, they were designed around the new lines because the line diameters were coming down and the strength was going up. Line radius and diameter are two important pieces of information for our designers. Knowing the working loads and the breaking loads on line and wire and rod tells us what the breaking strengths should be on different products we design. If we're designing a runner block, we definitely look at the working loads of the line or wire, etc. We design our blocks to meet those loads, with a safety factor built in, of course.

When it comes to sails, for which we've developed products like our battcar systems, it's critical to work with the sailmakers. For example, we did *Mirabella V's* batten car system, and the battens on that beast are enormous. [Launched last year, the 246-foot *Mirabella V* is the largest single masted yacht in the world.] We worked very closely with Robbie Doyle the sailmaker. We had to understand

what the ends of his battens looked like, and work together to design the attachments.

For that boat we also developed something which we patented and trademarked, the Switch Track [see photo previous page]. When designing the battcars, we knew that height would be critical. With the mainsail stowed, all the battcars would stack up to a height of 23 feet above the boom, and that was unacceptable. So we developed a device that allows the cars to alternate side to side as they come down. Now, instead of having a stack height of 23 feet above the boom up, we've reduced that by half. That was a neat development, and we've since gotten orders for those, in much smaller versions, from a lot of owners. We now have half a dozen going out to different boats in the 70 to 80-foot range.

**PS:** How long does the development typically take for new products?

**OH:** Sometimes we have to jump right on some of the things needed for an America's Cup client and we design, engineer, and fabricate those items pretty quickly. But something like our Carbo Blocks is more typical. Those came about in part through our America's Cup work, but it was a long development process that took about four years. We were deliberately trying to find a breakthrough in blocks. We knew we needed to make a major jump, so we looked mainly at the materials. It's kind of hard, you know, to improve upon a pulley, but by using this carbo material, which has long glass fibers in it, we did. With those we were able to develop blocks that were 60 percent stronger and 30 percent lighter than our classic blocks. And now, with some blocks, we used soft attachments, making them even lighter.

**PS:** What do you regard as the most significant equipment advances that have benefited mainstream sailors in the past five years?

**OH:** In the last five years, we've had the Carbo Blocks. And we've intro-

duced new traveler systems that have captive ball bearing systems. There are two major advantages: first, the balls roller easier and smoother in the return race since there are no joints for them to roll over; second and most importantly, the balls do not fall out when the car is removed. This is especially important for batt cars which are frequently removed from the track and genoa lead systems that move from an inside track to an outside one.

We haven't made any major changes in furling, but we're always looking at it. In winches, we've done a number of things. We've played with new materials in the gear boxes and gears. We know that titanium on titanium is bad, so we've looked at mixing that with other metals. There's been a lot of developmental work going on now in the gears, drums, gears boxes and shafts. At the high end, the drums are now all carbon fiber. In some we've put strain gauges to read the loads on the winches.

We've also done some interesting things with interconnecting pedestals together. The most successful system is on board *Mari Cha V*—the 140-foot record-breaking ketch. That is one of the most integrated pedestal systems in existence. There are 12 interlocking pedestals, and they can be switched from mechanical to hydraulic if needed, which is something you do from any of the pedestals. We've done all that with only two hydraulic motors, but you can still connect the genoa or mainsheet or halyard winches via hydraulic without having the hydraulic motor on every winch. So that's a huge savings in weight and complexity.

One thing that I'd also single out, which is a little out of our realm, is the canting keel concept. There's a tremendous emergence of these keels in racing boats. I think you're going to see them in cruising boats too before too long. We tried to prove that on *Procyon*. [A 65-foot, experimental, joint project built as a flagship for the sailing industry in 1992.] Unfortunately, there were some set-

backs and we never got to demonstrate all the features to the designers and builders.

The keel on that boat cants 35 degrees, and it uses a wing instead of separate foils to oppose leeway, which isn't quite as efficient, but is viable for a cruising boat. When we tested it, the boat pointed very well and we were shifting 13,500 pounds of weight to the windward side. The hydraulic system on that boat was the essence of simplicity. I think you'll see more of that coming in. We've got some ideas, but whatever we do, it will be on a smaller scale. That was a 2.5 million dollar program.

**PS:** Regarding materials, what will the future of sailing equipment offer?

**OH:** I think you're going to see a lot more use of carbon. Tartan Yachts and C&C boats are being built standard with carbon masts. J/Boats does this too. You almost expect that for performance-oriented boats like J/Boats, but Tartans are pure cruising boats. The material costs may not be coming down as quickly as we once thought, but the labor costs are coming down with better manufacturing processes. And whenever you're talking about putting something aloft, carbon fiber offers some big advantages there. We find it to be an exceptionally good material in certain areas like winch drums or anything that requires complex shapes and strength. Of course carbon and titanium both have yield points that are very close to their breaking points, so you don't get a lot of warning with these materials. For that reason, we shy away from those materials when it comes to runners and other critical components.

Another area is line. The line guys keep coming up with new stuff. I suspect that in general, wires will be replaced with new lines. I sailed on Cam Lewis' big catamaran Team Adventure several years ago, and most of the standing rigging was high tech line then. The manufacturers are continuing to solve the issues with UV degradation and that will move this forward.

*According to Olaf Harken, winches like this new carbon-fiber one from his company should become more reasonably priced over time as carbon manufacturing processes become less labor-intensive and less costly. PS likes the sound of that.*

**PS:** Do you foresee Harken getting involved in other areas,

like manufacturing rope clutches or steering systems, things like that?

**OH:** We'll always be developing new products and adding to our lines. We've done custom steering systems, but we don't really want to do that kind of thing too much because there are good companies out there doing that already. Within what we already do, there are a lot of areas that still need development, but I won't tell you what we're looking at because that's something we discuss within our PDC.

One of the big challenges remaining is how to handle the mainsail on a cruising boat. The jib is simple, roller-furling has accomplished that. But with the mainsail you have several systems—in-boom, in-the-mast, and battcars—but nothing is out there that doesn't have some drawback, whether it's price or complexity.

Our best solution is the battcar. We feel it's the least expensive and best performance approach because you don't have to build special sails; you can build the best possible sail with lots of roach, and there are no restrictions. With single line reefing, battcars, and something like a Stack-Pack system, you have a very efficient way to control your mainsail. I agree, it's not as neat as stowing it in your mast or boom, but with in-mast systems you lose sail area and have a big, heavy spar in the air. In-boom systems are good if the company making it is good and the installation is perfect,



but those are a lot of ifs, and it's all costly. I think I had this issue solved on *Procyon* with the A-frame mast, but people don't seem to like that approach. On my own boat—a Feeling 32—I have a Stack-Pack system coupled with battcars and full-length battens, and it works well. It's very easy to sail and control the sail area because of the battcar system.

**PS:** Lastly, which other industry players do you think are making progress regarding progressive changes in equipment and design for sailboats?

**OH:** There are companies that do good innovative things out there, people like the Hall brothers (Hall Spars & Rigging) and the Gugeon brothers too (West Systems) and some of the sailmakers like North, Doyle, and Quantum. In the past, we've worked together very closely with Garry Hoyt. We used to do a lot of stuff together when we were boatbuilders. We did Waterbugs and Mallards and other projects that sometimes ended up in the field out back. We jokingly call it the field of broken dreams. But Garry is really an innovator, he takes chances. That's what innovation is all about. You've got to have those people who stick their necks out and do it. Garry is certainly one of them. These people are all on the forefront of this work, and they all sail actively too. ■