



Success in the Real World is a Matter of Perspective

As the accompanying article (see page 8) points out, discouragingly high prices and practical limitations are problems that remain unresolved in the realm of electric propulsion. Nevertheless, electric propulsion systems are on the water. While cats have gotten most of the attention, some good, old cruising monohulls have gamely taken the challenge. Here are field reports from some of the projects that *Practical Sailor* looked into for this article.

A CRUISING MONOHULL

Wandering Albatross is a Westsail 32. Her owners, Chris Lamond and Mary Liz Hepburn, fitted her with a Solomon Technologies 144-volt DC motor when David Tether was still associated with that company. The electric motor and absorbed glass matt (AGM) batteries fill the space formerly occupied by a diesel engine. After nearly three years of cruising from Florida, through the Bahamas, and up and down the Eastern Caribbean, they are very pleased with their system.

Lamond says that they decided to forego the regeneration function because the Westsail's propeller, tucked in its tight aperture behind the full keel, sees too little water flow to be effective. They reverted to a two-blade prop, which locks vertically behind the keel to reduce drag.

With no regeneration capability, they only charge their batteries when they can lie alongside a dock, which by choice isn't very often. They sail everywhere knowing that they have only a few hours of power available when the batteries are fully charged. Consequently, they have learned how to sail the boat, and at the Panerai Antigua Classic Yacht Regatta in April 2007, *Wandering Albatross* won her class, which suggests that a properly motivated and well-practiced crew can squeeze speed even out of a heavy displacement cruiser.

The couple has looked into charging the batteries from a wind generator. However, when *PS* last spoke with them, they had not located a 144-volt charge controller that could handle the potential open circuits when a wind generator shuts off during high-wind events. Their current routine of using shore power to recharge every month or two remains their strategy for the foreseeable future.

ONE-OFF NEW BUILD

Joseph Huberman's *Prestissimo* is a custom Wylie 43 that he ordered to be designed and built around the concept of a hybrid drive. It has a 144-volt DC Solomon Technologies motor, an 80 amp-hour (Ah) bank of batteries to power it, and a 5.5-kW DC generator from Glacier Bay.

Chris Lamond and Mary Liz Hepburn have learned to live with the limited motoring range of their Westsail 32 (left), which is equipped with a Solomon Technologies electric drive.

Because of the distance between his home in Raleigh, N.C., and Deltaville, Va., where he keeps the boat, Huberman doesn't do daysails. He takes short cruises of two or three days and longer ones of several months. In the summer of 2007, he took the boat to Maine and back. When leaving a slip, or getting off the anchor, he just uses the batteries. If he expects to motor for a half-hour or longer, he runs the generator, so that he can maintain the batteries at, or close to, full charge.

Under sail, he uses regeneration to keep the batteries charged, which also takes care of the house bank. When the sailing is good, there's a risk, he says, of overcharging the batteries. To prevent that, he takes an action that's not intuitive to those of us without electrical-engineering degrees: He opens the "throttle." The effect is somewhat like that of the safety valve on a steam engine. By actively turning the propeller, it reduces the work the propeller does and thus the amount of electricity the motor/generator puts out. This also trims propeller drag.

When motorsailing for any length of time, Huberman will run the generator, which keeps the batteries charged. He then has full power always in reserve if he needs it. Although the boat would likely be more fuel efficient with a conventional system, he's not complaining. Because the generator is so quiet and vibration free, he hardly knows it's running.

Now, Huberman totally plans his voyages around the wind conditions, even if that means sailing more at night. "I've learned to change my habits," he says.

DIESEL-ELECTRIC CATAMARAN

Electric Leopard is a Moorings 4300 built by Robertson & Caine in South Africa and equipped with the Glacier Bay diesel-electric system. A 25-kW, variable speed DC generator drives the dual 20-horsepower DC propulsion motors and provides power for the DC air conditioners. It is the result of a cooperative effort by the builder, The Moorings, Glacier Bay,

and an owner keen to explore this new approach. The boat has been operating as a bareboat in The Moorings' BVI charter fleet for more than a year.

When *Electric Leopard* appeared at the 2007 Strictly Sail show in Miami, amid much fanfare, The Moorings announced that it would welcome more diesel-electric Leopards in its fleet.

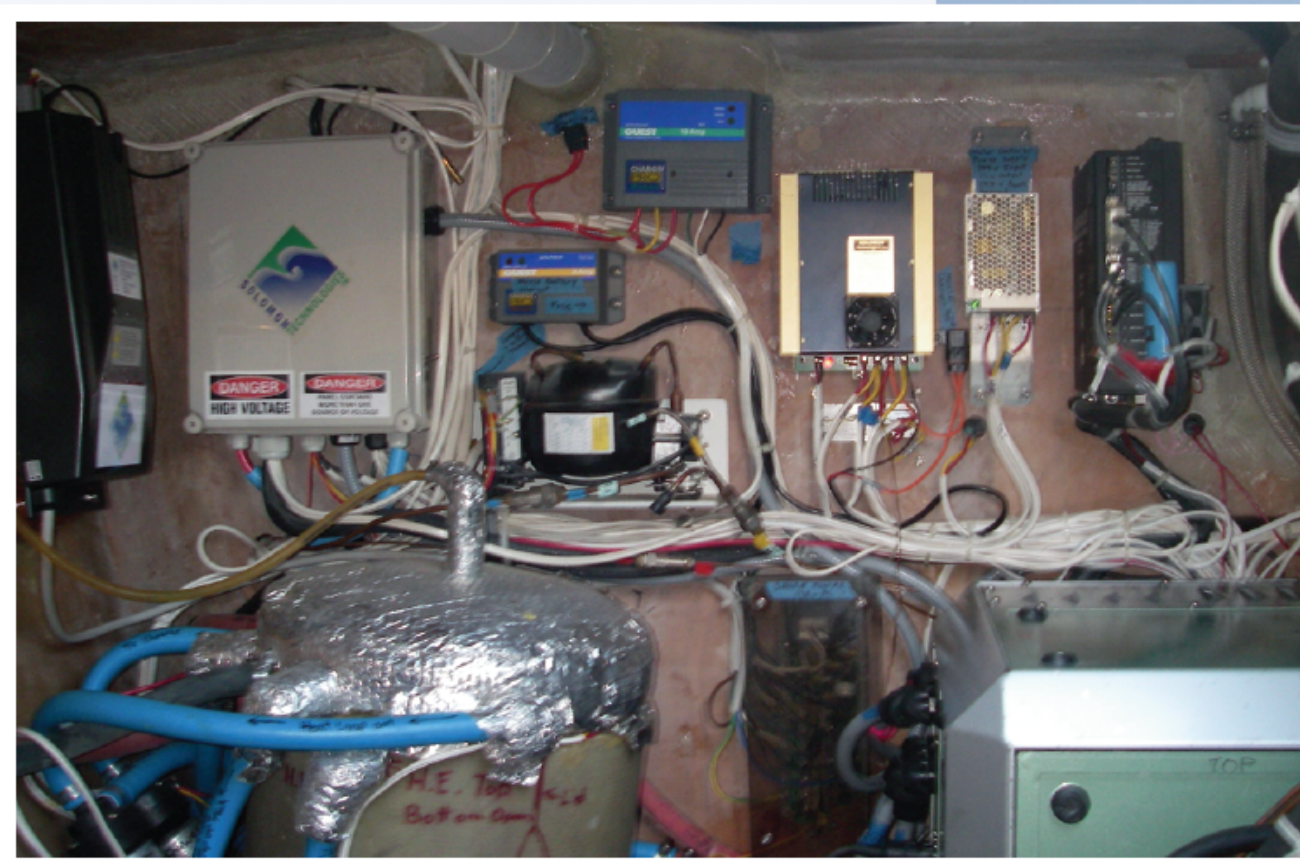
One year later, *Electric Leopard* was still serving as a charter boat, but it was the only one in the fleet. Lex Raas, CEO of The Moorings, is pleased with the way the boat has performed but, he says, "The whole package isn't together yet." By that, he means the 240-volt DC auxiliary systems, such as air conditioning, that Glacier Bay is developing to go with the "single source" electrical system are not yet in production. Until that time, and until some of the software teething problems have been squared away, he doesn't feel that the concept is ready for full-time deployment. "It's a work in progress," he says.

Raas is in a unique position to view how boats are used: He oversees fleets of hundreds of boats worldwide. On the bigger Moorings boats, it's the generators, he says, that rack up the hours, not the propulsion engines. Boat operators might motor for an hour or two a day but they run the generator all night to keep the cabins cool. Anyone looking at the new technologies with a view to efficiency, he suggests, has first to change their mindset.

John Robertson, co-founder and chairman of Robertson & Caine, has high praise for the boat's owner, Dr. Anthony West, for taking on the *Electric Leopard* project's inherent risks. Robertson's principal concern, too, is reliability. "We don't like using our customers as guinea pigs," he says. He and the company will keep close tabs on the progress of Glacier Bay and other participants so as to be ready to adopt electric propulsion and associated technologies when they're confident they meet their standards of performance.

HYBRID-POWERED CATAMARAN

Lagoon Catamarans placed a long bet when it began developing the Lagoon 420 Hybrid, a new model introduced in 2006 that was to be exclusively powered



Joseph Huberman's custom Tom Wylie-designed Prestissimo (right) features Glacier Bay's 144-volt DC genset and related controls (above). The genset drives a 144-volt Solomon Technologies motor.



by a hybrid-electric propulsion system. Early on, Lagoon was in discussions with Solomon Technologies, but when that company and Tether parted ways, Lagoon followed its own path using a French supplier, Leroy Somer, for the motors and controllers and doing much of the technical development in-house. (Tether is still a consultant for Lagoon, and the builder has tagged Tether's new company, E motion Hybrids, to provide systems offered as an option on the Lagoon 500.) Power on the 420 comes from a conventional 21.5-kW Onan AC genset used to recharge two 72-volt propulsion battery banks, each made up of up to six 8D batteries. *PS* sea-trialed the boat in 2007 and found the boat's overall performance to be sluggish, not unusual for a charter cat.

As one might expect with a big venture into largely unknown territory, the results have been mixed. The first boat Lagoon presented in the United States, at the Annapolis boat show in 2006, missed demo sails when a faulty controller shut down one of the two motors. The company might have saved itself such an embarrassment with more testing, but it had already sold several hulls.

The Hybrid's performance will be fairly easy for watchers to follow as a few Lagoon 420 Hybrids are now operating in a number of bareboat charter fleets. Barney Crook, managing director of TMM

Yacht Charters, which has one 420 Hybrid in its fleet, says he believes that hybrid technology has a future in sailboats, just not charter boats.

The way charter boats are used, in the Virgins Islands especially, doesn't allow the regeneration part of the hybrid system to fulfill its function. (This is why Anthony West chose the diesel-electric system for his *Electric Leopard*.) Boats might be sailed for two or three hours at a time, which isn't long enough to replace the on-and-off-the-anchor motoring current draw, nevermind the on-board electrical demands. This means the generator, which kicks in automatically when the batteries need a charge, runs much of the time the boat's at rest. Because the generator has to be big enough to power the motors, it's bigger than it needs to be even for the air conditioning, and so wastes a lot of fuel. Also, TMM has discovered that the batteries drain quite rapidly if the boat's at a dock for any length of time and not plugged in.

Lagoon recently upgraded all of its Hybrids to Hybrid² models with extended range (estimated 1½ hours) under battery power and a new battery level monitoring system that, according to Lagoon, alleviates some fuel consumption issues. It now offers the 420 with straight diesel propulsion, which seems to us the more practical solution for most sailors.