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The magazine for those working in design, construction, and repair

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SEATTLE'S VIC FRANCK YARD
LOW-TEMP PRE-PREGS
GROUPE FINOT
WEIGHT MANAGEMENT FOR MOTORYACHTS

The firm whose controversial, wide-bodied sailboat designs now dominate the field of shorthanded distance racing, continues to develop high-speed monohulls—for cruisers and racers alike.

Groupe Finot

JACQUES VAPILLON/DPPI

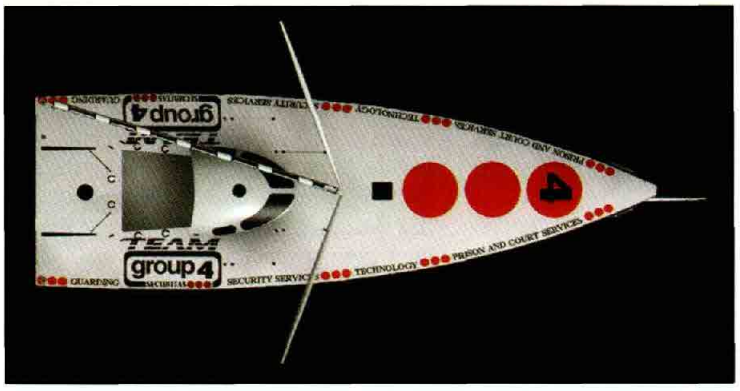
by Steven Callahan

Jean-Marie Finot might just be the world's most controversial sailboat designer. Even as his speedsters dominate long-distance, shorthanded races and continue to influence the realm of cruisers, he battles the critics over issues of safety and the public's tendency to oversimplify complex design issues.

"I am not interested in boat design," says Finot. "The boat is not the objective. The objective is to create something harmonious with the sea, the wind, your crew, and you." The harmony in his head, however, is based on a hissing wake winding out astern at 20-plus knots, and the rolling thunder of big waves offshore. Although his 145-plus designs have spawned more than 27,000 boats built in a half-dozen countries, it is the so-called Finot skimming dish, sled, monomaran, or aircraft carrier—an ultralight racer featuring a beam a third its length, and a broad, chopped-off stern—that has become his trademark as well as the cross he has sometimes had to bear.

In the 1960s, when modern long-distance shorthanded sailboat racing began, few people imagined single-handed skippers effectively driving boats longer than about 40' or averaging more than about 150 miles a day. (Even large yachts rarely exceeded 250.) No one envisioned lone sailors piloting Finot 60-footers around the globe, routinely doing in excess of 350 miles in 24 hours while the boats remain amazingly well-behaved (usually), even when sliding clown enormous seas in the Southern Ocean.

There's no dark secret to gaining



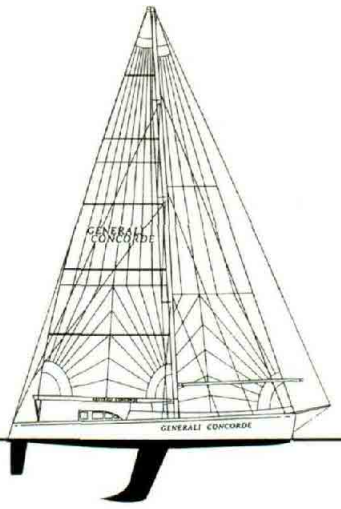
RENDERINGS, PIERRE FORGIA/GROUPE FINOT; PHOTO, JACQUES VAPILLON/PIXSAIL.COM

Facing page—Somewhere *displays two distinctive features associated with Finot-designed Open-class 60 (18.28m) solo ocean racers: an aircraft canopy-like deckhouse, on an aircraft carrier-like deck.* ***Above***—*Four views of the virtual* Team Group 4, a *recent Open 60, invite close study. At upper right, is a photo of the real thing. After winning the first leg of the 1998/99 Around Alone Race,* Team Group *4 had an unlucky grounding off New Zealand, compromising her carbon hull-to-keel-blade connection; the boat was pulled from the race. (For a technical discussion of the damage, see "Working with Carbon Fiber," PBB No. 61, page 34.)*

performance: increase power, decrease drag, or both. Starting early in the 20th century, offshore-sailboat designers began improving rigs and then lowering centers of gravity by using external ballast and deeper keels. They reduced drag by sculpting narrow hulls, or they added sail-carrying power by increasing beam, but until recently, they could only marginally decrease weight. In fact, boats like *America's* Cup 12-Meter yachts employed *more* weight to capture more ultimate stability. Until the 1960s, few offshore boats were light enough to escape the limits of their gravity waves, which bind hulls in displacement mode to a narrow range of hull speeds.

Since the 1960s, the quickening pace of change in offshore sailboat

Seven *years, seven representative raceboats. The Finot Open-60s profiled on these two pages chart an evolution in design, rigging, and construction. Keel migration aft, for example, is barely noticeable, except for* PRB, *where the shift is quite evident. Hers, however, is a less aft-oriented rig; instead, more emphasis has been placed on the daggerboards forward. The first boat in this series is aluminum, while the later boats were built in advanced composites, reducing weight by nearly half.*



DRAWINGS COURTESY OF GROUPE FINOT

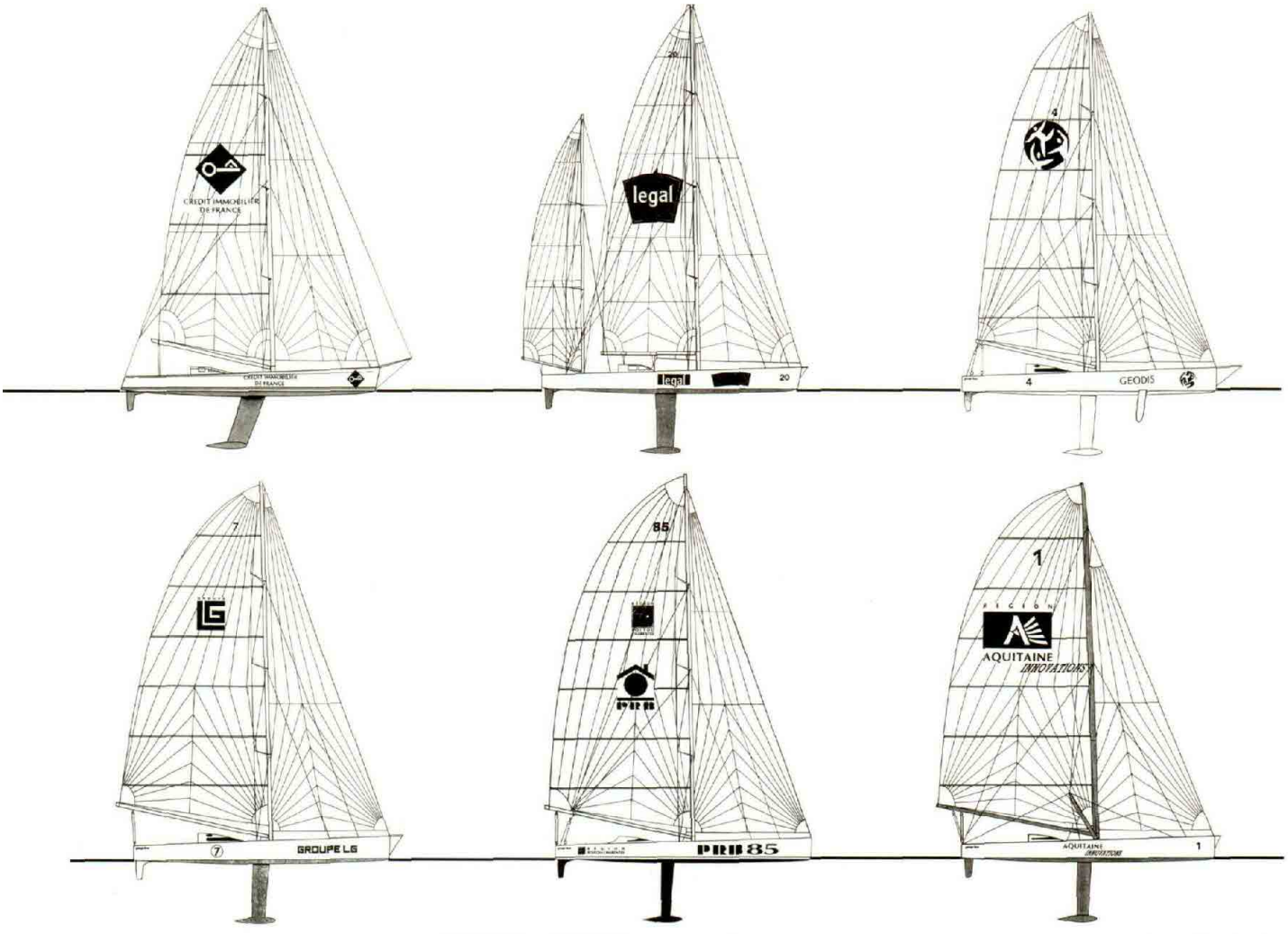
construction has fostered parallel advances in design. For example, in the United States, Alan Gurney's cold-molded 73' *Windward Passage* ("the big dinghy"), with a beam of more than 19', set records around the world. Bill Lapworth's light but narrower glass boats, like the Cal 40, balanced upwind power with low drag, and surfed prodigiously to become a production classic. Bill Lee and other West Coast designers followed suit in the 1970s with cored-glass, slim-waisted, ultralight displacement boats (ULDBs) that sacrificed upwind stiffness but shattered downwind records as they raced far offshore to places like Hawaii. New Zealand's Bruce Farr, among others, morph'd extreme dinghy designs like the Sydney Harbor 18s into IOR (International Offshore Rule) winners. These sharp-bowed yet very wide, shallow hulls, with their broad sterns and with big crews camped out on the windward rail, sailed upright while carrying generous sail both upwind and when surfing and planing off the wind. The IOR model, though, proved a poor package for cruising or shorthanded offshore racing. When overpowered and well heeled, these designs showed little forgiveness; their triangular plan-forms nosed down, ventilating their rudders and often causing the boats to spin out of control. More importantly, though very stiff at small angles of heel, these designs lacked a large range of stability. Indeed, the trend among racing yachts toward big beam, light displacement, and a shallow hull with a high center of gravity was widely held responsible for the numerous knockdowns and capsizes in the disastrous 1979 Fastnet Race, in which 24 boats were abandoned and 15 sailors died.

From France, Jean-Marie Finot had been lending a more measured influence. After two years under the wing of Philippe Harle, one of France's most prolific boat designers, Finot made a name for himself with *Ecume de Mer*, winner of the 1970 and 72 Quarter Ton Cups (she then spent five years circumnavigating), followed by *Revolution*, which won RORC championships in 1976, '77, 78, and 79. *Revolution* showed that even back then, Finot thought outside the box. Whereas the early IOR greatly encouraged pinched sterns and bulbous protrusions, called bustles, around the rudders, Finot's design featured smooth lines and a broad transom.

Finot recognized that light weight, broad beam, and a shallow hull were not technical problems per se. The problem was with a handicapping rule that *penalized* a light shallow hull having a low center of gravity (giving it an improved range of stability), and, in general, hull shapes offering better overall handling characteristics. Finot, who had closely studied hull shapes, derived formulas for attaining good balance; though the "hips" of his boats have grown broader in the years since, Finot's vessels have also earned a reputation for remaining so easy to handle that 60-footers are fitted with tillers that usually require only fingertip control.

Finot's goal has always been straightforward: to design boats that are, in his words, "happy in all conditions." The then-new "Open" development rules provided Finot with a perfect opportunity to realize his dreams. Dreading any repeat of negative results caused by previous handicapping systems, the organizers of shorthanded offshore races decided to divide boats into classes determined only by overall length, thereby allowing designers to explore widely divergent paths to victory.

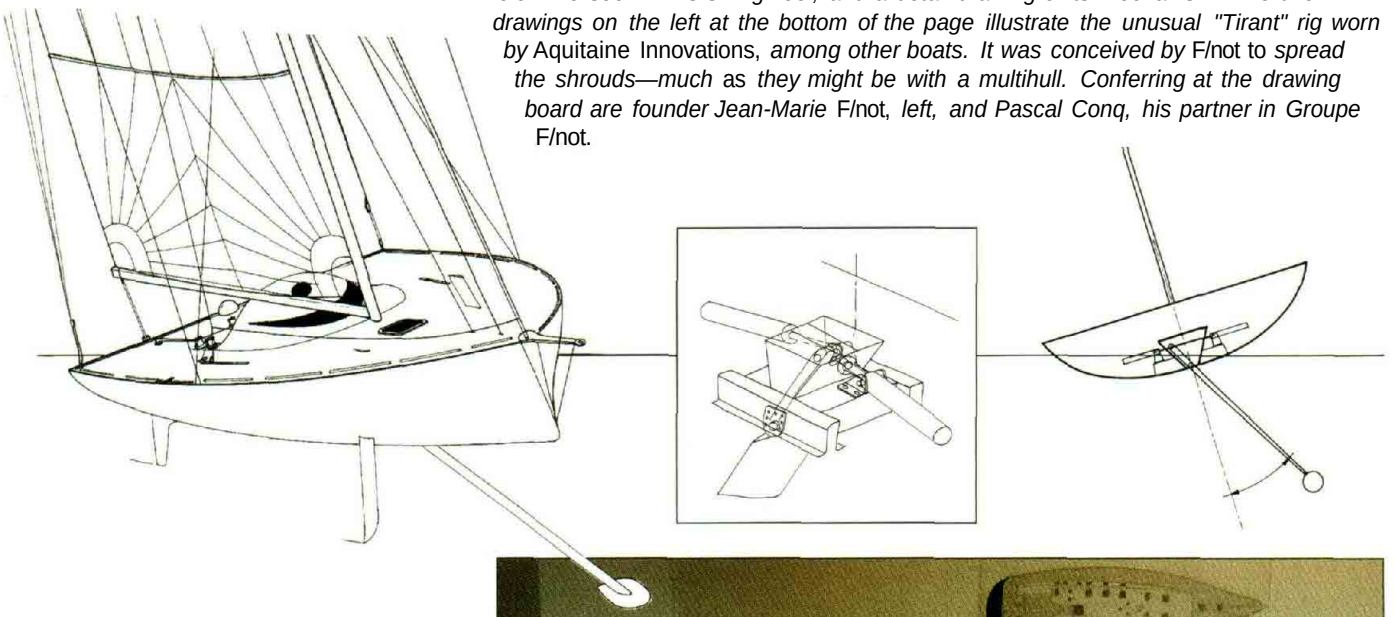
In most of those early races, monohulls competed directly against multihulls. The latter type benefited from low-drag, skinny, lightweight hulls that were incredibly stiff, allowing them to carry lots of sail even in high winds. Their rigs' power also benefited from stiffness. Since lift is perpendicular to a foil, one component of a heeled sail's thrust pushes the boat down into the water, increasing dynamic displacement and drag. More air also slips up and over the sail's head, decreasing the sail's power. A deep keel may lend a great deal of stability as a boat heels, but it won't add much stability at the low heel angles at which a boat most efficiently sails. So the only way to gain comparable power in a monohull was through beam, light construction, and movable ballast, which significantly lengthens the righting arm even at zero degrees of heel. Overcanvassed 19th-century "sandbaggers," with length/beam ratios of 3, and narrow racing log-canoes of the same period, whose crews hiked out on boards, were among the earliest boats to exploit movable ballast, but they almost always sailed in displacement mode. Then in the mid-1960s legendary French offshore sailor Eric Tabarly commissioned the design of a shallow-bodied 35' raceboat with a novel system of water ballast that could be



	Générali Concorde	*Groupe Sceta***	*Café Legal****	*Geodis*	*Groupe LG*	*PRB*	*Aquitaine Innovations*
Year built	1989	1990	1991	1993	1995	1996	1996
Length	18.28m						
Beam	5.80m	5.80m	5.80m	5.75m	5.75m	5.70m	5.85m
Draft	3.80m	4.25m	3.92m	4.12m	4.12m	4.18m	4.15m
Displ.*	14 tons	11 tons	11.5 tons	9.3 tons	8.9 tons	9.5 tons	8.5 tons
Mast	25.50m	25.50m	25.50m ketch	25m	25m	25m	25m wing (40 cm)
Total sail area	220m^2	240m^2	261m^2	265m^2	285m^2	270m^2	304m^2
Mainsail	104m^2	135m^2	112m^2	155m^2	170m^2	160m^2	190m^2
Genoa	116m^2	105m^2	9m^2	110m^2	110m^2	110m^2	114m^2
Spinnaker	300m^{2}and 350m^2 entered according to the configurations						
Materials	aluminum	E-glass/ PVC foam	S-glass/ PVC foam; deck: carbon/PVC	carbon/ Nomex	carbon/ Nomex	carbon/ Nomex	carbon/ Nomex
Builder	Le Guen Hemidy	Pinta	CDK Composites	JMV/MAG	JMV/MAG	Pinta	Thierry Eluere/ Composites Aquitaine

* The last four boats have essentially the same hull weight; the difference is in the ballast and equipment
** *Credit Immobilier de France* *** *Baggages Supérior*

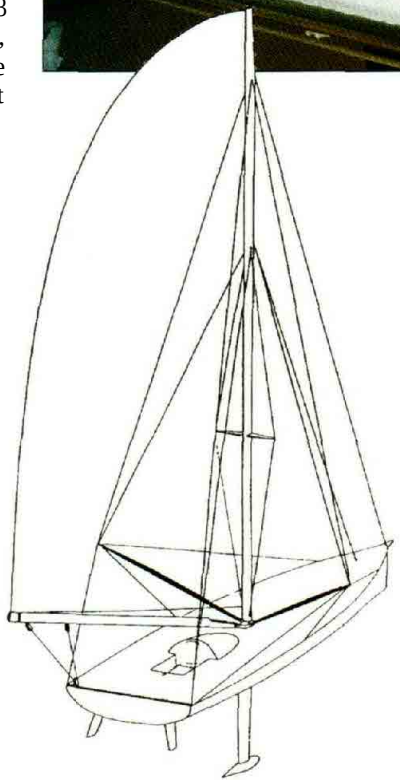
Below we see PRB's *swing keel, and a detail drawing of its mechanism. The two drawings on the left at the bottom of the page illustrate the unusual "Tirant" rig worn by* Aquitaine Innovations, *among other boats. It was conceived by* F/not to *spread the shrouds—much* as *they might be with a multihull. Conferring at the drawing board are founder Jean-Marie* F/not, *left, and Pascal Conq, his partner in Groupe* F/not.

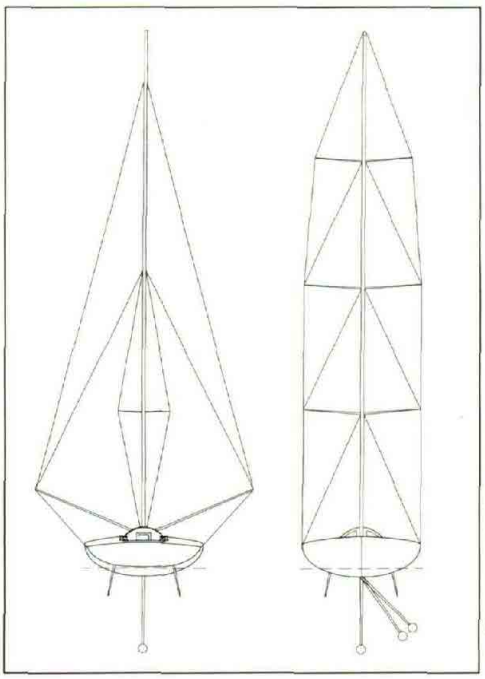


dumped when not needed yet easily picked up again. Tabarly's *Pen Duick V* easily won the Singlehanded Transpacific Race.

By the early 1980s, the "Open" rules for both the MiniTransat singlehanded transatlantic and the BOC singlehanded circumnavigation races (already limited to monohulls) had closed significantly. Organizers feared that too much water ballast might help capsize a boat caught aback. After the 1979 MiniTransat and the '83 BOC, they limited water ballast, which had to be carried within the hull; in the BOC, to an amount that would heel the boat at rest no more than 10°. Designers immediately recognized that the wider the hull, the more form stability it possessed to resist heeling from the movable ballast. They could tuck ballast tank under the deck edges of very wide hulls—the farther from the centerline, the more foot-pounds of righting moment they would gain to hold up increasingly large sail plans. The net effect of the rule was to increase beam and power while eliminating narrow, self-righting designs with external ballast systems.

In view of the IOR experience, however, throughout the 1980s most designers of offshore racers feared extreme beam. Since singlehanded sailors had to trust self-steering in truly horrendous conditions,





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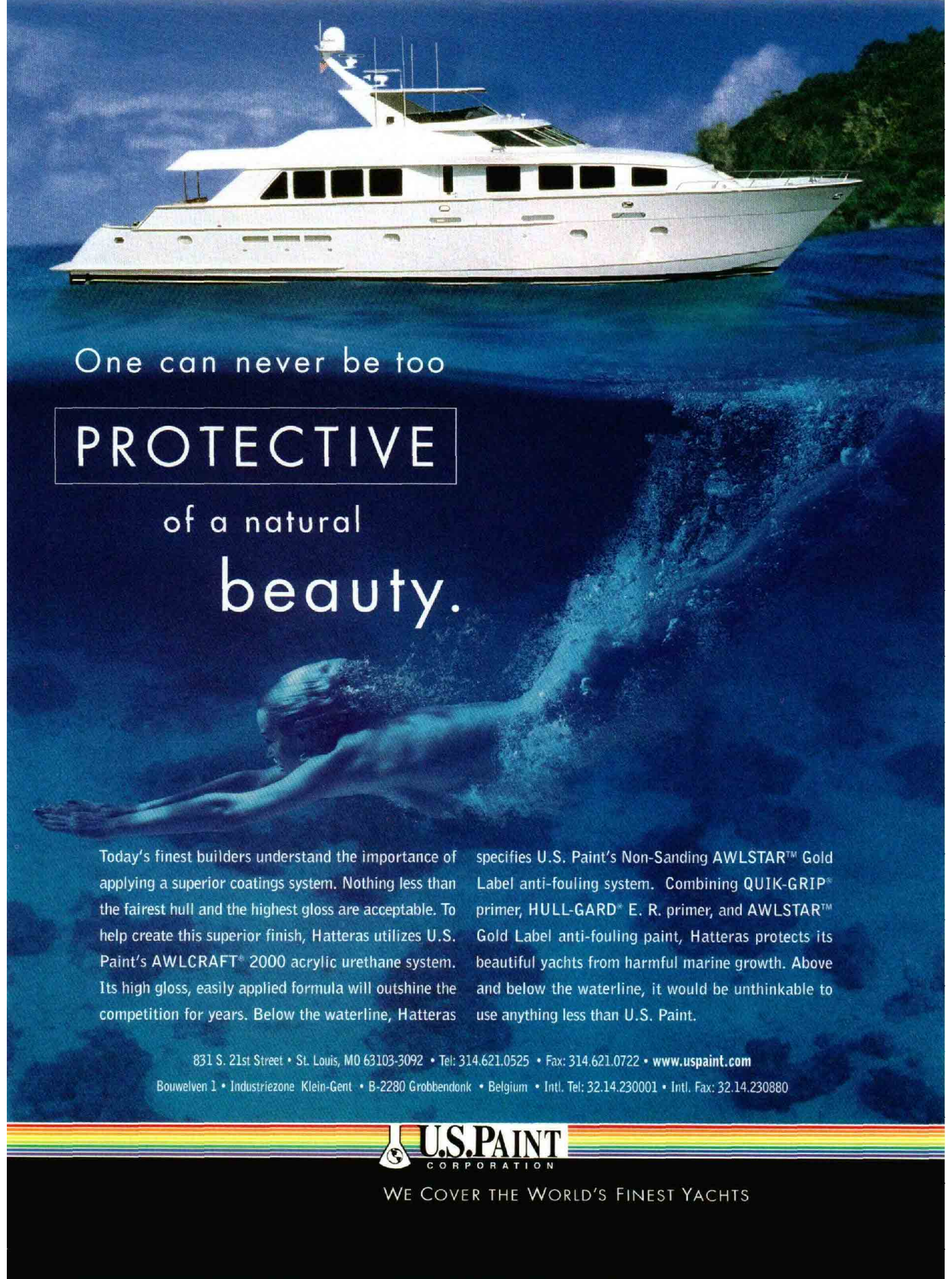

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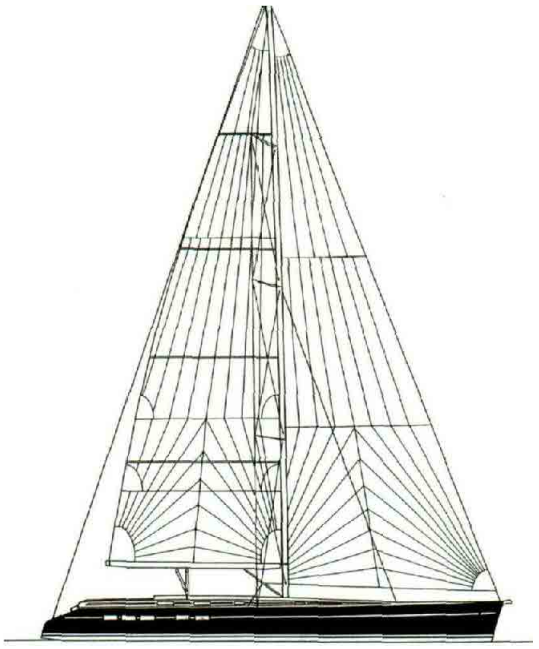

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Designed as a fast offshore cruiser, the Cigale 18 is a semi-production 60-footer being built by the Alubat Shipyard in France. The low-profile deck is deceiving: down below, accommodations are fairly generous. While Finot's big raceboats may get a lot of press, the firm's design work for production builders has been a staple of the business for years.

they needed easily handled boats that also were capable of sailing efficiently to weather offshore. This enticed designers of the period to draw narrower boats. But not Finot.

With a maximum length of 6.5m (21.30, MiniTransat boats had always been little more than decked-over dinghies. As early as 1979, those boats with beams a third or more of their length clearly claimed the advantage, especially during the second, downwind leg from the Canary Islands to the Caribbean, when they were doing 180- to 220-mile days. Such speed more than made up for any upwind shortcomings, but even upwind they could carry so much sail they remained very fast, if wet, while bashing into waves. When well heeled-out, one of their double rudders, like those found on traditional Great Lakes racing scows, remained in the water at a near-ideal angle and kept the boats under control. Finot carefully observed the field, beginning in 1977, when his *Reve De Mer* finished second. By the time he produced a winner 12 years later, which he followed with wins in '91 and '95, he'd merged all the successful trends with his own refined hullform. He scaled it up to 60' with *Generali Concorde* for the 1989-90 Vendee Globe (6th place) and then *Groupe Sceta* for the 1990-91 BOC (1st place; *Generali Concorde* 2nd), quickly solidifying his lead. Since then, Finot's lead has only stretched as his boats won the 1992-93 and 1996-97 Vendee Globe races and the BOC/Around Alone in 1994-95 and 1998-99, as well as the 1991 and '95 MiniTransats. His Open 50 designs have been just as successful, placing first and second in the 1998-99 Around Alone.

Designer Olin Stephens has long criticized light, beamy IOR boats, insisting that sailing hull shapes must be balanced from end to end. Finot actually agrees with Stephens, but typically re-examines the underlying truths behind such rules of thumb. He discovered early on that good balance does not require pinched ends or heavier displacement. While perpetually sketching hull shapes, centers of forces, and graphs and vectors as he talks, Finot concludes, "Triangular shapes are not good, and immersed banana shapes are not good except for turning." He balances his hulls by using firm forward shoulders—again, like lake scows. These hulls roll out evenly, the heeled centerline remaining nearly parallel with the upright one. American designer Rodger Martin recalls his surprise upon seeing a Finot boat sailing upwind for the first time: "The bow didn't roll down," he says. "It actually lifted!" Martin began developing related shapes for his own Open designs.

Finot boats have also re-emphasized the importance of sail forces in the balance equation. A stiff boat keeps the rig more centered over the hull, decreasing the turning lever arm between the rig's center of force and the center of lateral resistance. By the late 1980s, Finot had got the proportions of his winners so right that they have not had to change much since. In his Open 60s, for example, a beam of 5.7m to 5.85m (18.7' to 19.2') remains more or less constant. Mast heights reach about 25m (82'). This

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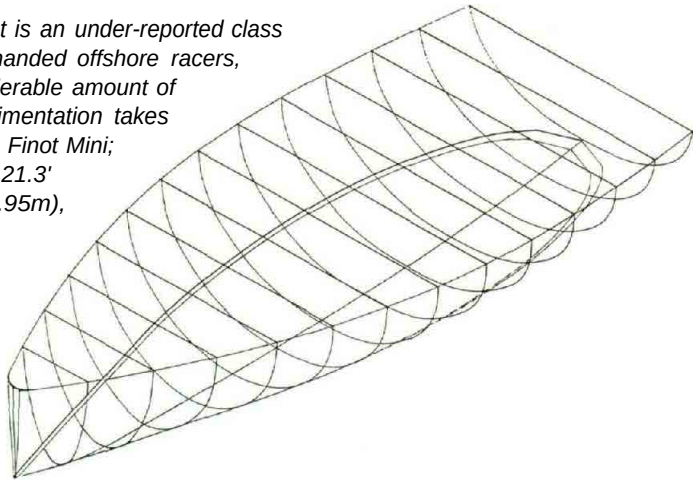
The MiniTransat is an under-reported class of small singlehanded offshore racers, where a considerable amount of technical experimentation takes place. Here's a Finot Mini; she measures 21.3' (6.5m) x 9.7'(2.95m), and draws 6.5' (2m). Note the dinghy hullform.



GROUPE FINOT

envelope's seemingly consistent size, though, masks its significant evolution.

Composite-built boats in the Whitbread and other major offshore races have a history of delamination and shear failures. Finot knew that he would have to confront the huge beating that his broad, flattish panels would take offshore. So Finot's first Open 60, *Generali Concorde.* launched in 1989, was built of aluminum. Still, Finot soon recognized that only composite construction could appreciably lighten his hulls. *Groupe Sceta,* Finot's first Open 60 built of polyester and glass, suffered delamination in some large panels in the first leg of the 1990-91 BOC; but repaired, she carried on to win. Pascal Conq, Finot's right-hand man since 1985 and now his design partner in what is called Groupe Finot, explains that it was hard to tell what caused the delam problem with *Groupe Sceta,* though it appeared to be due

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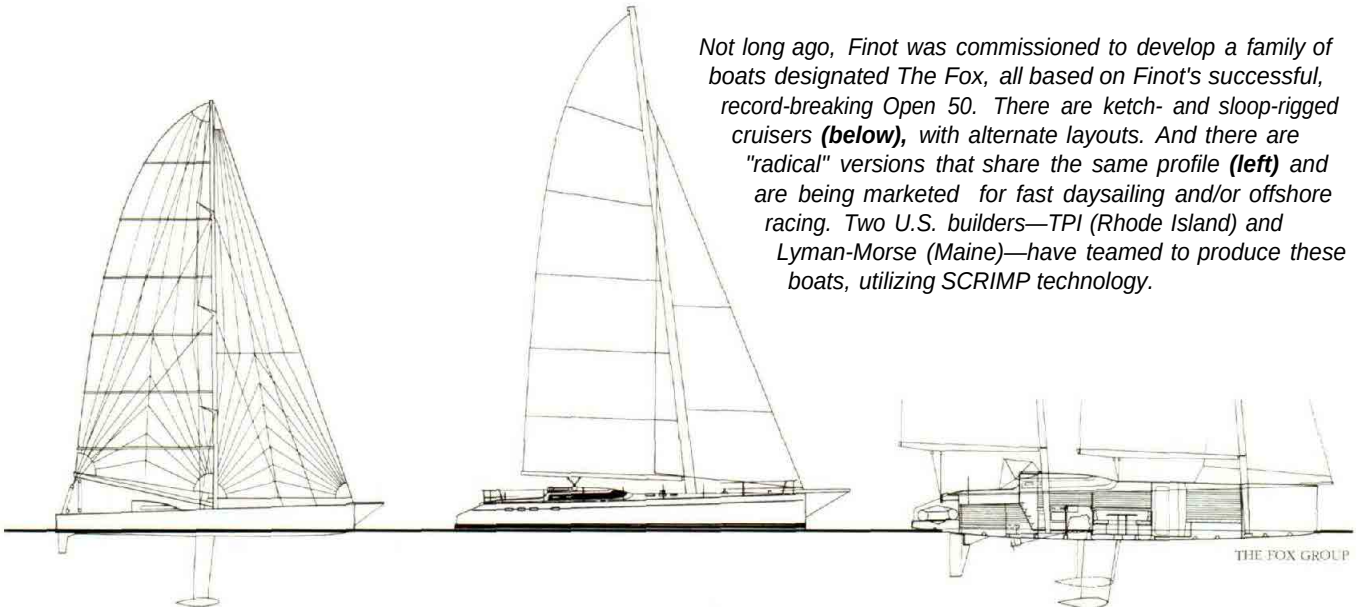

*Not long ago, Finot was commissioned to develop a family of boats designated The Fox, all based on Finot's successful, record-breaking Open 50. There are ketch- and sloop-rigged cruisers **(below),** with alternate layouts. And there are "radical" versions that share the same profile **(left)** and are being marketed for fast daysailing and/or offshore racing. Two U.S. builders—TPI (Rhode Island) and Lyman-Morse (Maine)—have teamed to produce these boats, utilizing SCRIMP technology.*

to outgassing from the foam core. The next Finot raceboat. *Baggages Superior,* was built with epoxy and higher-quality glass; she suffered no problems going around the world to win the 1992-93 Vendee Globe. Even so. says Conq, "We later found a 'bubble' in the engine compartment, so we decided to do something about it."

The Finot office has always been very computer-oriented, and uses finite element analysis for engineering high-load areas and details, as on masts. But Finot himself takes a multi-pronged approach to the general engineering of his hulls. "Our number one obsession is to make sure the boat is strong enough," says Finot. "We looked first at 'old' regulations like Lloyd's to figure out the size of stringers, frames, and skins. We could then calculate the pressures those are built to handle. Next, we looked at our boats as built. If a stringer broke, we asked what it took to break it. But we also consider the speed of the boat and the wave and calcu-

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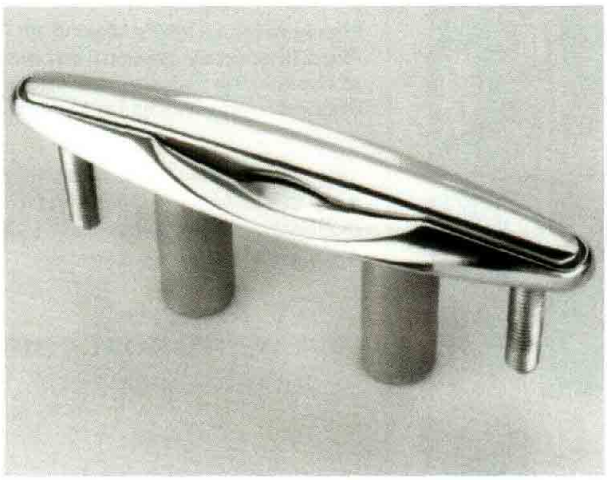

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late the energy it takes to slow or stop the boat. Say the boat is going 12 knots and the wave 30 knots and the boat slows to six; that energy forces water away from the hull, and we can calculate that."

A typical Groupe Finot hull is divided into 30 or more panels composed of five or six basic laminates. Photos of a Finot model being tank-tested for surfing and planing, show sheets of light spray near the bow; these shift suddenly to a massive solid bow wave concentrated just forward of the keel. That's where, Finot notes, "the keel and rig tend to twist the hull and pull the boat into a banana shape. It is also where the hull panels become significantly bigger, fuller, and flatter." Experience indicated that the panels most highly stressed withstood a head of seven meters or more, "but to me it still was not enough," notes Finot. "We design for a *working pressure* of 15 meters, and *failure* at 30 to 40 meters, or about 30 tons per square meter of hull. For that kind of load it's difficult to design a sandwich structure that won't fail in shear. So, since the 1994-95 BOC, we've been using core materials only aft and in the deck, and pre-preg carbon single skins with stringers forward." Discounting lost spars and a ruptured keel joint (after grounding at full speed—boats with deep narrow fins are designed to survive a grounding at up to 10 knots, but not 20), Finot's raceboats have suffered no significant structural failures. It is a remarkable record.

For cruising boats, too, Finot now believes that single skins—beneath the waterline, at least—provide superior shear strength and longevity, since they eliminate any possibility of water entering the core. "It requires a little more material and may be a bit heavier," he says, "but a solid skin of carbon is about half the weight of solid glass, and *stringered* carbon is close to the weight of cored glass or carbon. It just takes more time to build." He thinks it's also safer for groundings or collisions, because single-skin carbon is more flexible than a cored layup, so it better absorbs spike loads. And, the skin is thicker than a skin on a core. "Also," he notes, "when failures occur within a cored laminate, you can't see them. With a single skin, you'll see a broken stringer, and you fix it."

Finot has honed aircraft-style stringer/skin construction by alleviating stress risers and eliminating secondary bonds. "We round the stringers on top and place little fillets in the corners," he explains. "We also use more flexible resins in the fillets, and we put the stringers in when we cook the hull, so they become part of the primary bond."

Thanks to composites, Open 60 displacements have plummeted from 14 tons to 8.5. Finot could save still more weight, but he chooses instead to balance several factors. These include the need to increase power while minimizing wetted surface. Finot keels have deepened from 3.8m (12.50 to 4.18m (13.7'). Increased ballast now is carried in highly refined T-bulbs having hollowed tail sections. With the launch of *PRB* in 1996, Finot chose to begin offering

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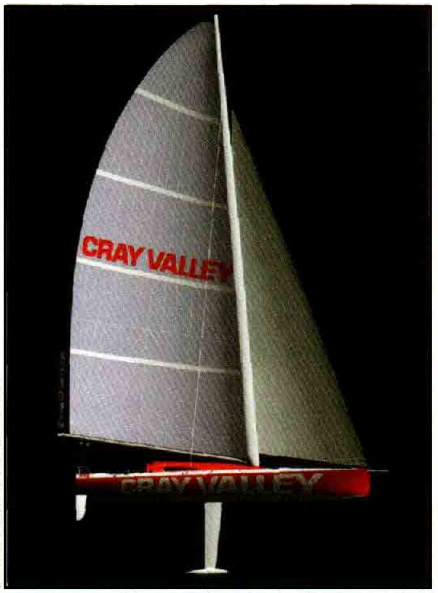

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swinging keels in lieu of water ballast. The swinging keel allows the center of gravity to shift to weather at low heel angles, just like water ballast; but, driven by hydraulic rams, the swinging keel is quick, relatively simple, and keeps the boat lighter, which is a distinct benefit when reaching or sailing upwind. Of course, once the keel is hitched up to weather, it makes a very poor lateral-lift device, so Finot employs secondary daggerboards (as do other designers). Recent victories with these boats have proven the effectiveness of this approach, but victory comes at the

CCP Cray Valley, *an Open 50, set a Newport-to-Bermuda record prior to winning Class II in the 1998/99 Around Alone Race. Her hull and deck were SCRIMPed by Maine builder North End Composites. The boat as built has a smaller deckhouse than is shown in the Finot rendering.*

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GROUPE FINOT

The South 35 is Finot's newest production racer/cruiser. Construction is carbon pre-preg; the builder, Aerodyne Technology in South Africa. She measures 34.4' (10.5m) by 11.5' (3.52m). Groupe Finot's name for the rig is the "C. Wing.

price of an extra $100.000 to $200,000 for the additional complexity.

The rig revolution also has yielded enormous speed enhancement. Increased stability and carbon masts have allowed Finot to boost raw sail power as areas increased from 220 square meters (2.367 sq ft) to 304 (3,271 sq ft). Rigs have moved aft. too. With small headsails and large, heavily roached mains'ls set on booms overhanging the sterns, sail pressures do not depress the bows as much, allowing Finot to continue to test just how sharp he can make his hull entries to improve upwind work. Keels, too, have migrated aft, to balance the rigs. And forward daggerboards on boats with swinging keels help keep the bows from blowing off on some headings.

With apparent winds often in the 30- to 40-knot range offshore, the aerodynamics for both reducing drag and maximizing lift become increasingly important. Finot was an early proponent of carbon fiber, which decreases a spar's sectional weight and frontal area, correspondingly decreasing pitching inertia and parasitic drag from windage and turbulence. Also, by 1991, departing again from the route taken by most of his contemporaries, he returned to non-overlapping working jibs. Taking advantage of the boat's wide beam, Finot rigs—with their very long spreaders—suffered smaller compression forces, keeping them slim and light.

The great efficiency of wing masts held much appeal for Finot, but how to get one light enough for a monohull? What if he widened the staying base even more, as on a multihull, by using a pair of boom-like spreaders splayed out from a deck-mounted maststep? Says Conq of what he and Finot call their "Tirant" (meaning push and pull) rig: "The weight of the rig is a little greater, but it's centered lower, so the heeling moment is the same. We needed to acid no weight to the keel or anywhere else, and we gained a wing. There's much less drag and it makes the forward 25 percent of the sail much more usable."

Unfortunately, the first Tirant-rigged boat dismasted in the Transatlantic Cate Race. Finot and Cone) found that pre-tensioning the shrouds and controlling the stretch of the running backstays was critical. "There was a miscommunication about the modulus for the Vectran backstays," says Finot. "The running backstay stretched too much, so all the force came on the primary rigging. Now we use PBO-fiber backstays." (Made by Toyobo, a Japanese manufacturer, "PBO" is an acronym for the lengthy chemical name describing this new cordage, which is about 50% stronger for its weight than Vectran.) Beneath the mast, a hydraulic mast jack pretensions each rod under the Tirant. Load cells with a readout at the chart table let the skipper check levels: mainsheet, 3-3.5 tons; lower shrouds. 7-11 tons; mast compression, 20-25 tons. By the 1998-99 Around Alone, Tirant-equipped boats were reliable enough to dominate the race, Canting

RENDERINGS: PIERRE FORGIA/GROUPE FINOT

such rigs could allow a boat to develop even more horsepower by keeping the mast upright when the boat heels: Finot has designed one, but says that at this stage it remains too complicated for his taste. Besides, they are currently forbidden by the rules.

Finot boats have shown such consistent superior speed that in the 1998-99 Around Alone, half the fleet was conceived on Finot's board, and most of the competing boats looked like Finot clones. Groupe Finot designs finished first and second in Class I (Open 60s, and the only two boats *to* finish) and Class II (Open 50s). Strange then that the editors of a prominent sailing magazine recently plastered the word "unacceptable" across a photo of a Finot speedster. Of course, that boat was upside down at the time. Still, why should we be surprised when grand prix racers of any ilk, from cars to powerboats, push the limits and a goodly number crash? And why would the media blame Finot for the capsize, rather than a rule that encourages monomarans that remain just as content upside down as they do right-side up? Finot himself seems rather perplexed by it all.

This type of raceboat should be assessed as a hybrid craft, because it is more closely related to a catamaran than to a 12-Meter, both in terms of performance and stability characteristics. Like a cat, these very wide, extremely stiff hulls develop enormous righting moment (RM) at low angles of heel (Finot's reach maximum RM at about 50°), so they are highly

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Despite an excellent race record, PRB's *terminal capsize in the last Around Alone caused many members of the international racing community to question the dynamic stability of Groupe Finot's big, wide, shallow hulls. Called upon to explain the circumstances of that particular event, Finot's Pascal Conq insists that newer* F/not *raceboats will self-right if flipped.*

resistant to knockdowns or capsize. But, acknowledges Finot, "that also makes them less forgiving." The RM quickly declines after the maximum is reached. Once inverted, the boats become stable rafts; like multihulls, they have not sunk but protected their crews within the hulls, sometimes for days, before rescue. Granted, those within the racing community already opposed to multihulls and light monohulls have always been critical of these craft, but after a number of Finot boats capsized and refused to re-right during the last Vendee and Around Alone, even Finot fans were beginning to wonder about the Groupe Finot approach.

Finot argues that the complex issue of safety cannot be summed up as simply as his critics would have the public believe. He stresses structural integrity as the primary safety feature. Finot believes that sailing upright also is more restful for the crew and safer. He adds, "I think that speed is a huge security factor. Even against the wind, it's an advantage. Given better weather information and the ability to sail 400 miles a day, you gain a lot of choices of where to go in relation to a storm system." Moreover, Finot feels that certain criticisms are apples-to-oranges comparisons. "One race such as Around Alone," he says, "is equal in miles to a typical family cruising for their whole lives. It's not fair to compare traditional cruising vessels sailing in the summer to high-performance boats racing in the Southern Ocean. In the winter each year, not many people go out cruising, but every year one or two traditional boats go down. If you compare traditional boats sailing the same amount of miles in winter—or even the number of failures of 'conventional' boats in the most recent Sydney-Hobart Race [the fleet was swept by a gale with monstrous seas]—to the Open 60s, I think you'll find proportionally more accidents with traditional boats."

Despite this reasoning, Finot hardly discounts stability, which he ranks second in importance to structural integrity. In fact, he declines to design multihulls precisely because of stability concerns. In the final analysis, Finot is determined to create boats that can perform like multihulls but are self-righting.

Deep bulb-keels have helped to deliver static stability ranges of up to 120° in Open-class designs, and that is surprising, given the proportions of these boats. But Finot argues that rules of thumb and hydrostatic figures

only through 180° are not very useful. He thinks dynamically. He considers the ratio between the total energy under the positive righting curve and the energy in the capsize force of the wave. He also understands that the boat itself may *add to* capsize energy, as when veteran singlehander Isabelle Autissier jibed her Finot-designed 60 in the 1998-99 Around Alone. That jibe added significant centrifugal force to the capsize moment. It also put her boat's canted keel on the wrong side, aiding the capsize. Once flipped, the keel then rested to weather, helping to resist re-righting.

Clearly, boats like those that Finot designs, with their immense catamaran-like righting moments, will capsize infrequently. But he is still determined to design boats that are unwilling to remain upside down. For each boat in every conceivable condition—with mast and without (masts are usually sealed and buoyant, helping to resist capsize and thus promote re-righting); with and without water ballast; with keel canted or upright—he plots righting curves throughout 360°. The asymmetry of forces offered by factors such as water ballast reduces the negative energy on one side of the curve, so a Finot boat probably will re-right by continuing its roll through 360°. Although the positive stability energy of *Fila,* a Finot Open 60, is *60* times her negative energy, when she capsized in the mid-Atlantic the boat took 6.5 minutes to re-right. It took that long, says Pascal Conq, because first, the keel had to swing to leeward; second, since the rig was broken, *Fila's* skipper had to get all that gear into a position that would permit the boat to re-right; and third, he had to maneuver the boat 90° to the waves. (Conq points out that for boats built before *Fila.* a dismasting during capsize might cause the hull to remain inverted permanently if waves are not large enough to tip the vessel at least 20°.)

Fila was re-righted and went on to win the 1998-99 Around Alone. "But," says Conq, "we don't want to hear anything more about capsizes." The goal now at Groupe Finot is nothing less than to reduce the negative energy on one side of the righting curve to zero. To do this. Finot and

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Conq are designing decks with greater camber, and bubble coach roofs with greater volume. Also, some raceboats currently carry inflatable bags on the sterns. Once activated, this equipment raises the capsized boat's center of gravity and reduces re-righting resistance from the broad beam; re-righting is facilitated around the narrower bow. And, if the boat retains its watertight mast, then so much the better.

Finot is fairly pleased with the technical progress in offshore racing-boat design during the past 30 years. "It used to be that up to 9 knots of wind, the boat remained 'asleep,' and it might remain 'happy' to about 30 knots. Now, with a more stable boat, you can put up more sail and keep sail up longer, so the boat is in harmony with the sea from 4 to 40 knots," he says. Has this expansion of the performance envelope done much, though, for cruisers? After all, in an Open 60 you don't even have enough headroom to stand inside, except under the tiny coach-roof blister. And just what are the differences between racers and cruisers? "No difference," Finot replies. "A cruising boat is not a racing boat, but the crew faces the same problems. Even when sailing with your family, very often you must handle the boat alone."

The many cruisers Finot has designed for production builders like Beneteau show some influence from his raceboats, but newer designs, such as the aluminum Cigale and Levrier product lines from Alubat Shipyard in Les Sables D'Olonne, France, and the all-carbon sport cruiser, the South 35, built by Aerodyne Technology in Cape Town, South Africa, are close cousins to Finot's Open designs. Given similar hullforms, these new cruisers feature greater relative freeboard, which earns them enormous interior volume for accommodations, and extends the range of their static positive stability to 130° or more. They carry water ballast tanks, but the tanks are placed lower in the hulls to add to the range of stability. The bulbs on their keels do not extend forward of the fin (so they won't snag debris), demanding a different bulb shape, but these fins are still pretty deep. Other fast-cruiser designs still on the Groupe Finot drawing board display *lifting* keels. Finot's trademarked "C. Wing" rig—an option on the South 35—is clearly a departure, but may foreshadow upcoming Open 60 designs. "Once we did the Tirant rig we knew we'd try to find another, simpler solution as soon as possible," says Conq. The C. Wing, a lightly stayed carbon wing mast, eliminates spreaders, which often restrain a mainsail from being let out enough for perfect trim, and which claw at long battens and sails that are eased for reefing.

Although the public has been gradually lured into the benefits of wide, lighter boats, many yachtsmen still view such boats as being too radical, and Finot continues to battle long-held myths. He acknowledges that if you were to spend all your time sailing upwind, heavier narrower hulls might be more comfortable. "But I don't do that," he says, noting that cruisers usually prefer offwind courses to bashing to weather. "Even

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When confronted with the old saw that loading up a light hull hampers its performance more than it would a heavy one, Finot laughs. "I agree! With a heavy boat loaded you slow from 4 knots to 3.9; with a light boat you go from 6 to 5.5!" He points out that a beamy hull makes a bigger footprint on the water than a narrow one, increasing its pounds-per-inch immersion, so a given load depresses the wide hull less. Like cruising-multihull designers, Finot, for structural and hydrodynamic purposes, designs boats with the fully loaded condition in mind. Take the South 35 as an example. Finot allows for a working payload of one ton and a maximum of two. Says Conq: "Putting additional weight in is usually *not* catastrophic. But taking too much weight out is terrible, because the boat gets tender."

For Finot, development of monohulls is far from over. "Since people like Van de Stadt, Harle, and in my generation, Dufour, began drawing what I consider 'modern' designs three decades ago, speed has gone up by 30% to 50%, and the window of performance has widened." Continued refinement, he adds, "will make it possible to improve cruising boats by another 30%."

Finot's success is due not just to designing boats with great speed potential, but also ones that are practical. Says Conq: "We're trying to be as simple as we can because we like simple things, and we know that it's not easy to design simple things that work. We don't want to hide behind something complicated just to pretend it's something good." Thanks to the many offshore miles logged by Finot boats, the interiors and deck layouts of a Finot *cruiser* are roomy *and* highly pragmatic. This has led to an austere aesthetic package as modern as an aircraft. "We take a lot of time to find the lines and shapes that we like to look at but that also work with our aims," says Conq. "We don't look at aesthetics first. If a solution brings something untraditional, even if it hurts a bit aesthetically, we're not against it. We think it's nice because it functions."

The Groupe Finot aesthetic may never appeal to traditionalists, but to those who love the act of sailing and want to increase their range. Finot designs are becoming increasingly attractive. Aboard a Finot Open 50 a couple years ago, our small, relaxed crew slipped along faster than the light-to-moderate breeze, and outpaced a fully crewed *America's* Cup boat...to weather! Now *that* is a thing of beauty. PBB

About the Author: *Steve Callahan began Open-style racing in 1977 and has since crossed the Atlantic twice in Open-style boats. He's written widely on adventure-racing designs and personalities.*

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