

## FARR HORIZONS

*An inside look at our world of yacht design.*

### *The Exciting New Volvo Open 70*



*Volvo Open 70 Concept Yacht - Copyright Farr Yacht Design Ltd*

Over a year ago, Volvo Ocean Race organizers commissioned Farr Yacht Design (FYD) to conduct a preliminary study to develop a concept Volvo Open 70 (VO70) design. Senior Naval Architect Britton Ward headed this project, and worked closely with the race organizers to develop the new Volvo Open 70 Rule.

According to Britton, under the guidelines of the new rule designers will have much latitude to find the best solution for expected race conditions. For the next event, it is highly possible for the fleet to exhibit significant differences in design concepts reflecting the various teams race strategies and emphasis on offshore versus inshore competition.

Even at the heavy end of the permitted displacement range, these boats will be some of the lightest, most powered-up ocean racers devised. In terms of sail area to displacement (power to weight), the VO70's are closer to modern skiff dinghies than conventional keelboats and have the potential to achieve speeds in excess of

30 knots. Preliminary performance estimates show the VO70 to be approximately 30 to 60 seconds/mile faster than a Volvo Ocean 60. Compared with a VO60, substantial performance gains should be found reaching and downwind as a result of the light displacement, large sailplan and high stability of the new design.

Upwind, the VO70 target speed will be close to the wind speed through 12 knots. At downwind optimum angles, the VO70 will sail the wind speed through 30 knots!

Substantial development will go into refining appendage concepts for these designs. Reliable and functional canting keel mechanisms are a must but the decision between centerline dagger boards, twin asymmetric dagger boards, forward rudders and even the number of aft rudders is not necessarily clear-cut. To better understand these appendage trade-offs, FYD is undertaking a comprehensive research effort including both scale model testing and computational work.

Achieving the rule minimum displacement while maximizing the weight in the bulb will also present design and building challenges. Sufficiently stiff and rigid structures engineered to withstand the rigors of the Southern Ocean will be critical to completing the Volvo Ocean Race and we will be devoting substantial resources to developing refined structural solutions based on our extensive experience.

The limitations on the sail plan and number of sails should help to control program costs but also present fertile ground for new developments. Maximizing the useful life and sailing range of each of the sails will be paramount for this event and will be a key ingredient in building a successful campaign.

Since 1985, Farr Yacht Design's record remains undefeated in this prestigious event.

#### **2001-2002**

- 1st - illbruck Challenge - VO60
- 2nd - Assa Abloy - VO60

#### **1997-1998**

- 1st - EF Language - W60
- 2nd - Merit Cup - W60
- 3rd - Swedish Match - W60

#### **1993-1994**

- 1st - NZ Endeavour - Maxi
- 2nd - Merit Cup - Maxi
- 3rd - La Poste - Maxi
- 1st - Yamaha - W60
- 2nd - Intrum Justitia - W60
- 3rd - Galicia 93/Pescanova - W60

#### **1989 - 1990**

- 1st - Steinlager 2 - Maxi
- 2nd - Fisher & Paykel - Maxi
- 3rd - Merit - Maxi

#### **1985-1986**

- 1st - UBS Switzerland - Maxi

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## Designer's Voice

### Parametric Design and Engineering of Appendages

David Fornaro, Design Engineer

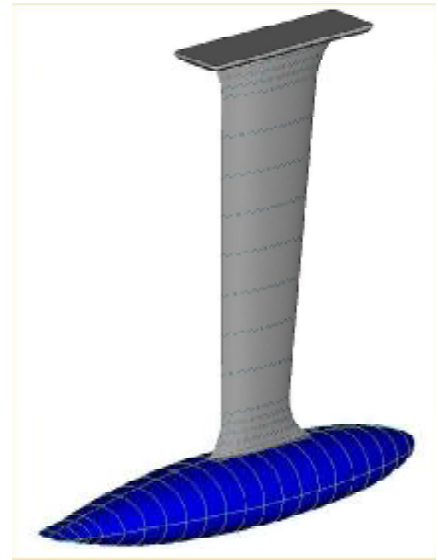
To maintain a competitive technological edge, the team at Farr Yacht Design is continually developing new and unique methodologies for every aspect of our design work. Often this is via developments in the computer software we use for design and analysis. Where possible, we use commercially available software. However, we also devote much time to developing our own software and to developing customized enhancements to the commercially available software that we use. Through this tailored software development, we gain significant capabilities beyond those of our competitors to accurately design and analyze state-of-the-art yachts.

One such area of development is our integrated, detailed design and engineering of appendages such as keels, bulbs, rudders and canards. For designing these parts we use Pro/Engineer, which is a commercially available, high-end parametric modeling software package. Parametric modeling, in general terms, allows the creation of geometric shapes through defined relationships between features. This facilitates the ability to build intelli-

gence into the model such that the relationships between key design parameters are always appropriately maintained. Such relationships often involve detailed mathematical equations that can be programmed into the model to define the character of the geometric shape. Key to the success of a parametric model is the ability to properly establish and then vary these mathematical relationships to fully explore the design space.

As an example, consider a high-performance racing keel (e.g. America's Cup or Volvo Ocean Race). For the fin, we will typically use foil-design software such as XFOil to design the sectional shape. Often the optimum design will vary the sectional shape along the span of the fin. Through a custom-designed spreadsheet we can automatically transfer the foil coordinates from XFOil to Pro/Engineer in a pre-defined format. The model is programmed to receive this data and apply additional inputs such as the span-wise distribution of foil section transitions and the planform definition such that the fin is automatically updated with the correct shape. The result is truly infinite mathematical control over the fin geometry, not a simple blending of a few pre-defined sections. For the bulb, simple input parameters such as length, width, and height are not very useful for developing a complex shape. Of much greater value is to provide as input size- and shape-descriptive parameters such as volume, prismatic coefficient, length/diameter ratio, squish ratio, droop, etc... Developing parametric models to receive such input and produce the desired geometry results in the ability to create and analyze multiple design iterations very quickly. Similar methodologies apply to the modeling of rudder blades and stocks. Only through extensive custom programming of our parametric models are we able to do this.

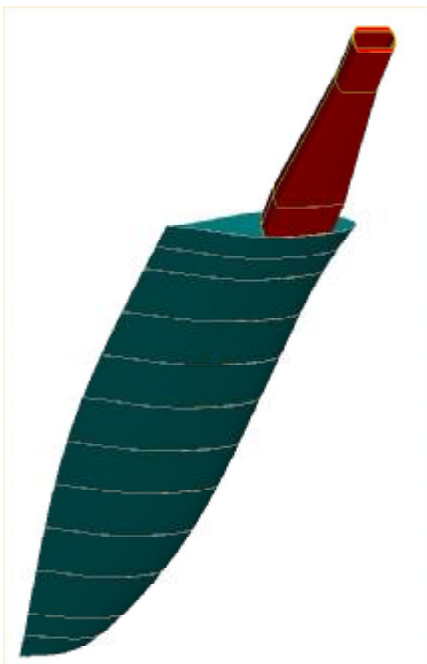
Once the geometry has been created, we are then able to utilize the model for hydrodynamic and structural analysis.



*"T" shaped keel model for a racing yacht.*

For hydrodynamic analysis, we use a version of the computational fluid dynamics (CFD) software ICEM CFD that integrates into the Pro/Engineer design software to automate the preparation of the models for analysis. We can then use any one of a number of solvers to analyze the flow around the shape that has been created. Updating the geometric model based on the results of the analysis is then simply a matter of modifying the input parameters to achieve the desired changes.

For structural analysis, we have programmed into the geometric models the equations necessary to calculate stress and deflection of components such as keel fins and composite rudder stocks. The results of these calculations are automatically presented in custom-designed reports. As the designs are evolved and their shapes changed, the structural calculations and the associated reports are automatically updated. In addition to keels and rudders, a recent addition to these structural capabilities is the programming of longitudinal deflection calculations into a model of the hull and deck, which similarly will automatically update as the design evolves. This in-



*Rudder stock and blade model.*

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## Designer Profile

### Patrick Shaughnessy, Senior Designer



Senior Designer Patrick Shaughnessy began his career at FYD as a part time draftsman in 1990. His ambition, intelligence and dedication to excellence have earned him a seat as a shareholder within the organization.

#### *...Appendages continued*

cludes development of laminate composition as well as hull and deck geometry. Often it is not straightforward to develop sets of equations to accurately solve these structural calculations. In most cases we have utilized advanced finite element analysis (FEA) methods to help develop and validate the solutions we are programming into the geometric models.

Once we are satisfied with our designs, both hydrodynamically and structurally, the parametric models are then expanded to include any necessary production details and utilized as the basis for our detail drawings, for which we use Autocad. In addition, we can also provide three-dimensional surface models to the manufacturer from which the parts can be directly milled to the final shape, or moulds can be created.

Born in Annapolis, Maryland in 1970, Patrick began sailing in local junior sailing programs and eventually taught younger children in these programs. Following his graduation from high school in 1988, he studied architecture and design at the University of Maryland and Anne Arundel Community College before joining our team in 1990.

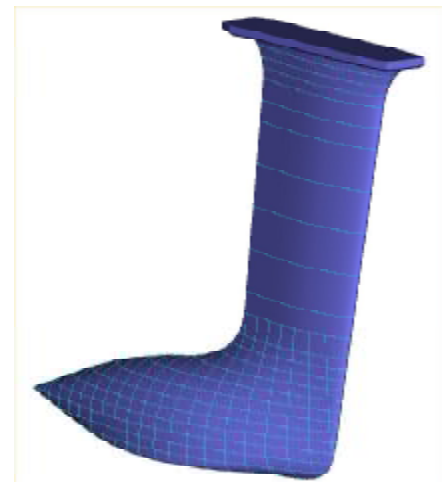
Patrick has taken on various responsibilities during his tenure at FYD. Starting in 2004, he assumed the role of Design Production Manager. In this role, he is responsible for scheduling and managing all research, design and consulting work in our overall plan. This involves determining project requirements and developing a plan of resources and timing for executing work within the overall office work plan. In a design capacity, Patrick is responsible for the geometries and layouts of decks as well as sail plans and rig concepts for all our designs. He has been involved with four of our America's Cup challenges as well as three

Whitbread/Volvo campaigns, designing decks, selecting hardware and representing the sailing team's requirements during the structural design process.

As an experienced designer, Patrick realizes the importance of developing his skills as a big boat sailor. Sailing at a professional level since 1996, he has crewed primarily as a bowman on Farr designs such as the Mumm 30, Farr 52 One Design, CM 60 and custom IMS racing designs. For several years, he crewed on Carrera, a CM 60, setting the course record in the 2001 Annapolis Newport Race, and helping the team win the 2002 Storm Trysail Club Monte-Sano Award for Racing Excellence. Participating in high profile events in the United States and overseas, has allowed him to work closely with owners and crew to hone his skills as a highly talented and gifted designer.

Patrick resides with his wife Christine, and daughters Perry and Megan in Annapolis, Maryland.

The ability to customize our design software to automate the shape creation, hydrodynamic analysis and structural analysis of appendages has been a significant enhancement to our design process. It is important to note that this system is utilized for every one of our designs, not just high-profile race boats. More than five years in the works, we now have parametric models of nine different styles of keels and three types of rudder blade/stock. Beyond appendages, we have also developed extensive parametric modeling capabilities for deck geometry, internal structure and even detailed parts such as chainplates, forestay fittings and backstay fittings. This integration of the design and engineering of the major components of the yacht greatly enhances our ability to produce world-class designs.



*Model of an "L" shaped cruising keel.*



## On The Drafting Table

### More Transpac 52's

Following on the heels of our first and successful Transpac 52 (design #495) **BEAU GESTE**, FYD is pleased to announce we have been commissioned by a long time client to design a new Transpac 52 (design #533) to be named **ESMERALDA**. The new design will vary slightly from our maiden design based on direction from the client and his skipper Ken Read of North Sails and America's Cup fame.

Additionally, two more yachts from this new TP52 design have been contracted and all three yachts are being built by Goetz Custom Boats in Rhode Island. The boats will be similar builds with some interior modifications to suit the needs of the individual clients.

Anticipated launch of the three new TP52's will be in the late Spring of 2004. Two of the yachts will participate in the Bermuda Race in June 2004 as their inaugural event. All three clients have expressed the desire to be at Key West 2005 as well as a number of of various U.S. East and West Coast regattas.

On a separate note, **BEAU GESTE** had a fantastic debut at the 2003 Coastal Cup in June. On board was the owner, Karl Kwok along with Gavin Brady, Senior



Naval Architect, Jim Schmicker and a crew of America's Cup veterans. Sailing down the coast of California, the yacht was surfing in winds that exceeded 35 knots at times and achieved a top boat speed of 32 knots resulting in a victory in the Transpac 52 Class over 4 other entrants by three hours!

**BEAU GESTE**'s second outing was the Transpac Race which is a 2250-mile

race from Southern California to the lighthouse just past Diamond Head in Hawaii. It was a dogfight all the way but **BEAU GESTE** managed to pull off the win in the Transpac 52 Class and correct to 2nd in fleet.

This year she will participate in various medium to long distance races in the Northern Hemisphere.

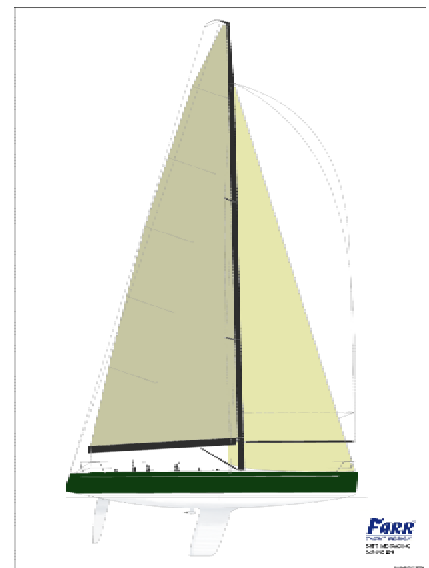
### A new CAM for 2004

Research and design work have been completed and construction is currently underway for a new IMS yacht for the Spanish racing team, "CAM". Led by Fernando León and Kiko Sanchez Luna, the team came to FYD desiring another winning yacht for the 2004 IMS season to replace their successful Farr IMS 50 (design #466) launched in 2000.

Results from an intense look at the latest version of the IMS rule combined with CFD analysis of hull variations and innovative deck geometry options have produced some features not yet seen on IMS boats. "The close examination of rule workings has allowed us to significantly upsize the boat in terms of length and

sail area within a set rating limit" said Jim Schmicker, Senior Naval Architect at FYD. "While the appearance of the resulting boat is sure to turn heads, the new design will give our clients the best rating for size benefits for Mediterranean sailing conditions".

The new CAM follows a long line of inventive IMS designs from Farr Yacht Design beginning with our breakthrough design "Gaucho" at the 1992 Key West Race. FYD has won 6 IMS World Championships and over 30 IMS regattas worldwide.



## *FYD and Nauta Yachts Collaboration*

Since the late 1980's, Farr Yacht Design and Nauta Yachts of Italy have coordinated efforts creating several sleek, semi custom cruising designs such as the Nauta 65, Nauta 70, Nauta 80DS and the Nauta 93/95. Once again we are teaming to develop the Nauta 74 (design #540).

The first hull of the new Farr 74 has been commissioned by a Swiss client who intends to spend a great deal of time sailing with his family in the Mediterranean.

The design brief calls for a fast cruising yacht capable of carrying full sail up to 16 knots of wind and will motor quickly when the wind lightens to less than 8. She will have all the comforts and cruising amenities we have come to expect from a Nauta yacht. FYD will produce the hull shape, appendages, rig plan and deck. Nauta Yachts will create the interior styling. With these efforts combined, we ex-

pect the Nauta 74 to be a fast, comfortable and easy to handle passage maker and vacation hideaway.

Construction is underway with an anticipated Spring 2005 launch. For more information, please contact Nauta Yachts at [design@nautayachts.com](mailto:design@nautayachts.com) or Tel: +39 02 481 4317.



*The Nauta 65, WABI SABI (design #254)*



*The Nauta 95, MAYA RAY (design #366/2)*



*The Nauta DS80 ACAIA Upper Saloon (design #489)*

## *Farr 115' SOJANA Launched*

It took a while, 5 ½ years to be exact, but Peter Harrison's dream is finally a reality. What started life as a 90 footer in 1998 was officially launched at the GBR base in Cowes, England on a beautiful sunny Friday afternoon. With family, suppliers, crew, and guests in attendance Joy Harrison officially cut loose the bottle of champagne and christened the dark blue lady "SOJANA".

And what does "SOJANA" stand for you ask? SOPhie, JAMES, NATalie...the first names of the Harrison's three grandchildren who were on deck for the christening of the yacht that bears their names.

SOJANA is the first Superyacht to be built in Cowes. Harrison, founder of GBR Challenge, will benefit from America's Cup technology that enables this super world cruising yacht to have potentially very high performance. In the right conditions, SOJANA will be capable of achieving speeds of up to 25 knots.

An extremely hi-tech structure, the hull consists of a pre-impregnated carbon laminate and Nomex honeycomb core, similar to the technology used in

America's Cup yachts. Green Marine Ltd, world experts in composite technology and the builders of high performance yachts such as Assa Abloy, completed the composite structure in June 2002. Using this aerospace technology engineered by SP Technology, allows SOJANA to be strong and light with exhilarating performance in mind.

Farr Yacht Design, Ltd, created the hull design, appendages and sail plan. The ketch rig, built by Hall Spars in Rhode Island, was selected as it offers a flexible sail configuration. This allows her to be easily handled in various conditions and sailing modes, but also gives a large sail area with tremendous power in reaching and running conditions. SOJANA has a tall mizzenmast, well separated from the main mast, which minimizes interference between the rigs.

Additional stability for cruising is achieved by specifically designing the tankage systems to allow the transfer of fuel and fresh water to windward when necessary. The cockpit was designed to be both efficient for cruising and crewed

racing, with a spacious seating area aft for dining, which also gives protection to the non-sailing crew. There is also a spacious cuddy providing guests with panoramic views in air-conditioned comfort.

The interior design and styling combines the dual roles of fast offshore sailing and safe family cruising. Interior designers and stylists, Design Unlimited worked closely with the owner, to achieve a layout, which meets all the demands for luxurious living yet is still practical for the racecourse. The classic style interior has been built within strict weight tolerances, so behind the beautifully crafted interior joinery is a mass of hi-tech Nomex structure.

The building of SOJANA was started at Green Marine in September 2001 with the composite structure completed a year later. The fit-out, managed by Fast Cruising Ltd, has been completed in the GBR yard in Cowes.

*Continued next page...*

## ...SOJANA continued

SOJANA will have a permanent crew of five, skippered by Marc Fitzgerald. Peter Harrison's family and friends will often enjoy the magnificence provided by SOJANA but she will also be available for luxury charter and guests are sure to enjoy her sleek elegance, and appreciate her responsive, sailing performance.

SOJANA also plans to compete in various regattas around the world such as Antigua Sailing week and the Nioulargue in St Tropez. In racing mode, she will require 27 race crew to ensure that she is a serious contender for the trophies on offer.

*Article written and provided by Oliva Seton - GEM Group.*



*Peter Harrison at the helm of SOJANA enjoying a spirited sail in the Canaries.  
Photo courtesy of Rich Tomlinson*

## Out and About

The design staff at FYD not only sits behind computers but actually spend time sailing. In February, Bruce Farr and Russ Bowler donned their sailing gear to race on the ACC yacht, "NZL 20" in the New Zealand Millennium SuperYacht Regatta. FYD designed NZL 20 for the 1992 America's Cup Challenger, NEW ZEALAND CHALLENGE.



*Bruce Farr and Russ Bowler aboard NZL 20*

During the 2003 Acura SORC, Designer, Patrick Shaughnessy was bowman on the new Farr 36 One Design "Tazo" (design #498) and placed 2<sup>nd</sup> in PHRF 2. Patrick was asked to crew again as bowman during the 2003 Block Island Race Week and

again placed 2<sup>nd</sup> in the PHRF 33 class. Naval Architect, Luke Shingledecker and Design Sales & Marketing Manager, David Millett were on the Block Island Race scene as well. Luke was crew on the Farr IMS 49' "Canvasback" (ex-Bribon) and Dave was aboard the Farr 395 "Spinal Shock".

One of our newest team members, Naval Architect Alon Finkelstein, joined the team of "Le Cygne" a Beneteau First 40.7 to sail in the Annapolis Newport Race in June.

In July, Patrick and Naval Architect's Jim Schmicker and Britton Ward headed to the Mediterranean. At the Breitling Cup in Palma Patrick crewed on our new IMS 53' design "Orlanda" (design #493M). Jim was aboard the 1999 IMS 50' "CAM" (design #466) and Britton was on a chase boat analyzing fleet mark rounding times and boat interactions.

Back in early September Steve Morris and Mick Price traveled to Lorient, France to sail with Jean Pierre Dick and Nicolas Abiven, skipper and project manager of

the Farr designed Open 60, "Virbac" prior to the start of the Mini Transat. As this was Farr Yacht Design's first foray into the Open 60 game, Steve and Mick were eager to spend time on the water in this new sailing machine.

And finally, three of our designers headed to Key West Race Week in January to race on our designs. Patrick was bowman on Marco Birch's Farr 53 "Talisman" which placed 1st in the IMS class. Alon crewed again on "Le Cygne" and placed 2nd in PHRF 6. Dave Millett joined the team of "Spinal Shock" and placed a respectable 3rd in PHRF 3.



*The Farr Open 60, "Virbac"*



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## *Tidbits*

### *Wedding Bells*

Congratulations are in order for one of our team members. Ann Staley tied the knot back in September. We wish Ann and her new husband, Brian DeVilbiss, all the best.



### *New Team Member*

An official welcome aboard to Mark Bishop who joined our team as Design Engineer this past December.

Born in New Zealand, Mark started sailing P-Class dinghies and raced regularly during the Wednesday night series in Auckland. He holds a Bachelor's in Mechanical Engineering from the University of Auckland.

Specializing in composite structures of sailboats, Mark previously worked with Southern Spars and High Modulus in New Zealand which gave him a strong foundation in engineering methods and applications. Mark has traveled to many building sites around the world and prior to joining our team, he was as an on-site engineer for a large high-speed power craft in Florida since March 2001.

Mark and his wife, Catherine, have re-

located to the Annapolis area and are looking forward to the season change to enjoy the water activities on the Chesapeake Bay.



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### *News Flash!*

Nauta Yachts, Pegaso Srl and Southern Wind Shipyard have commissioned our team to design a new 96' cruising yacht to be named the Southern Wind 96. Stay tuned for more details.

We have improved our website. Please visit [www.farrdesign.com](http://www.farrdesign.com) for information on our team, design photos and specifications and much more.