Where now?

In the first of a new series of articles that will look further ahead at the future of racing sailboat design Dobbs Davis talks to Britt Ward, one of several younger rising stars who are steadily making their mark within the competitive environs of Farr Yacht Design's Annapolis offices

The household names of performance yacht design, who built their reputations and success upon foundations laid in the 1970s, are now getting a little older... The name-founders, who had built these firms with ingenuity, intuition, hard work and often a healthy dose of political savvy in the era of the IOR and metre rules, are now forging through the wilds of the ACC and offshore box rules, offshore handicaps and the occasional 'no-rules' project, using tools for design and engineering that were unimaginable three decades ago.

Compared with the IOR lead mines of the 1970s and 1980s, most of these new designs are faster and safer, and the design-to-build process more reliable than ever before. And while this has come at a considerable increase in cost to the clients, particularly for custom projects, there seems to be no lack of a ready market as the top firms are busier than ever.

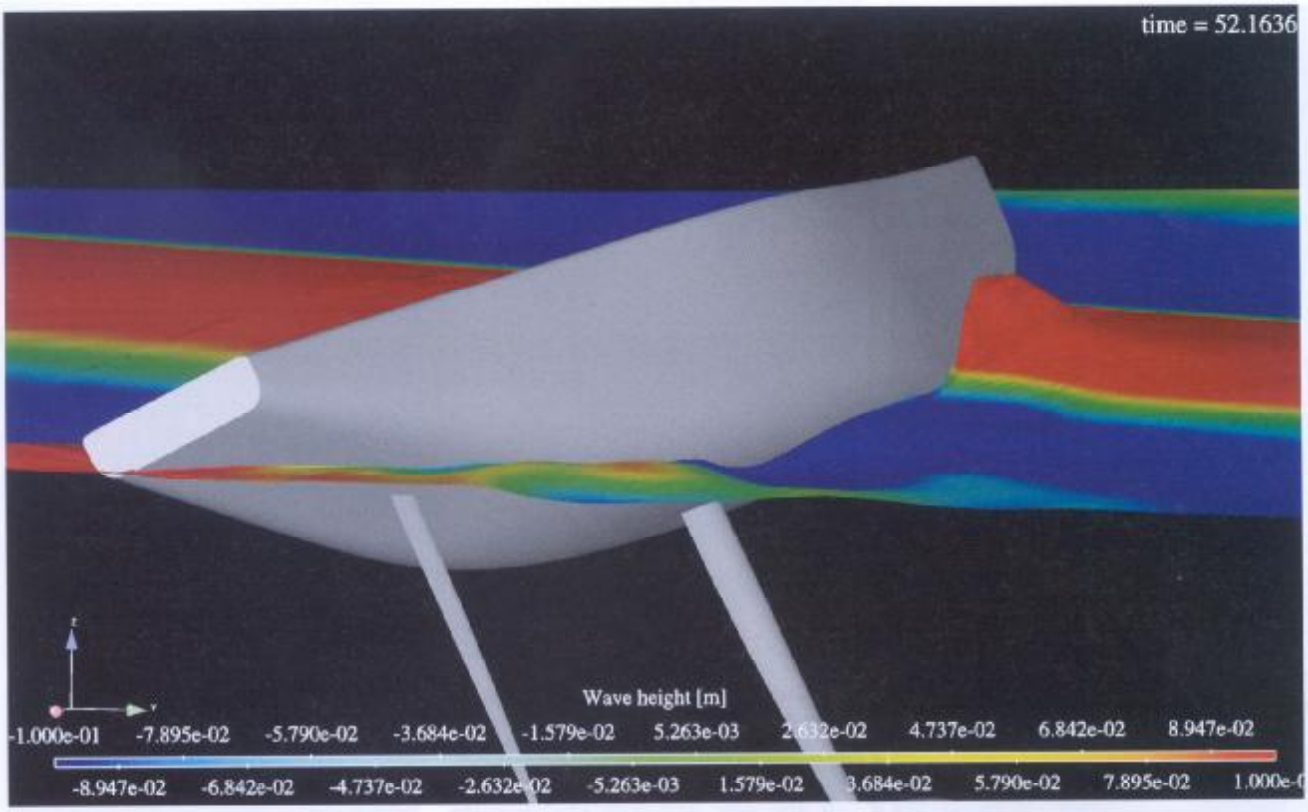
One of the great names in the genre of performance yacht design is Farr Yacht Design, based in Annapolis. When Bruce Farr and Russ Bowler migrated here from their native New Zealand a little more than 26 years ago, they already had some successful and mostly Antipodean-built designs under their belt. They justified their relocation to the US east coast as necessary in the pre-internet age to be closer to expanding US and European markets. With fellow Kiwi and *Ceramco New Zealand* watch-leader Geoff Stagg brought onboard to market their designs under the Farr flag, the rest, as they say, is history.

So it is perhaps this same prescience that drives Russ and Bruce to be focusing now on grooming a new generation at FYD to write the next chapter in their firm's history. From a core group of seven naval architects and design engineers, FYD have doubled in size in the past five years, carefully recruiting new young talent who are proficient in the latest-generation computational tools. All are university-trained in naval architecture and/or engineering, and all have a passion for sailing. While FYD's two elder statesmen remain actively involved in the design work, with Russ focused on managing the team's work while Bruce takes on experimental projects, the younger talent have relatively free rein to interject fresh ideas to FYD projects and make the most efficient use of the latest design technology.

One of the team's rising talents who is becoming increasingly well known on the international scene is Britt Ward, who has been with FYD since 1996 and holds the title senior naval architect. Britt's role at FYD is to manage the large research programmes that represent a paradigm shift in how naval architecture has been practised in the past decade.

Ward supplemented his academic background in naval architecture with post-graduate study in computational and experimental hydrodynamics under the legendary Jerry Milgram at MIT. With this proficiency in computer skills he has taken a leading role in the continuing development of FYD's in-house VPP. Britt's

PIERRE ORPHANIDIS/VALENCIA SAILING



Left: **slab-sided or what... but note the nice aero-treatment of the front of the boom; detail is everything in this Cup cycle.** ***Above:*** **a COMET RANS CFD visualisation of a current ACC yacht showing details of free-surface flow (courtesy BMW Oracle).** ***Right:*** **'tank-test model for the office, sir?' Like most of the top teams BMW Oracle runs their tank programme at 1/3rd scale**

introduction to ACC design was an apprenticeship with measurer Ken McAlpine, but since joining FYD this experience has evolved into a critical role in the ACC research and design that FYD have been doing for several years for the BMW Oracle team, whom he will shortly join in Valencia to help analyse and evaluate performance. Offshore Britt was also responsible for managing the Volvo Open 70 hull research project, where early input from FYD helped the race organisers shape the then new VO70 rule, as well as having input in FYD's recent excursion into the once all-French world of Open 60 design.

SH: Describe the process of code development in the VPP you use at FYD. What are its strengths, and how is it applicable to the latest ACC design work?
Britt Ward: Our in-house code, which we call KARI, is a real workhorse based on a potential-flow model that we developed with help from a group of MIT PhDs, but which needed adjustment to accept the additional parameters of pitch, heel, appendages and so forth that you find applicable on a sailing yacht.

The potential-flow code does a great job because it runs quickly, with a lot of data, and for heavy-displacement yachts like ACC boats it generates good results comparable to the RANS codes.

GILLES MARTIN-RAGET/BMWO

BRUCE FARR

FYD's latest innovation in the IMOCA class is this powerboat-like trim tab that allows the hull shape and transom immersion to be adjusted to optimise performance

GARETH COOKE

It also does well with predicting the wave field around the boat and the induced drag on the appendages, but the viscosity is a term that is added empirically. This can be important in low-velocity conditions, say below 10kt for an ACC boat, where viscous drag has a big influence on the flow. Even though we have a pretty good idea of what this is, we're still just basically guessing on the viscosity with this code.

This, though, is a question that the RANS code can answer, as it's the only thing that can be used to run at full scale and full Reynolds numbers, whereas our tank testing is all done at one-third scale. We use the RANS code to understand how to scale those pieces, and therefore improve the tank results, and the potential-flow codes to predict the running length and running wetted areas, for which previously we'd have had to either use a camera or guess at to explain the tank data. So in this way we work on each piece to make it better and improve the overall result.

Because of this complexity in each design we've always found that these computational tools are most useful if used in concert with one another, where experiments can be designed to answer what the code cannot, and then taking what is learned from this and incorporating it into the next level of development.

SH: But is KARI sufficiently versatile to work with other more radical lightweight modern types, other than just heavy ACC boats...

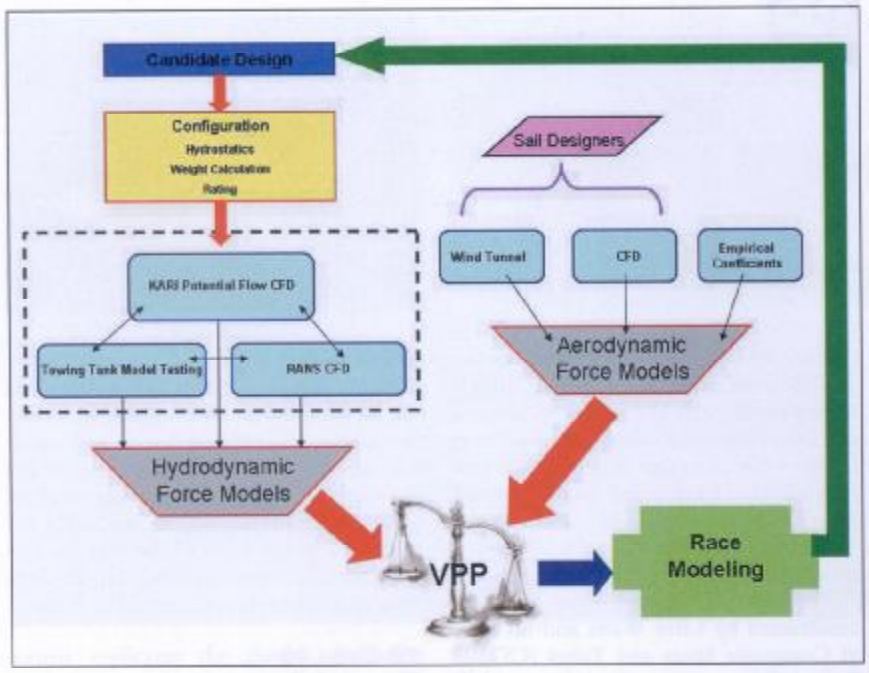
BW: KARI is a step beyond where these codes have been before in terms of its accuracy and the level of resolution it achieves, so we can also use it for designing and optimising appendages. Even though we've developed it in the course of the America's Cup cycle – where we are improving it steadily through validation with tank test results – essentially it is an all-purpose code. But we are now working to improve its versatility so we can apply it to VO70s and other high-performance designs – even though the asymmetric dagger boards, canting keels and immersed transoms introduce a whole new level of complexity! This is a much harder problem for potential-flow analysis, though we've focused on the problem for the past nine months and have made some very solid progress.

SH: Have BMW Oracle helped fund the development of KARI and so do they now have part ownership...

BW: No, we put in the development effort, so they now pay us a licence fee for its use.

SH: During the BMW Oracle design process how were you able to use tools like KARI to communicate with their own large design team?

BW: We designed KARI to run on high-end Windows-based workstations, from which we developed our own distributive computing system; so from one machine it will send out a job and monitor it from



half a world away. For a while we were running jobs on both sides of the Atlantic using the same system. We took time to train people on both teams to operate the system.

SH: Cup projects are notorious for disrupting a studio's day-to-day business. How much impact did the Oracle BMW design project have on your operations here in Annapolis?

BW: For the past three years I've personally been maxed out on the ACC design project, and lots of others here have had input into the process. This is one of the reasons we've been hiring in new people to support this kind of intensive design effort. Nevertheless, this time around it has not been as disruptive as in the past, largely because we have had other members of the team's own construction engineers and designers to take on a lot of the detail work that we used to have to do in-house.

My task has been to manage the hull design team, which has allowed Bruce and Juan [Kouyoumdjian] to be free to be creative, drawing shapes and thinking about new ideas. The interesting thing I've learned from this process is that while the computers are really useful tools, and it's the science that now guides us, the human artistry is still there – you can get a lot closer to the optimum based on knowledge when it's crossed with experience and artistic flare. That's the beauty of this process: computers are not going to replace us any time soon, because we can get to the right solution faster when we bring our own knowledge and experience to bear on the problem.

SH: How would you characterise the collaborative process working with Juan K?

BW: We went into this with an open-arms approach, laying out on the table what both of us knew, and I think the collaboration was really valuable. Juan's approach is typically different from ours, where we have tended to be a little more methodical, while always making time to explore out-of-the-box ideas so you don't get channelled down the wrong path. I think Juan's done that perhaps a little better than we've done previously.

We would make sure that for every experimental development series there was another path of more free-form ideas and how they might come together to influence the design. We were told that going into this Cup they had closed the box down so far that it would be hard to find gains; but the fact is they were still there, very substantial gains, and often from very subtle shape changes. Bottom line is, did we get a faster boat from this, and I think we did.

I think this is going to be the closest Louis Vuitton Cup ever. And it will be decided by seconds in the seventh race.

SH: Would you consider repeating such a collaboration in the future?

BW: There is a massive amount of overhead associated with this kind of process, so it's unlikely that you'll ever have the time and funding available in anything other than an AC programme. But it's always good to have a look to see what others are doing, and in this sense the process is generally a positive experience.

SH: From the outside it would appear that 2007 ACC designs have nevertheless pretty well narrowed down to a small range of variations. What is it like to make the transition from that to something like an Open 60?

BW: To go from staring at hundreds of near-identical America's Cup hulls to switching to an Open 60 is really refreshing! Thinking about how to optimise a heavy, fully crewed yacht trundling around an inshore course and then how to get a singlehanded planing boat around the planet is what's really exciting, and a big part of why I work here. It keeps you creative. And there's a lot of cross-pollination of ideas, too... though sometimes that must look pretty unlikely! ❐