Artfully, quietly, radically

Carol Cronin sits down with one significant contributor to America's Cup success who prefers to fly well below the radar… Seattle-based engineer, designer and free-thinker par excellence Paul Bieker

I first heard the name Paul Bieker 30 years ago, rigging up for the only big International 14 regatta I ever sailed. All around the busy boatpark sailors were raving about the speed and durability of the newest Bieker boats. And a class that prides itself on cutting-edge development is a tough group to impress.

Since then I've occasionally stumbled onto one of Paul's many innovations… but spotlight hunter he is not. Even this profile took a little coaxing: 'I worry that I may be a little too boring for something like that.' Fortunately, we both love to talk about making boats go faster – and he doesn't seem to mind dumbing down the technical stuff. The reward was a fascinating glimpse into a unique free-thinking design process.

A lot of art

Paul was born in Portland, Oregon, and he grew up racing and cruising with his family on the west coast of the US – while endlessly drawing boats. He was the eldest of three, and after high school 'my dad packed up the family and we sailed down through the South Pacific to Polynesia', on a Swan 48. In addition to providing future design inspiration, 'The nice thing about a trip like that is it gives you time to think.'

There was also time to apply to the Rhode Island School of Design, where Paul started university once the family returned to land. 'I tried to be a regular architect, because my dad suggested that… a more practical path. But I did a couple of years and decided that, yeah, I really did want to design boats for a living.' His degree in naval architecture came with high honours from the University of California at Berkeley.

'The neat thing about boats is that there's still a lot of art to it,' he says. 'The first thing a boat has to do is interact with its environment; the variety of wind and sea conditions. They're pretty complex machines, and I think we're still a long ways from being able to just design them with a computer. I like that.'

This is a just a bit ironic from a guy revered for his computer savvy, so I ask about the transition he's experienced over almost 40 years of design work. 'When I first started I had the ducks and splines and a nice set of curves and everything to hand-fair lines. But even in college I played around with writing simple curve-fairing programs in Fortran.

'The IBM AT had just come out, and that was one of the first PCs on which you could really do meaningful CAD work.' Then after university… 'I don't think I ever designed a boat again by hand. It's a pretty good chance that the last boat I hand drew was a concrete canoe for the UC Berkeley Civil Engineering Department competition! It was a challenge; how to make a lightweight concrete structure… and it had nothing to do with anything that I did after that.'

Int14 lessons

Paul had a brief stint in Gary Mull's 'too analogue' office before migrating north to design commercial vessels. Seattle's active International 14 fleet 'was a big thing for me. I didn't know anything about composites from school; I learned by building the 14s. How to put things together, how to do laminates, the strengths of the different materials…'

He never had a serious boat failure, he says. 'I had enough of a structural background that I knew when something wasn't right, and I didn't let it get out of the door.

'Probably the worst thing I ever did was when I first decided I wanted to vacuum-bag a boat. I was having a hard time finding a vacuum pump, so I decided to try using a shop vac. It didn't have enough oomph to really pull the core down against the skin in the mould, so we had these big pockets of air on the outside skin that we had to inject with resin. That was brutal! But that boat ended up winning the US Nationals…'

He does remember breaking down with a girlfriend-crew on one of the first 14s he

***Opposite*: Oracle comes from 1-8 down to defend the America's Cup in 2013. Bieker describes his engineering involvement as 'responsible for the highest loaded bits of the boat!' These included the foils of course, Bieker Boats-engineered and built by Core Composites, plus the bulb/fillet (*inset*) at the foil intersection which Bieker introduced midway through the match to reduce ventilation. One of two original Riptide 35s (*left*), the design that took Bieker from Int14s to much larger yachts of every type. These lightweight water-ballasted 35-footers will keep up with 50ft ultralights in most conditions. *Below*: Bieker's Eagle 53, light, all-carbon 'daysailing weapon'. Hybrid wing rig plus the choice of C or T-foils for full-foiling**

owned. 'It had been put together by a novice guy and wasn't too well built. We were out sailing, quite a ways from home, with the spinnaker up and both on the trapeze – and the whole rudder with a section of the stern came off the back of the boat…

'I had this [very short] moment when I was still holding onto the tiller extension and dragging the rudder with a piece of the transom, and then of course we spun out and started to flood.' They managed to limp home on a half-flooded boat. 'Luckily it was downwind back to Seattle. I remember my girlfriend up forward, trying to keep the bow down. I hung off the stern and used my legs as a rudder to kind of steer it towards the harbour. But I didn't build that boat,' he quickly adds.

By the early 1990s his success on the Int14 circuit brought more boat orders than he could fit in alongside full-time ship design. Taking a more flexible job freed up both time and creativity, and he began designing and building a few larger sailboats as well, including the Riptide 35 for Jonathan and Libby McKee. It was the Riptide 35 that would put Bieker Boats on a much bigger map.

'A large proportion of my boats have been racer-cruisers; even if they're pretty racy they've got decent interiors. When I grew up the boats we sailed were dual-purpose: you raced them and you cruised them. You can do both.'

Paul also continued to develop and improve his Int14s, and Charles Stanley/Mo Gray won the 1997 Worlds in a chartered Bieker 2 (which, Paul joyously remembers, the British skipper then purchased).

'Going into the event there was a lot of talk about how the Aussies were going to be so much quicker, but that boat was the most mongrel of all – American hull and foils, Kiwi rig, English sails and sailors. Charles [and Mo] got second with it in 1999, and the guy who got first was an Australian sailing a Bieker 3.' (Grant Geddes/Craig Watkin). Which brings us to…

Paul Bieker's most radical ideas

I'd already sampled the smorgasbord of innovation that is Bieker Boats, so I ask him to name his most radical idea – thinking he's going to talk about the strange bumpy-edged rudder I spotted. Instead Paul mentions the hydrofoils he added to an Int14 rudder in the spring of 2000, a retrofit to the already fast Bieker 2.

'Most other people would have done T-foils right down at the bottom, and when you look at the rudder alone that looks like what you'd want to do. I put the foil up closer to the water surface, where it interacted with the wave pattern created by the hull and helped make the water think the boat was longer than 14ft. I thought that was pretty neat, and it made a big difference to the boats; they went quite a bit faster!' Not surprisingly, they were also quite controversial when they made their first big debut at the 2000 Worlds.

Two 14s had hydrofoils for the 116-boat Worlds in Beer, UK, that summer. 'One was mine, and the other was some friends of mine' (Kris Bundy/Jamie Hanseler). 'They won! We screwed up in the corners, but we did better than we would have otherwise. From then on all the boats had those rudder hydrofoils.'

After another foiled-rudder Bieker won the 2001 Worlds. The class history records that 'The Australians wanted to ban foils but the World Association voted to accept them with limitations to prevent a fully foiled flying hull, which had already been trialled in Perth, Australia.'

Spooky flutter

'Another good one' was much smaller and far less controversial. '*Wild Oats*, the big Maxi down in Australia, their canting keel was fluttering at I think it was 30-32kt. Which is a pretty spooky thing, you know.

'We analysed it, looked at moving the bulb on the fin, all these major changes; but we couldn't significantly shift the flutter speed. And then I remembered when I was a kid I saw some tip tanks on an aeroplane that had little fins back at their trailing edges. At the time I didn't know what they were for. But it just kind of came to me: that's what you need to do. So we put a little fin like a windsurfer skeg on the tail of the *Wild Oats* bulb and the flutter went away. A super-cheap fix to a really serious problem – one of those when you wish you weren't getting paid by the hour!'

Tubercles

I have to ask about that bumpy rudder, but I'm rewarded by another brief glimpse into Paul's free-thinking approach. 'I read an article talking about the purpose of tubercles on humpback whales; basically they're an anti-stall device. At low angles of attack they don't have a big drag penalty. At high angles they create turbulence that mixes the flow in the leading part of the foil and delays stall.' They also help 'make that turbulence work like a fence for ventilation'.

Fortunately, he explains further. 'A rudder with tubercles tends to not ventilate as easily; the flow doesn't just shear off the leading edge and suck air down. On a pure raceboat you probably wouldn't do them because there is a small drag penalty. But they give you this feedback; right before stall you feel the helm shudder. So if you want to make the steering a little bit more forgiving then it's a user-friendly device.

'I've put them on a few boats where it seemed like the right thing.' Added to a 65-footer with rudders too far aft, 'it totally changed the behaviour; the boat no longer spun out on jib reaches.' Thank you, humpbacks.

***Above/top*: the spectacular and surprisingly commodious 53ft Polynesian-inspired cat *Fujin*… 30kt+ in comfort and scourge of the Caribbean multihull circuit. The chiselled aesthetics are there to minimise windage more than just look cool (which they do). Paul's little family proa (*right*) was home-built to wind down and have some fun following Oracle's stressful losing Cup campaign of 2017**

Team Oracle

Those Int14 hydrofoils attracted Larry Ellison's attention, and Paul was part of the Oracle Racing design team from the early naughties until they disbanded in 2017. That's five America's Cups, including the 2010 Deed of Gift match and 2013's last-minute comeback. 'We dragged our two boys around on each one of those,' Paul says, in a rare mention of family.

'The [Oracle] teams changed a little bit each time, but the general feel was fairly familiar,' he continues. 'The boats changed pretty radically. Probably the biggest transition was the big trimaran…

'There was a long history of racing ACC monohulls and you were just taking things a bit further down the track each time; you weren't faced with huge unknowns. When we did the campaign with the big trimaran we were in really unfamiliar territory technically. The materials and engineering tools were the same, but the nature of the boat and the load cases were all dramatically different. It was a lesson in taking a step back and approaching things from first principles.

'That really changed the way the work itself felt; it was much more free once we got out of the monohull programme, more of a brave new world kind of thing. And our engineering got a lot better. For the monohulls you'd design the boat, build it, throw it in the water, and go sailing without ever testing anything. With the modern boats you structurally test pretty much every major part of the boat before you go on the water. And you instrument them with pressure sensors and fibre optic strain gauges to monitor the loads much more closely than we ever did in the monohulls. We're learning a lot quicker than we did in the past.'

The SailGP door opens

After helping to transform a non-foiling AC72 catamaran into one that could (just barely) win the 2013 Cup, Paul became Oracle Racing's chief design engineer. He was closely involved with writing the AC50 Rule for 2017: 'I figured out the hull shapes and the layout; how big the rigs were, and where the rigs were placed.'

But when Oracle lost to Team New Zealand in 2017 'those boats were put out to pasture, but then Russell Coutts decided to create the SailGP circuit. It's a one-design hull and platform based on those original designs, since when they've evolved the systems and foils and wings.

'They're quite a bit more sophisticated than the boats we sailed in Bermuda, and we're working on new foil designs to improve the boats further each season.'

Paul had just returned from the SailGP event in New Zealand. 'The racing is really something; 11-12 boats on a small course, going 40kt+! It's a pretty serious rodeo. Then when they have crashes I help figure out the repairs…'

Asked what he will work on after our chat reveals the wide array of projects his three-person office takes on. 'Today I am still working on SailGP repair drawings, then we'll be onto a new heavier rudder. Plus we have a proposal for a moderate-speed foiling electric passenger ferry; that's been one of my goals, to bring some of the foiling technology into the regular world.'

The design top three

I can't resist what I present as an unanswerable question: what's his favourite boat? 'Oh God, that is unanswerable!' So I expand it to his top three, which he says is easier. 'Riptide 35, the *Fujin* [a 53ft

***Left*: the latest Riptide 30, launched last winter. Fast and easily driven, easy to handle, seaworthy and with a simple gravity-driven water ballast system. *Top left*: Bieker's personal favourite, the Shilshole 27. Stitch-and-glue build, lifting keel and rudder for shoal waters, easily trailed and with exceptional performance. A compact design that features a carbon rig plus other key components factory supplied in carbon. Bieker's numerous powered designs all revolve around the common theme of efficiency. His 18ft skiff (*top*) has a top speed of 23kt powered by a 20hp outboard with a fuel burn of less than 1-gal/hr. His elegant Shearwater design (*above*) similarly cruises at between 13 and 16kt with a 60hp outboard burning around 1.6-2gal/hr. Shearwater weighs in at just 1,021kg ready to go…**

catamaran] and… the third one's pretty tough… but I would say the little 27-footer [Shilshole 27]. I particularly like the construction of it; CNC computer-cut plywood. Pleasant to build, lightweight. And pleasant to be inside.'

All three are 'technically racer-cruisers', he points out. 'I think we've lost something… all these one-trick-pony sorts of boats. I've come to realise, though, that there are a fair number of people who just aren't interested in the cruising side.

'So adding those details is simply cumbersome and expensive; they're better off with a stripped-down shell. But I think they're missing something when they don't spend any time sailing their boats for fun.'

Brava Italia

For the 2024 Cup Paul's working part-time with Luna Rossa. 'It's been pretty fun. It's a good group, and I like the way they work. On an Anglo team everybody comes into the office and plants in front of the computer, just churning through work. That's part of the way Luna Rossa operates as well, but they go out to the café and have a coffee, once in the morning and once in the afternoon, and that involves a 0.5 or 1km walk; you're usually walking and talking to different people each time.

'Then you sit down, have coffee. There's chit-chat, but usually some things come up and you get a little bit of free association. If nothing else, you learn more about what the other guys are working on; make connections that you might not have done just working side by side, not really interacting. There's a nice camaraderie.'

Paul travels to Italy every few months or so. 'Mostly, I work remotely. A lot of the work is just designing things, without a lot of interaction. But the interesting thing is that once you understand how another person works, we can interact with people in Europe or New Zealand and it's a bit like you're in the same office.'

A little recognition, dress codes, and what might be next

Paul lives with his wife and two sons in a small town an hour and a half north of Seattle. His kids are now 'in their low 20s, and it's actually been good having them home. We've got a little 27ft sailboat that we do evening races on in the summer, and some long-distance racing and cruising.' That's the Shilshole 27, one of his three favourite designs.

When Cruising Club of America named him the recipient of their Diana Russell Medal last year, 'in recognition of innovation in sailing design', he says it 'just kind of came out of the blue'. He accepted the award at the New York YC in Manhattan, which he'd visited only once before. 'Right after we won the Cup I wanted to see the model room. But I didn't have the right clothes on and they turned me away. This time I learned my lesson! No dungarees.

'It was fun to get a sense of the history; pretty nice. And also pretty intense.'

Paul's been a member of the CCA for about 10 years, and he says he'd like to help with their work on racing and safety rules. But 'the big thing I've been thinking about lately is trying to get some kind of a youth development class' going in the US. 'The model for me is the Cherub, down in Australia and New Zealand.

'The Bruce Farr generation of designers and sailors came out of that scene, where they were involved with development boats. And that's where I learned the basics; I wouldn't have been able to do what I've done in boats without the 14 class. I look at the sailing scene now and it's really all about purchasing that one-design Opti or that one-design 29er. There's something that's lost, at least for the percentage of the community who are interested in the technical side.'

The workflow has changed dramatically since his early days. 'We have more technical tools to help direct the work now; help you avoid mistakes. But it's still an art. And in the end, if the dog doesn't hunt it's not considered successful.'

Bieker boats can definitely hunt, and I could listen to their designer all day… but he needs to get back to innovating, and I need to digest the four-course meal of our conversation. As we sign off I can better appreciate the very memorable reverence of those veteran Int14 sailors – even if I can't quite keep up with such a high-level, free-thinking thought process.

Too boring? Not a chance. ❑