

Review Sled TP52

The weighting GAME

Words by Ben Gladwell Photos by Will Calver



As high-tech racing yachts explore new ways of saving weight, a new TP52 from Cookson Boats in Auckland has even pared its name to a minimum: *Sled*.

Minimise weight, maximise aerodynamics – those two design concepts drive every aspect of *Sled*. Designed by Botin Partners who also designed for Emirates Team New Zealand, *Sled* exploits the absolute limit of the TP52 class rule. She is one of nine, new TP52s to hit the European professional circuit this year and is race-ready – yet she seems sparse. What's missing? Weight and windage.

POWER TO WEIGHT

A boat's power-to-weight ratio is a major factor in achieving optimum performance. An easy way to maximise power-to-weight ratio is to lower the centre of gravity by stripping every possible gram of weight from the deck and above, and put it as low down as possible. Not literally, but if you find a way to save weight in the deck and mast, you can put that equivalent amount of weight in lead in the keel, according to the TP52 rating rule.

Adding weight to the keel increases its righting moment, which allows the yacht to carry more sail area – which equals more power.

Within the TP52 class rule, the maximum allowable weight of the keel and bulb is 4600kg. Once the keel has reached its maximum allowable weight, you can still add weight saved from above deck as ballast in the interior until the boat meets the required weight of 7000kg.

Brad Marsh, a New Zealander and bowman on *Groupama* in the 2011-2012 Volvo Ocean Race, was on *Sled*'s design team. He says they went to extremes to optimise *Sled*'s weight distribution.

"We try to take as much weight out of the mast as possible," Marsh says. "One kilo saved from the top of the mast is worth

three kilos in the keel [in terms of generating righting moment]. We have even taken off the Spectra covers from our running backstays; we just have a clear tape cover over the carbon. The dry-weight saving is negligible, but once they're wet it might be worth a kilo or so.

"We only run four halyards: one really light one for the mainsail because it's got a lock, two mastheads and one jib halyard. We mouse one of the masthead ones to the top of the rig because it's only there as a back-up. If we see that halyard again during racing, it means we have made a mistake."

Under the TP52 rules, a rig must weigh a minimum 235kg when fully dressed with standing rigging and spreaders. Thanks to modern mast-building technology, *Sled*'s rig is strong enough to withstand the expected loads but weighed in at less than 235kg, so she required corrector weights to meet the rule which governs the mast's weight and centre of gravity.

As for *Sled*'s deck, it almost feels that the design team took the weight-saving too far. I looked for essential items such as jib cars and tracks, in-haulers, stainless steel pad-eyes, big kite blocks – all gone. *Sled*'s decks are almost bare – not only to save weight, but to reduce windage and the chances of a sail or sheet snagging on deck fittings. Instead, most of the systems normally deemed necessary for windward-leeward racing are below decks.

In place of fore-aft jib tracks with cars and in-haulers for the jib-sheets, the lead for the jib-sheet emerges through a slot in the deck. The sheeting position is controlled by a purchase system below decks. In upwind mode, the jib clew is pulled inboard to about 30cm from the mast, significantly further inboard than on most boats.

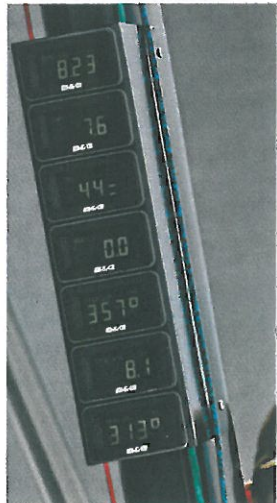
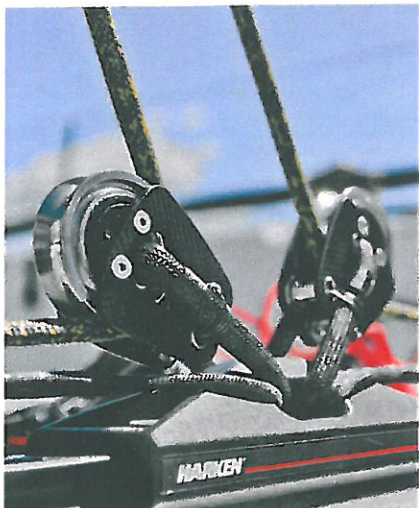


The decks and cockpit seem almost stripped bare to reduce weight and improve aerodynamics.



The people

THE OWNER OF *Sled* is the head of Japan's second-largest cosmetics company, known to his crew as Mr Okura. The crew includes 14 sailors, one more than on most of the Super Series teams. This reflects the high proportion of Japanese sailors onboard; they tend to be lighter than the mainly Anglo sailors on the other crews, so *Sled* can carry more crew while remaining under the limit of 1130kg. *Sled's* roster includes six Kiwis.



Hamish Pepper and one of the Japanese crew's hands are a blur as they work a grinding pedestal. To save weight, the mainsheet blocks are carbon and titanium, and the instruments are the smallest available.

The day that *Boating NZ* went for a sail, *Sled* never saw more than nine knots of breeze upwind. She was still able to sail comfortably at around 30 degrees to the wind once the breeze was more than six knots, and maxed out at nine knots of boat speed.

Sled's maritime diet also includes latest technology in cordage which is unusually thin in diameter, especially in the gennaker sheets. Some lines are just 4mm and would look more at home on a sports boat or skiff than a 52-foot keelboat.

Inside, *Sled* looks almost fragile. The structure in front of the main companionway consists of a longitudinal beam, a bulkhead with large cut-outs for moving sails and two ring-frames. That's it.

ONE HULLUVA BOAT

Today's TP52s are all built to the maximum of the rule in terms of their length, 15.85m, and beam, 4.42m, as a longer waterline increases hull speed and wider beam increases form stability.

Don Cowie, sailing master on *Sled*, was mainsail trimmer on the Emirates Team New Zealand TP52 which won the MedCup in 2009 and 2010. He says most of the Grand Prix TP52s are designed either by Judel-Vrolijk or, as in *Sled's* case, Botin Partners.

"If you look at the regattas last year, the Botin boats were stronger upwind and weaker downwind, compared to the Judel/Vrolijk boats," he says. "However this boat [*Sled*] is a bit more focused on being a bit faster downwind, which is going to mean taking a hit upwind."

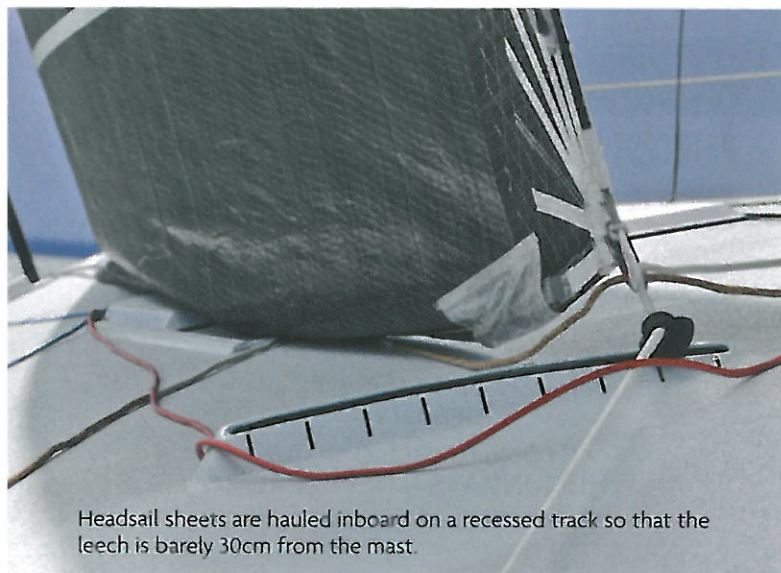
The two design schools have quite different deck styling, too. "They [TP52 rule makers] have got rid of the old IRC and IMS



headroom restrictions," says Cowie. "So these boats used to have a funny little cabin top on them, but now that's all gone and it's just a racing deck. You'll see on the Judel/Vrolijk boats that their decks are straight, which is lighter than the curved decks of Sled but the shape is less structurally sound, so they need more structure to keep it strong, which balances it out. Personally, I think this looks nicer."

Sled will race in the TP52 Super Series, an owner-operated evolution of the original series, the MedCup. In the Super Series, boats are driven by their owners rather than by professional sailors, so there are some concessions to make the boats easier to control.

"You have to have something that's a bit more forgiving in the rudder fin shape," says Cowie. "If you had the best fin shape, it would be very hard for the owner-drivers to get it in the groove, so there is a little compromise, but bugger-all really."



Headsail sheets are hauled inboard on a recessed track so that the leech is barely 30cm from the mast.

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Don Cowie trims the traveller during a gybe.

There is nothing in the class rules about the position of the boat's centre of gravity, so *Sled* has gone for an unconventional bulb shape and a flexible fin to generate righting moment and simulate the effect of a trim tab.

"Some of the other boats have got nice aerodynamic-looking bulbs," says Cowie, "whereas ours looks like it was designed using a straight-edge, trying to get as much of the lead as far down as possible to maximise the righting moment. If you look at a lot of the old America's Cup bulbs, they were flat along the bottom, and it's a similar concept with these. Our fin is a long way forward in the bulb, so that when the boat heels, the uneven weight distribution of the bulb twists the fin, pulling the trailing-edge to leeward and making it like a trim tab that pushes the boat to windward."

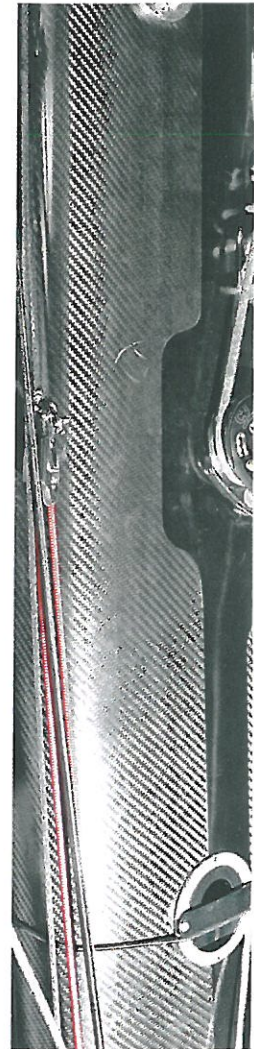
WIND DODGERS

The emphasis on reducing windage on high-performance yachts means designers think almost as much about avoiding the wind as they do about catching it.

"Windage has come a long way since the Cup days in 2007," says Cowie. "It's obviously more important on a catamaran when you're doing thirty knots, but even at nine knots it makes a difference. On this boat, the pit-winch is recessed, so it sits below the line of the deck, so when the hatch is closed, it's all out of the slot between the jib and main."

When selecting instrument panels on the base of the mast, many boats consider ease of visibility first, however, *Sled*'s sailing team decided upon the smallest possible displays, which are usually reserved for placement on a grinding pedestal.

"It saves us about four kilos, compared to the standard size B&G 20/20s," says Marsh. "But it is also a fifty-millimetre reduction in windage on something that is right in the slot."



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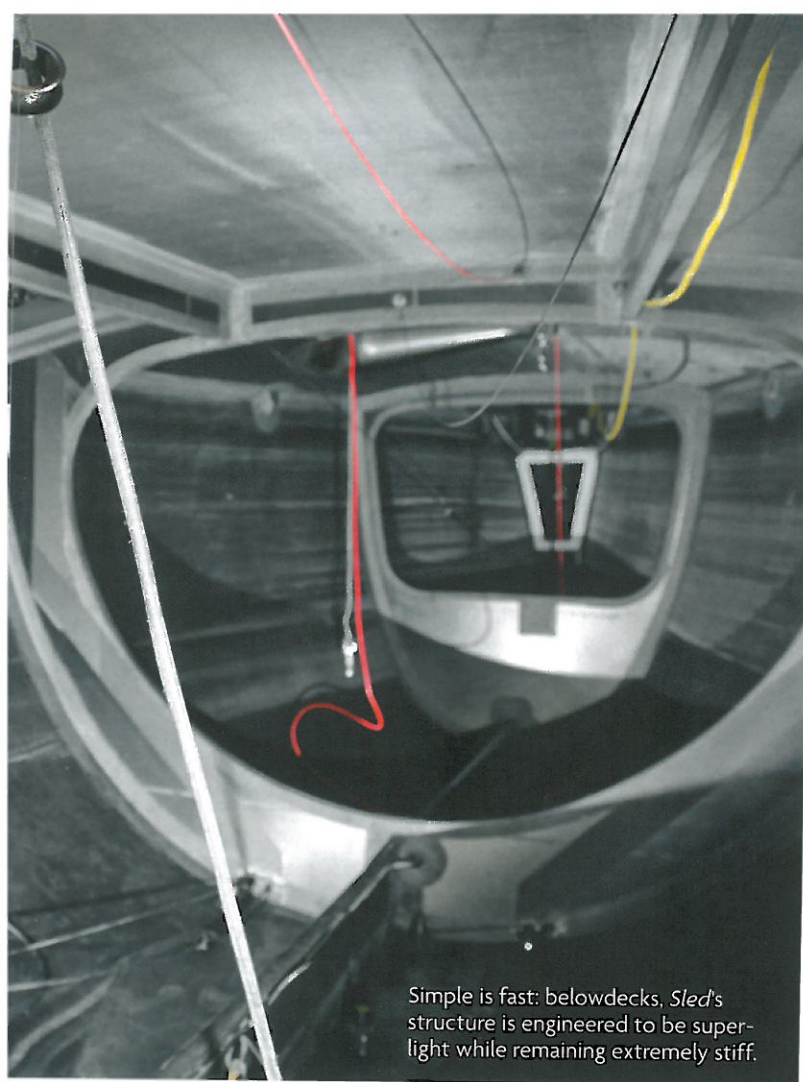
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COOL BITS OF KIT

There are so many small features on *Sled* that inspire eloquent phrases like: "Oooh, I like that." For example, the little cut-outs in the forward hatch, allowing it to be closed over the top of the staysail and gennaker sheets. But perhaps the coolest piece of equipment onboard is the take-up system for the tails of the gennaker sheets and halyards.

It looks like someone trying to start an outboard motor, but as the person in the cockpit repeatedly pulls the piece of string, it sucks the tails of the ropes through a hole in the cockpit side and down below onto a dedicated, spinning roller.

Apart from keeping the cockpit tidy, it pulls the heavy, usually wet, ropes down into the bottom of the boat, where they help lower the centre of gravity.

"When it's windy, they get washed out the back of the boat every time a wave comes over the deck," says Marsh. "It means you don't need to have someone off the rail to gather them in and lay them out nicely before each gybe. When we are sailing downwind, we are hiking harder than we do upwind to try to keep the boat flat."

TRICKLE DOWN

Sled is also one of the first generation of yachts to benefit from technology developed for the AC72 wing-sailed catamarans of the last America's Cup, in this case aero-pedestals. These run athwartships and have a cut-out to reduce their profile. *Sled* uses an aero-pedestal to power its mainsail downwind and adjust the hydraulic rams. The principle of these rams controls the tension of the deflector and the forestay.

Deflectors have been around for a while but have featured only recently on the TP52 class rule. Deflectors branch away from the backstay to connect to the mast near the hounds, allowing

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The crew of *Sled* includes international crew and some high-profile New Zealand sailors like Emirates Team New Zealand grinder Derek Saward, fifth from left, and Volvo Ocean Race winner Brad Marsh, far right.

the main trimmer to adjust the shape of the mast and forestay tension, as adjusting the forestay ram is not allowed during racing.

"Pulling the middle section straight with the deflector is a much more efficient way of stiffening the rig," says Cowie. "It allows the rig to be twenty-five kilos lighter because you don't need all that carbon up there to keep the top section stiff. When you pull the backstay on to tension up the forestay, it bends the top section of the rig as well, but when you start winding the deflector on, it starts pulling from lower down the rig, right at the top of the forestay, so the rig bends less."

It is possible to control the shape of the mainsail by pumping on or releasing the deflector, as it helps to bend and straighten the top section of the mast. More deflector equals less bend and deeper main; less deflector equals more bend and flatter main.

BIG BANG

Sled is one of the highest performance monohull yachts on the planet, the Formula One of sailing. She has been designed and built by Cookson Boats in Auckland, one of the best in the world, but without costing the Earth.

"The Fifty-Twos are cool," says Cowie. "I think for the size of the boat and the budgets, they're pretty hard to beat. The bang for buck is huge. Most crews sail with thirteen or fourteen guys; they're a relatively easy boat for the owner-drivers to drive, but they're so exciting to sail. We came down the harbour the other day doing twenty-two knots; it was our third sail and we were just smoking, and it was so easy." □

Sled TP52

- **loa** 15.85m
- **beam** 4.42m
- **draft** 3.50m
- **displacement** 7000kg
- **crew weight max** 1130kg
- **ballast** 4600kg
- **mast weight** 235kg
- **mainsail area** 98m²
- **headsail area** 66m²
- **spinnaker area** 270m²

