Charging along at more than 20 knots, Maximus struts her stuff during sea trials off Auckland. In breezes up to 20 knots, she constantly exceeded windspeed and impressed observers with her clean wake. At this stage, she still did not have the bow-prod for carrying gennakers and the lifting canard with trim -tab still had to be fitted.

Story & Pictures by Ivor Wilkins

Hail Maximus

For a yacht billed as the fastest 100ft monohull in the world, the launching was painfully slow.

This was not a portent of its sailing performance, but rather a result of its size. The pre-launch calculations showed that *Maximus* could fit into the old Team New Zealand travel-lift – literally with millimeters to spare.

In the event, those spare millimeters proved elusive and for a while *Maximus* wasn't going anywhere at all, fast or slow. She was stuck fast in the launching bay and it took a lot of juggling to ease the giant yacht into the water. If the birth process was challenging, it was only one hurdle in a list of many that the owners and designers of this speed machine have faced.

Maximus is the brainchild of two successful Auckland businessmen and yachtsmen, Bill Buckley and Charles St Clair Brown. Viewed in its totality, the yacht represents a very brave leap forward.

Every imaginable go-fast concept has been investigated and wholly embraced. There is nothing half hearted about it. As such, this yacht is a kind of speed laboratory, where the state of the art might be redefined.

The only constraint was overall length, set at 30m (98ft) to comply with the Rolex Sydney Hobart and Fastnet race stipulations. "We liked the idea of creating a line honours yacht, not building something representing a designer's interpretation of some rating rule," said Brown.

"We have enjoyed considering the design issues based solely on speed and safety," he added. "We have not compromised in any area, always recognizing that speed is the essence in all respects."

The keel not only cants (to 50°), but it retracts as well. This was a major mission, with the 12 ton bulb able to extend from within an exterior steel sheath, increasing the draft from 4m to 6m.

"It was a major engineering undertaking," said Neil Howe of A&G Price, the Thames-based company that cast the keel. In theory, the keel will be able to swing fully from one side to the other in 10 seconds, but the expectation is that most manoeuvres will only require half that speed.

Given the concerns thrown up by the failure of the *Skandia* keel during the 2004/5 Rolex Sydney Hobart race, Buckley and Brown conceded that they had relooked at all their calculations for the keel. Buckley said the hydraulic rams on *Maximus* were four times the diameter of those on *Skandia* and he was convinced they would stand up to the required safety margins.

"For the system to fail would require something really catastrophic," he said, "like hitting a container traveling in the opposite direction at the same speed."

Brian Jones from High Modulus said the structure surrounding the pivot point of the keel was subject to "some pretty big loads". There were two major challenges, one to accommodate the two materials, steel and carbon fibre composite, and secondly to transfer the huge loads involved over a large area to avoid serious stress concentrations.

The solution was "plenty of structure" and lots of Finite Element Analysis.

"One of the big challenges was to get the keel mechanism tucked away below the floorboards and achieve the full canting effect within a very narrow waterline beam," said Buckley. No actual dimensions are being revealed at this stage, but designer Greg Elliott has confirmed that the waterline beam is narrower than *Pyewacket*. Elliott and Clay Oliver led the design effort, which was set the challenge to produce the fastest monohull yacht in the world of its size.

The result is long, lean and mean. It's

all business with plumb bow, chopped off stern, no sheer, tiny blister coachroof. The hull, for all that it is extremely narrow on the waterline and fine in the bow, does have more shape than some of the more slabby incarnations this canting-keel form has produced in the past. Particularly at the point of maximum beam, there is distinct flare from the waterline to the deck, partly to give the rig a half-decent shroud base and partly to give the sails some breathing space in reaching mode.

The flare is also an effort to deflect water (huge volumes of water sweeping down the deck has been an issue with some of these yachts) and, where that does not succeed the decks are heavily cambered to shrug off water as fast as possible.

The Southern Spars rig is another daring leap forward – a rotating 650mm wing mast with all PBO rigging, this is as state-of-the-art as you can go and certainly nothing of this kind has been produced to a yacht of this size before. The rig is similar to the rotating wing masts chosen by Ellen MacArthur for her record-setting circumnavigation and for Mike Golding's *Ecover* in the Vendee Globe, although it is a big step up in size. It also utilizes two sets of spreaders, instead of one with a set of diamonds supporting the lower panel.

"The geometry was quite complex," said Southern project leader, Martin McIlwee. "We did a Solidworks model to ensure that all the rigging stays the same length as the mast rotates."

The rotation is 30° each way, with a mechanical "spanner" on the base of the mast to control the rotation. Upwind, the mast will tack more or less automatically under the pressure of the mainsail, although winching the "spanner" around will achieve a degree of over-rotation when required. Downwind, the policy will probably be to centre the mast before a gybe and then rotate it to the desired angle.

Greg Elliott has been something of a pioneer of rotating rigs on monohulls, so his experience in the aerodynamic benefits of this form was very useful. "With a boat of this size, as its speed increases, so does the drag," he said. "You have to reduce the drag in order to let the speed increase again. It is all about drag reduction

The North Sails wardrobe features a very powerful, square-top mainsail, a development of the recent America's Cup generation. The Southern Spars rotating wing mast tacks automatically under the pressure of the mainsail, but can be over-rotated for maximum aerodynamic efficiency.

because that is the only way you can go faster and faster."

Although the wing foil itself was heavier than a conventional tube, it required less support in the form of rigging, so there were savings there. Also, the long chord means there is less fore and aft bend in the mast, which means backstay tension translates directly into forestay tension, a bonus on very large yachts, where forestay tension is hard to achieve. Upwind, flattening the mainsail will be done through the cunningham.

On deck, the hardware package is by Harken, utilizing their biggest non-custom winches. Because some passage records require manual sail handling, the yacht is set up for both hydraulic and pedestal driven winches.

For round the buoys racing, sailing master George Hendy will be recruiting a crew of 20-24, while passage races and record attempts will see that drop to about 18.

As for performance, Elliott said the target speed upwind was over 12 knots, while it would exceed windspeed with sheets eased well into the 20 knot range. "We expect that at 135° true wind angle, the apparent wind angle will be more than halved, down to about 60°."

Unlike *Mari Cha IV*, in which Elliott and Oliver were also design collaborators, *Maximus* does not utilize any water-ballast.

Upwind, the issue with canting keels is always lateral resistance. A number of options were explored, including fins on the keel bulb, but in the end a retractable forward canard was adopted. An interesting development on a fairly standard theme is that the canard also features a trim tab, controlled mechanically from the helm. Fully immersed, the canard will have a draft of 4m.

"The trouble with some of these yachts is that their forward foils are fixed," said Elliott. "We did not want that, because when you are reaching or running, the canard drag is just a penalty."

Maximus is an ambitious yacht with an ambitious objective: to showcase New Zealand design and expertise and win line honours in all the major grand prix sailing events encompassing three continents in 2005. Given the complexity of the yacht, the team have left themselves little time to work out any kinks in the systems.

The plans are to spend less than a month in trialling and testing in Auckland before the yacht is shipped direct to Antigua. It arrives within four days of the start of Antigua Race Week, which is tight by any measure, let alone for a new yacht of this size and type. However, if it all goes together smoothly, the yacht will compete in Antigua Race Week, before heading to New York for the start of its first major objective, the Rolex Transatlantic Race.

"If the conditions on the way to New York are favourable, we might have a go at the 24 hour record," said Brown. "The Gulf Stream is not a bad place to make the attempt."

Following the Atlantic crossing is a full race programme in Europe, before rushing back to home waters. There will be barely enough time for a Christmas lunch, before hitting the Boxing Day start of the Rolex Sydney Hobart race.

It's all about speed and, in every respect, this is a take-no-prisoners programme in one hell of a hurry.