



# HISTORY IN THE MAKING

BY MARGARET WIND

I had the privilege of visiting the Wellington Electric Boat Building company (WEBBCo) recently, to preview the new 19m carbon fibre catamaran.

This is the brainchild of entrepreneur and owner, Jeremy Ward, whose goal was to build the first zero-carbon emissions, fully electric ferry in Australasia. Industry scuttlebutt has labelled the project courageous and, in some circles, madness, however, the almost completed vessel is shaping up to be a shining example of Kiwi innovation at its best.

Jeremy is currently the Managing Director of East by West Ferries in Wellington, a company he set up over 30 years ago as a commuter and tourist operation. The company has grown to become one of the major tourist attractions in Wellington. His extensive background in research and development and operation of tourism and transport-related businesses bode well for such an innovative project. The new vessel will be the third ferry for Wellington Harbour but the first fully electric one.

Housed in the new home of WEBBCo, on the marina at Seaview in Wellington, the new vessel is having her final fittings and survey checks completed inside the shed. There is barely a metre of space to walk down each side, but once on board, one can see how much work and attention to detail has gone into this build.

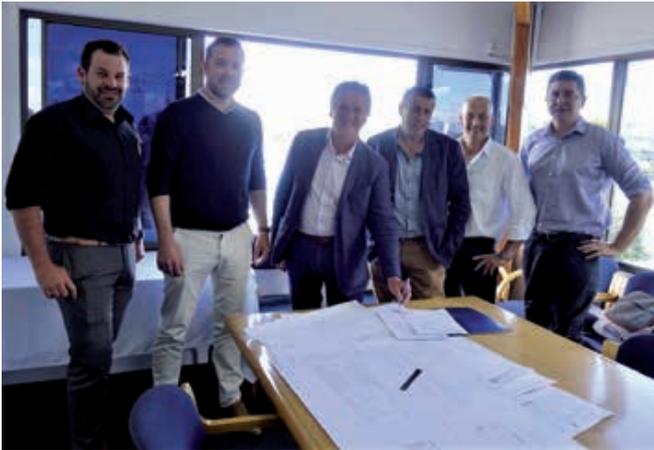
The coming together of several NZ maritime experts, working



Fraser Foote and Jeremy Ward

alongside the East by West and WEBBCo teams has been critical in the success of this ground-breaking project.

Building a conventional boat requires the integration of many aspects of design to ensure it meets performance, quality and cost requirements as closely as possible. The process is referred to as the 'design spiral', where each aspect of design is considered in greater and deeper detail as the project moves forward. The spiral allows each aspect to be revisited as more



Signing the contract for the 19m ferry – L-R: Ben Haselden (McKay), Kit Carlier (SSC Marine), Jeremy Ward (East by West Ferries), Fraser Foote (WEBBCo), Christian Stimson (SSC Marine) and Tony Stanton (SSC Marine)

information comes to light, and each party involved helps finesse the solution.

The addition of electrification, however, brings a whole new dimension that impacts every area of boat design, build and commissioning. This project was therefore highly collaborative, and could only be achieved through a proactive approach and an openness to finding workable compromises, and with an unwavering belief by all parties that the team could successfully bring this landmark vessel into service – and be the first in the southern hemisphere to do so.

We focus on some of the key players involved in this initiative ahead of her pending launch.

Fraser Foote had worked with Jeremy before, having built the previous East by West catamaran ferry for him some years prior. This made him a natural choice to take on the role of managing the build. Fraser is Wellington Electric Boat Building Company's Managing Director. As the previous owner of Northland Contract Boat Builders Ltd for 20 years, Fraser manufactured several vessels, using composite construction technology. Fraser has also worked under contract with the Oracle America's Cup Team and was an ideal choice given his extensive experience in composite construction.

## DESIGN & BUILD

Having purchased two proven Tennant designed catamarans (*CobarCat* and *City Cat*), they engaged the top design team at SCC Marine Limited. This company is a collaboration between three independent design houses, each with expertise and experience in complementary areas of design. The concept and structure of SCC Marine offers real value for money – three expert minds are better than one when faced with the challenge of designing such a unique vessel.

The three design houses include Tennant Designs Ltd with expertise in high-speed displacement power catamarans, Stimson Marine Design and Naval Architecture, led by Christian Stimson and Kit Carlier Design. The team of three has a combined 80 years of experience in designing and building fast, efficient vessels.

Gurit, a leading supplier of advanced composite materials and engineering services to the global and local marine industry was approached by WEBB in 2018 for the concept of a zero-emission, high-speed vessel. Gurit has a long history of serving the New Zealand marine sector for over 30 years with the practical application of 40 durable and high-performance composite materials and engineering services, (formerly known as SP High Modulus).



Interior fitout underway

Gurit engineering, worked as an integrated part of the design team, as they understood the need to save the battery weight through structural weight saving. Having Gurit on board as an experienced consulting team, meant the team were able to translate high-tech construction into something relevant to a commercial boat builder and operator while looking for innovative ways to save unnecessary weight (Gurit solutions included core thermoforming and infused panels with minimized core resin uptake). They also provided experience in fire protection and innovative use of design and materials around ESS (Energy Storage System) which is a unique challenge to this industry.

When East by West decided to build the new ferry, Gurit and their partners completed a study to understand the interaction between the cost of construction, versus the through life ►



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Weight is everything  
— a carbon fibre panel



WEBBCo  
team members

energy cost and CO<sub>2</sub> production of the proposed design.

This study had been focused on the potential savings in fuel and emissions that were possible due to reducing vessel weight through the use of three common construction materials:

- Aluminium (commercial industry standard)
- E-glass (production boat standard)
- Carbon fibre (race yacht standard)

With each level in technology comes an increase in raw material cost, but a decrease in weight.

The purpose of the initial study was to see if the energy savings and CO<sub>2</sub> savings could be justified commercially and what level of technology was appropriate. East by West has long been an advocate for fuel-efficient ferries, running a fleet of two lightweight sandwich composite vessels, using the CS hull form and sized specifically for the Wellington route they were on.

This same feasibility was used to make an early assessment of the viability of a full electric vessel. At this point, nothing of the scale in terms of electrification of a marine vessel had been undertaken in New Zealand, or indeed commercially released around the world. The initial feasibility study completed by McKay showed that if the same level of weight optimisation rigour was applied to building an efficient carbon fibre vessel, then it fell inside what was possible for a fully electric boat. It was however going to be challenging.

Gurit Hi-Panel customised solution is an engineered structural composite panel system for light-weighting and rapid construction.

One of the customer's key requirements was that they wanted to build the vessel in Wellington, where they are committed to providing an ongoing source of skilled employment. A workforce that would be capable of building zero-emission vessels for the New Zealand market, as well as for export. The challenge was

that no existing yard within Wellington had the capability to build a vessel of this complexity and size. Thus, WEBBCo was set up from a standing start at the beginning of the project.

Several digital construction techniques were employed to help speed the manufacturing process of the structure and make it available for the intricate process of installing the electrical system as early as possible. This needed to be done without compromising vessel safety, performance or weight.

Working closely with WEBBCo, Gurit supplied large portions of the vessel's structural shell in a modular carbon composite panel system. The Gurit Hi-Panel system integrates lightweight construction with digital manufacture to produce panels that are CNC cut to precise shape off-site and delivered to the builder.

Jackson Advanced Engineering was also engaged as specialists in large format precision machining, composites and polymers to produce the main hull moulds for the project.

Founded by Jim Jackson in 1977, Jackson Industries is a multi-faceted company providing diverse engineering expertise – from precision CNC machining, tooling, composite structures and the development of bespoke polymers through to rotational moulding, robotics and temporary site electrical distribution equipment. A perfect partner for such a project.

Leveraging years of experience producing moulds and composite enclosures for the electrical side of their business, with the addition of modern CNC machining capabilities makes Jackson Industries a market leader in composite part production and high-quality moulds for composite parts. Their processes have been refined over decades to be robust and efficient, but that doesn't mean they are behind the times. With a team always embracing new technology, materials, safety and processes. They have amassed a huge depth ►



Glazing being fitted to the 19m electric ferry by Nice Glass



Infusing the hull shell at WEBBCo's yard



Gurit engineers



Fourshare Power connections

of experience and are well worth talking to if considering a composite tooling or production project.

Fibreglass Developments were also involved in the project. Established in 1978, the company occupies a 44,000 sq ft factory constructing parts of the interior fitout in Feilding. Steve Bond, the owner and Managing Director, has been the fearless leader of Fibreglass Developments Ltd for over 35 years and what he doesn't know about fibreglass and composites isn't worth knowing. He is a strong believer in buying Kiwi made and throws his support 100 percent behind businesses and causes he believes in. A perfect partner for this project.

The electric propulsion and power management system, developed by McKay, was custom developed and designed for the East by West ferry to suit the route and charging infrastructure, and it is the first of its kind in the southern hemisphere.

On the day we visited, the place was a hive of activity. Jeremy and Fraser understand every inch of this vessel and walked us through the final stages of completion with electrical specialists and builders working on her final fittings.

Etched on a whiteboard is the company's mission statement – "Weight is everything"! This philosophy is evidenced throughout, with state of the art, lightweight composite material used in almost every element of the build. A material that

challenges most traditional metal equivalents. The vessel's weight – and where that weight is located – determines the resistance through the speed range. The electrical system, motors and batteries account for over a third of the lightship displacement. It was essential to minimise the weight of this large proportion of the all-up weight, since reducing the vessel weight declines the resistance, requiring less power and smaller batteries, so affecting the overall costs. The weight was closely monitored throughout the design and build by WEBBCo and SSC Marine.

As you might expect with new projects that are breaking the mould of how things are done, not everything has gone to plan. There have definitely been head-scratching problems to solve along the way. Add to that delayed material shipments caused by Covid-19, and survey regulations being written and tested as the build progresses, completion of the build is well overdue. It has been a challenge, but once she's launched, the research and development work that has gone into this ambitious project, should pay dividends in learnings and cost savings for future orders.

The next issue of *Professional Skipper* will focus on the technical aspects of the new vessel. By then, we hope to report a successful sea trial with a focus on her performance and sustainability outcomes. 

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