The world's premier Yacht Research Centre

The best are getting better

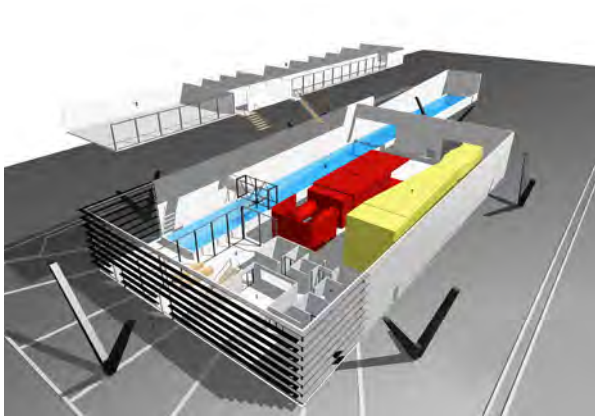
Building on recent successes and leveraging existing world-class R&D the University of Auckland and partners are planning to build an integrated, first-of-its-kind, Centre of Excellence combining aerodynamic and yacht facilities under one roof. The Yacht Research Centre will house the world-leading Twisted Flow Wind Tunnel, a large Boundary Layer Wind Tunnel, a Towing Tank, a Computational Fluid Dynamics Centre, a Design Centre for industry, as well as meeting, lecture and break-out rooms. Synergies with research into power boats, wind, vehicle aerodynamics, sports (e.g. cycling, rowing, sailing) and energy (wave, tidal, wind) will provide multidisciplinary study yielding novel research outcomes and pragmatic solutions.

Masters degree in Yacht Engineering

Education will be coupled with first class R&D in the Centre. A new one-year degree, the Masters in Yacht Engineering, will be taught with the assistance of marine industry experts. Special laboratories will be run at the ETNZ base for the selected students. The proposed course content includes: materials and structures, design and manufacturing, dynamics and response, aerodynamics and hydrodynamics, resistance and propulsion, computational fluid dynamics, and a research project.

Alliances with the marine industry

Integration with the local marine industry, coupled with strategic partnerships with racing syndicates, such as Emirates Team New Zealand, will provide the deep industry collaboration required to enhance innovation, and provide the designers and researchers to strengthen New Zealand's marine industry in the future.



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THE UNIVERSITY OF AUCKLAND
FACULTY OF ENGINEERING

Yacht Research Unit

Promoting academic excellence in
yacht research and design innovation

Leading the World

The Yacht Research Unit (YRU) at The University of Auckland has led the world in many innovative areas. This reputation brings leading yacht designers seeking the best possible advice. Undertaking a research project in the YRU has fast-tracked many graduates into leading yacht design positions worldwide.

Unique abilities in demand

From testing the sails that led Team New Zealand to its first ever America's Cup victory in 1995, to providing advanced sail analysis for many Volvo Open 70 yachts, the YRU has developed a unique pedigree in yacht engineering research.

For over 20 years the YRU has provided research breakthroughs and excellent professional services. More major regattas have been won by syndicates using the YRU's consulting and commercial services than any other yacht research unit in the world.

A track record of success

The YRU was established in 1987 with the primary function of coordinating and promoting yacht research and engineering within the University of Auckland. Since that time the impact of the YRU and the Faculty of Engineering has been phenomenal. Some world firsts include obtaining successful computational solutions for the coupled structural/aerodynamic behaviour of sails; the application of computational fluid dynamics to the flow around spinnakers; construction of a wind tunnel with twisted flow for testing sails; including advanced optimisation methods into a velocity prediction program; development of a real-time velocity prediction program; and development of a visual sail position and rig shape system.

Leading up to the America's Cup in 2007, The University of Auckland arguably had more graduates in Valencia working in key positions in teams than any other university in the world!

In 2008 the YRU was appointed Emirates Team New Zealand's (ETNZ's) "Official Scientific Advisor". ETNZ now offers several scholarships to support students studying in the YRU.

Since 2003 the world-leading High Performance Yacht Design Conferences have been hosted by the YRU with the NZ Division of the Royal Institution of Naval Architects (RINA).

Current research topics include:

- The effect of yacht motion on the unsteady aerodynamics of sails
- The aerodynamics of double-surface sails
- Development of an inverse design process for sails
- The effect of heel on the aerodynamics of upwind sails
- An archaeological and engineering study of prehistoric Pacific migration - canoe performance and navigational intelligence
- Pressures on sails using CFD, TFWT and full-scale measurements
- Computational investigation of hull hydrodynamics
- Optimum span-wise loading on an upwind sail for a given yacht
- Study of blockage effects in an open jet twisted flow wind tunnel
- Optimum design of fin keels for AC yachts
- An unstructured mesh optimized for downwind yacht sails
- Interference effects between yachts

Competitive success

The YRU has played a leading role in creating many of the world's most famous and successful high performance yachts and has an enviable track record:

- Two America's Cups (1995 and 2000)
- America's Cup development work with BMW Oracle, Emirates Team NZ, Team Shosholoza, Alinghi.
- Seven 24 hour monofull records since 2002
- Three Volvo Ocean Races since 2001

Other notable recent yacht projects include:

- ICAP Leopard3, Mean Machine TP52, Hugo Boss (Open 60), Paprec-Virbac 2, Ecover, Pindar (Open 60s), JK100 Speedboat and JV72 "Ran".

YRU facilities and capabilities

Twisted Flow Wind Tunnel (TFWT)

This allows accurate and repeatable analysis of sail performance.

Real-time Velocity Prediction Program (RT-VPP)

This system adjusts the model yacht position in the wind tunnel in real time, so that it behaves exactly as it would at full scale.

Visual Sail Position and Rig Shape (VSPARS) system

VSPARS is able to track mast deflection and sail shape in real time.

Rig Studies

High speed TFWT operation allows large scale design of rigging.

Flow Visualisations

Smoke in the wind tunnel is useful for understanding flow over sails.

Appendage Studies

Computational studies of the geometries of keels, rudders & bulbs.

Other applications and synergies

Researchers in the YRU can apply their knowledge of CFD, aerodynamics and hydrodynamics, wind engineering and wind tunnel testing to:

- Wind turbines - power estimation, flow velocities, wake structure
- Cyclists - aerodynamic drag reduction (force balance testing)
- Buildings - pressures, cladding & loads, dynamic response
- Automotive & motorcycle aerodynamics and flow visualisation
- Environmental studies – pedestrian level winds and emissions from chimneys