SARChI Chair

Naval architecture and design



Designing Africa's Maritime Future: Research Partnerships for Industry

Prof Annie Bekker

Stellenbosch UNIVERSITY IYUNIVESITHI UNIVERSITEIT

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sonke siya phambili
saam vorentoe

20 October 2026 Cape Town

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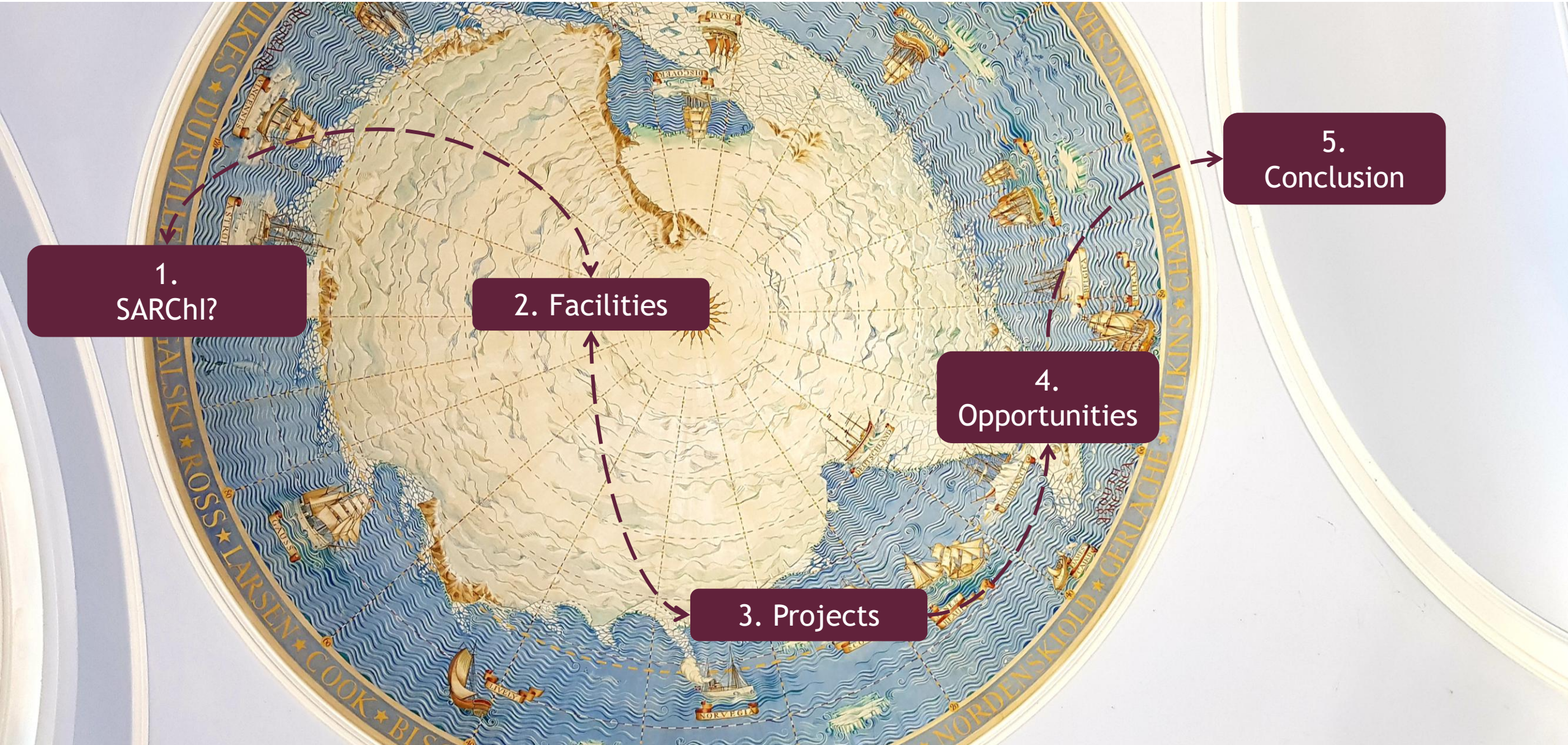

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1.
SARChI?

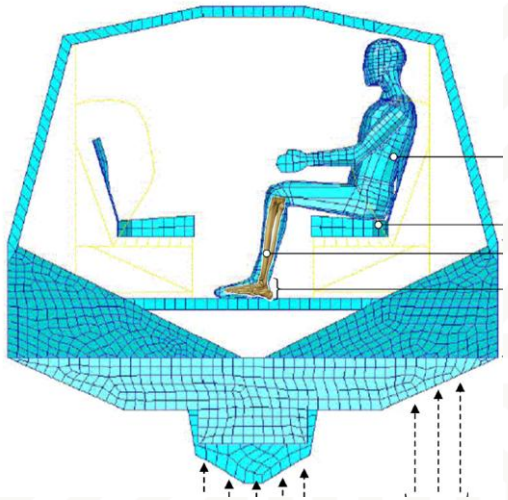
A passion for South Africa

2001 – **B.Eng** (Mechanical)

2004 – **MSc.Eng** (Mechanical) –

Vibration reconstruction and seat dynamics, Stellenbosch University & Ford Motor Company





2008 – **PhD** (Mechanical) – Impact and viscoelastic bone models for strain-rate dependent compression University of Cape Town



2023 – 2025 **Stellenbosch University,** GIBELA Engineering Research Chair

2008 – 2011 Noise & Vibration Team leader at **Optimal Energy,**

South African electric car





2011 – 2020 **Stellenbosch University,** PI for full-scale vibration measurements on SAAII since 2012. Research info at: www.sun.svrg.sun.ac.za

The Team

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Prof Annie Bekker
Chair
Vibration Measurement,
Signal Processing,
Modal analysis,
Digital twins.



Leané De Wet
Test Engineer
Structural analysis



Dr Adam Venter
Lecturer
CFD,
Turbomachinery,
Shape optimization.



Dr Nicole Taylor
Lecturer
Human-centered data engineering,
Digital twins,
Cyber-physical systems.



Gerhard Durandt
Lecturer
Hydraulics,
Measurement,
Structural dynamics,
Virtual sensors,
FEM.



Dr Brendon Nickerson
Lecturer
Dynamic models,
Inverse methods,
FEM,
Measurement.



Prof Nico de Koker
Professor
Probabilistic modelling,
Reliability,
Structural dynamics,
Environmental loads.



Prof Jaco Versveld
Associate Professor
Statistical Signal Processing,
Signal processing for underwater acoustics,
unmanned sailing vessels.

SARChI chair - what do we do?

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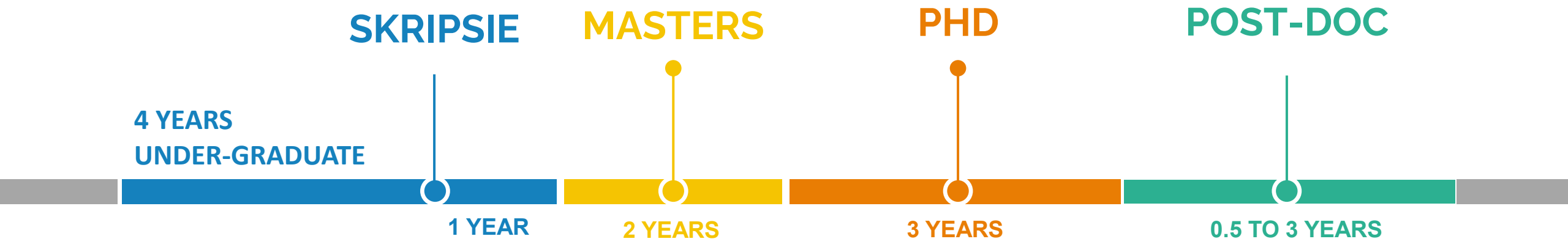

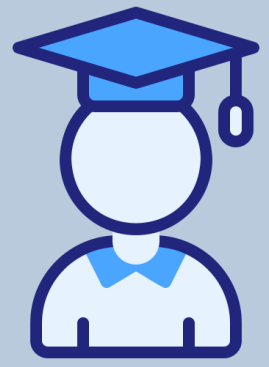

Nurture students



Research outputs



Patents & industry impact

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Our Facilities

Stellenbosch University Towing Tank



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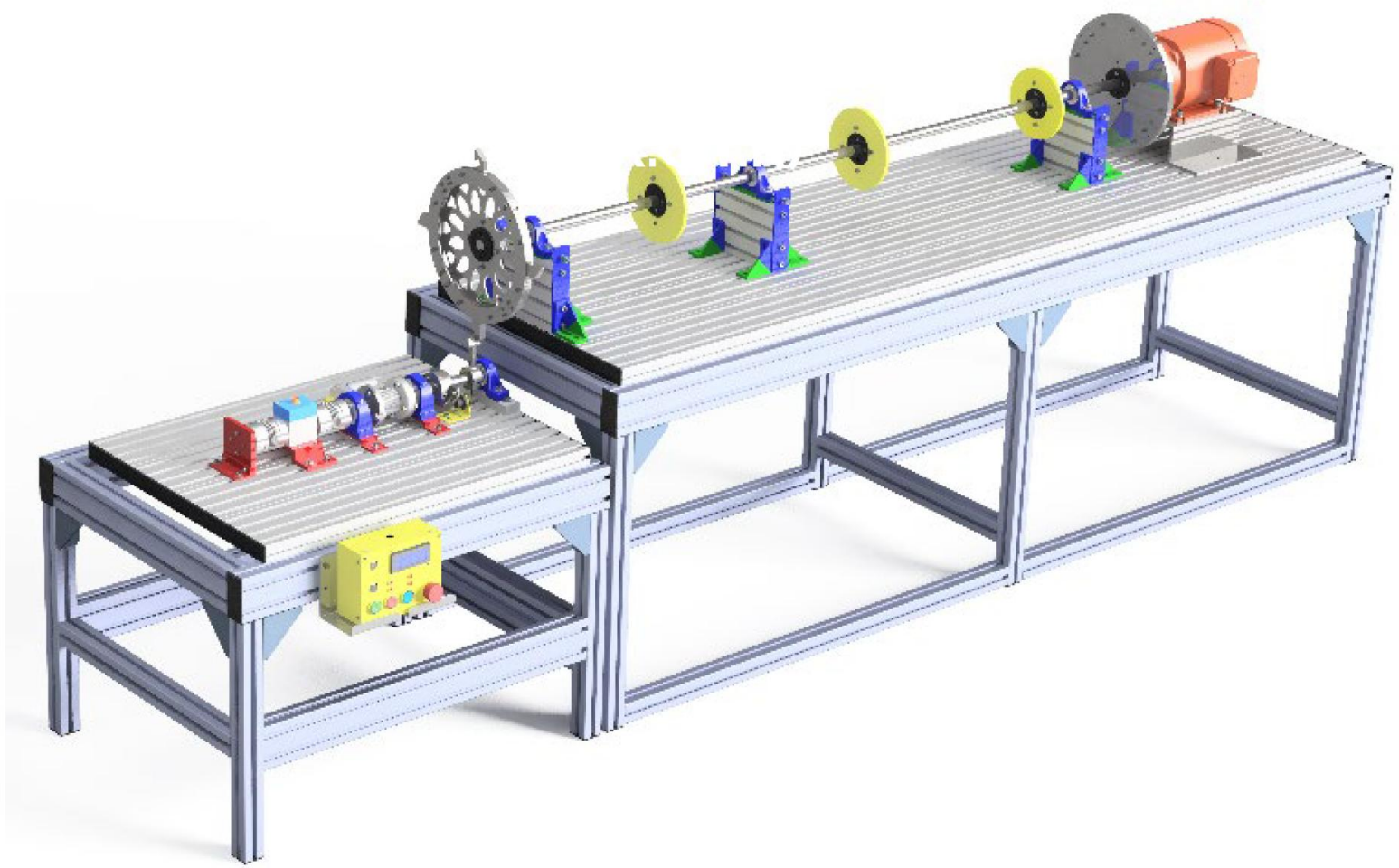
ROtating machinery Test Rig (R.O.T.R)



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S.A. Agulhas II Full-Scale Laboratory



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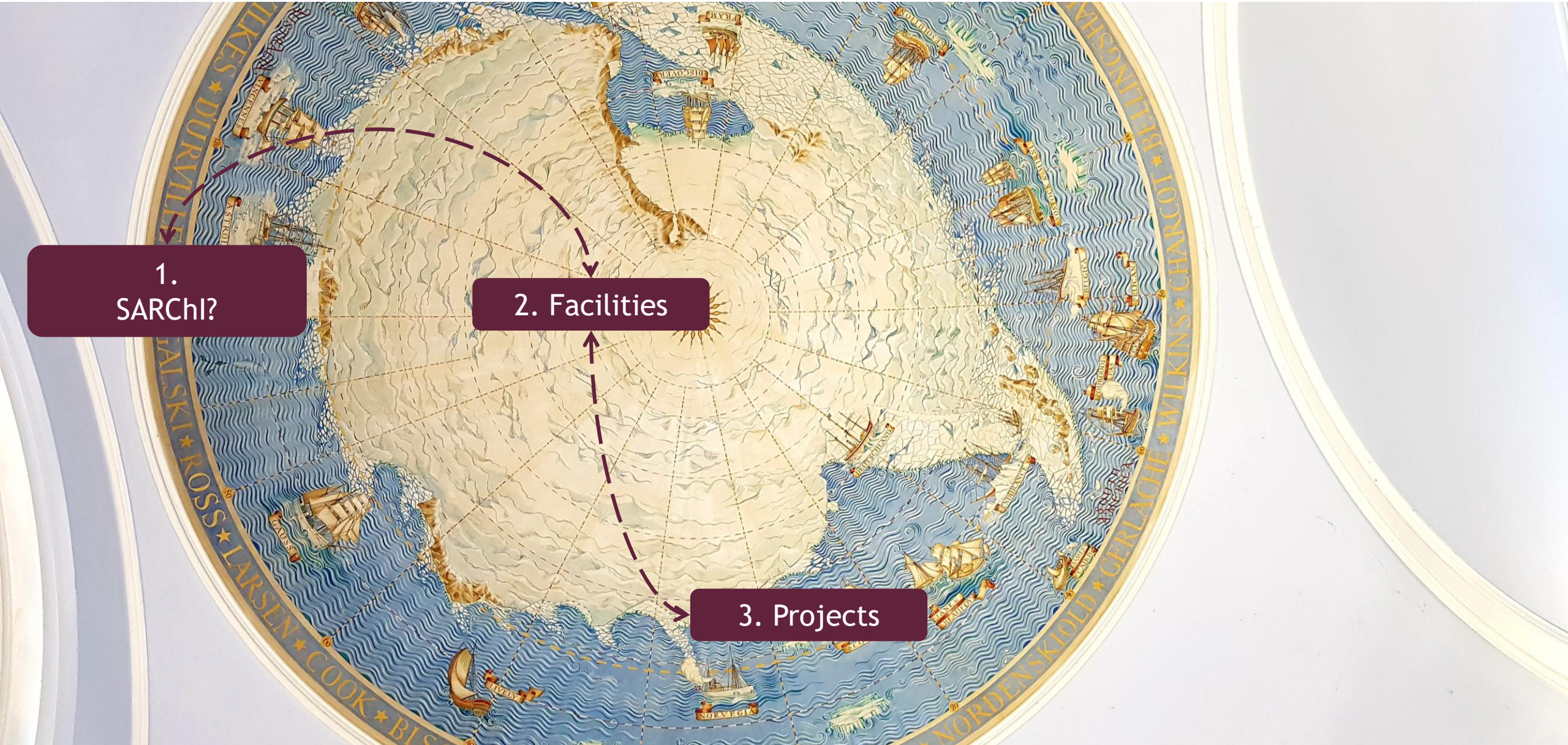

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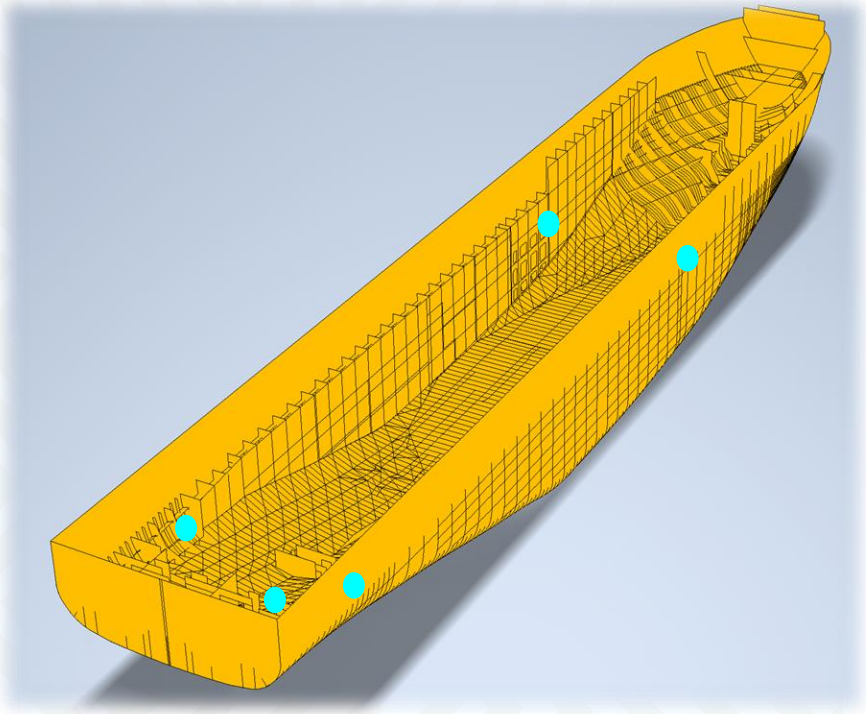
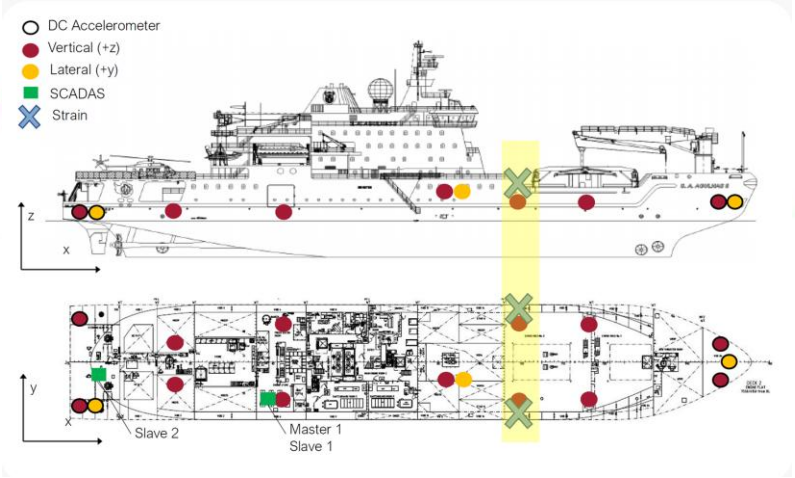
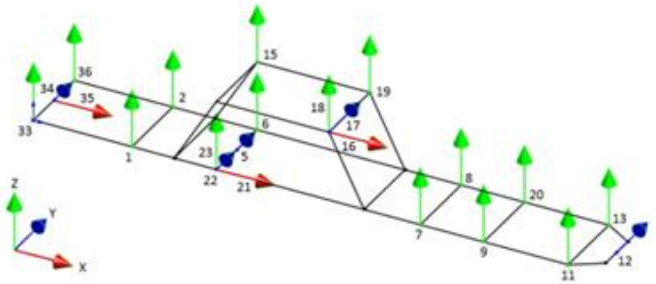
Digital hull for ship motion, fatigue & wave slamming





FULL_SCALE DATA and DIGITAL SHIP MODELS





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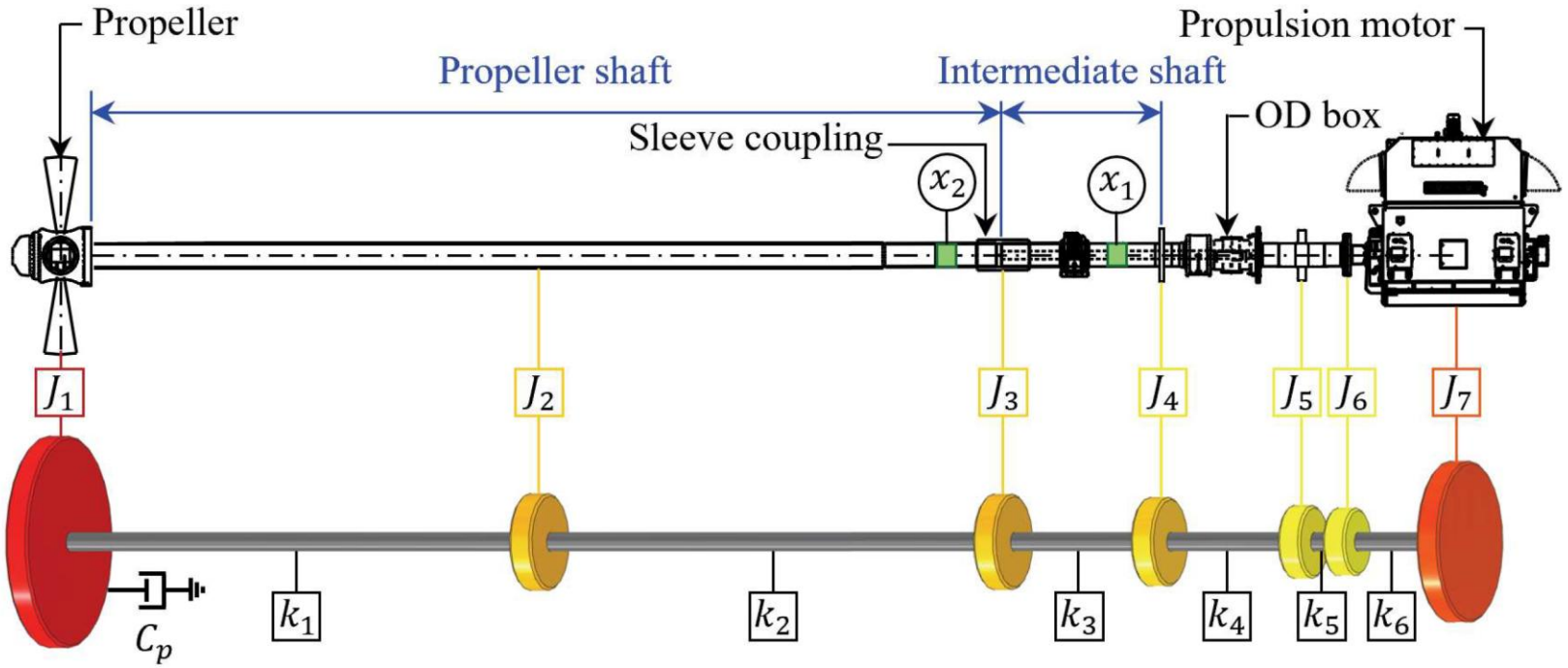
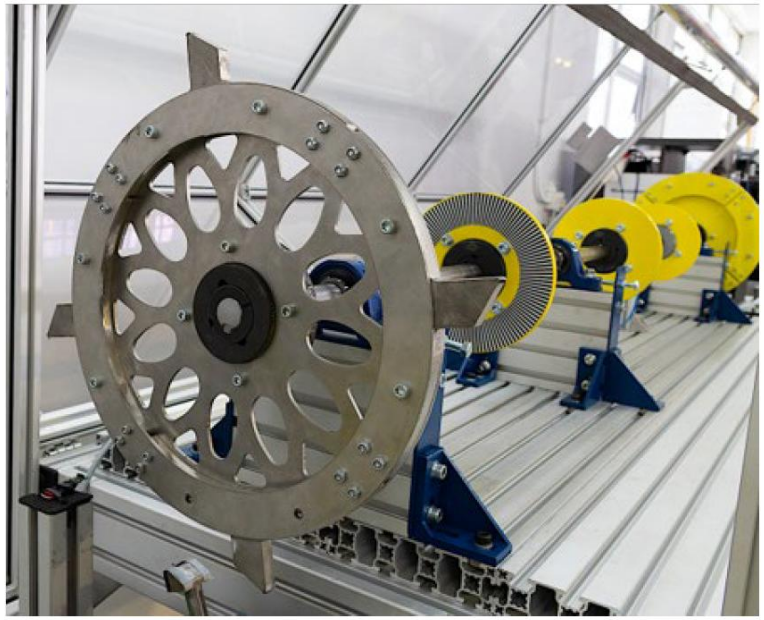
Rotating laboratory rig for ship propulsion dynamics





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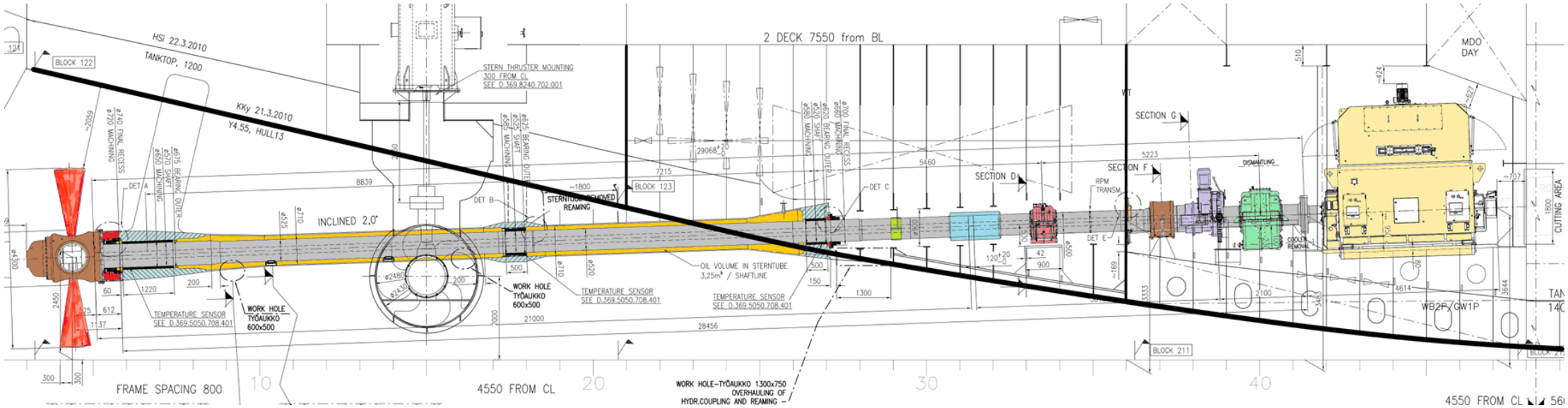
Propulsion system digital twin for ice impact



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Innovation in CFD (Computational Fluid Dynamics)

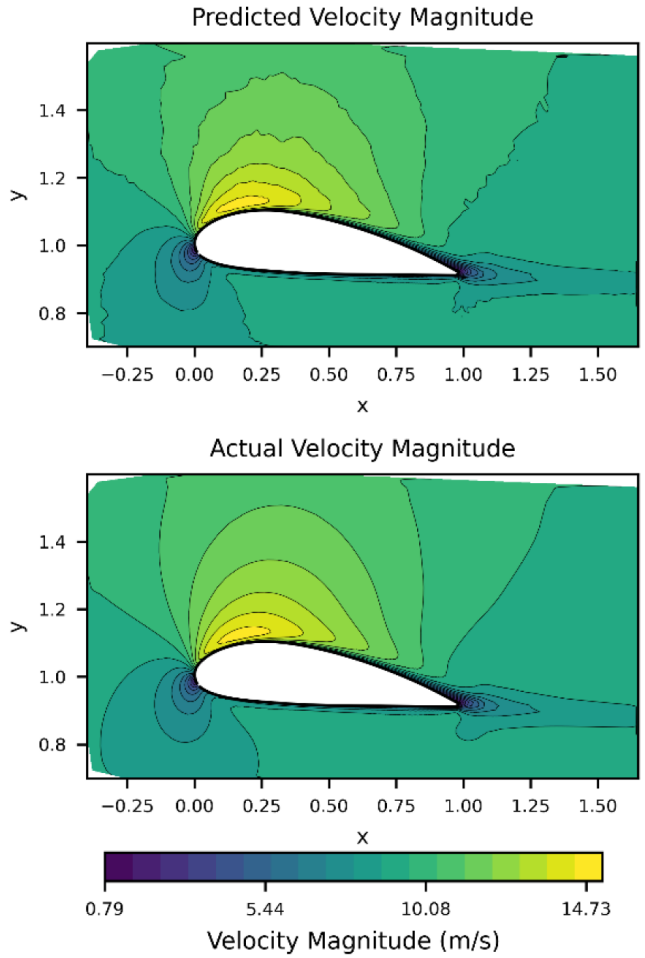
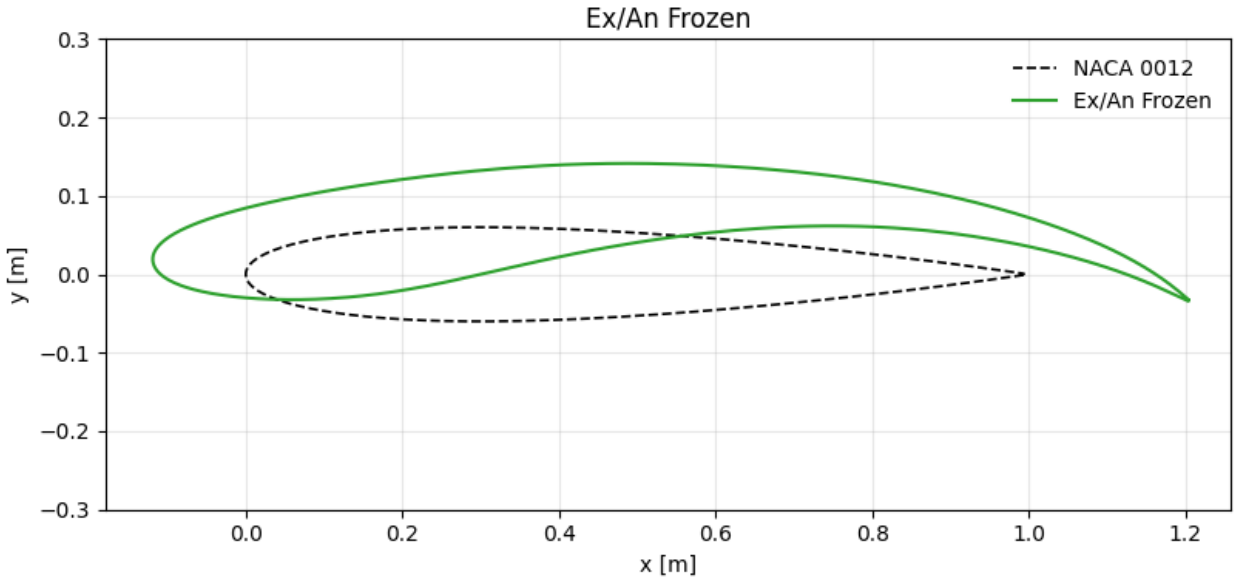


FIGURE 8: PREDICTED VS. ACTUAL VELOCITY FIELDS ($m = 0.04$, $AoA = 3.70°$, $V_{in} = 9.4$ m/s)

Quick solution methods & innovative shapes!



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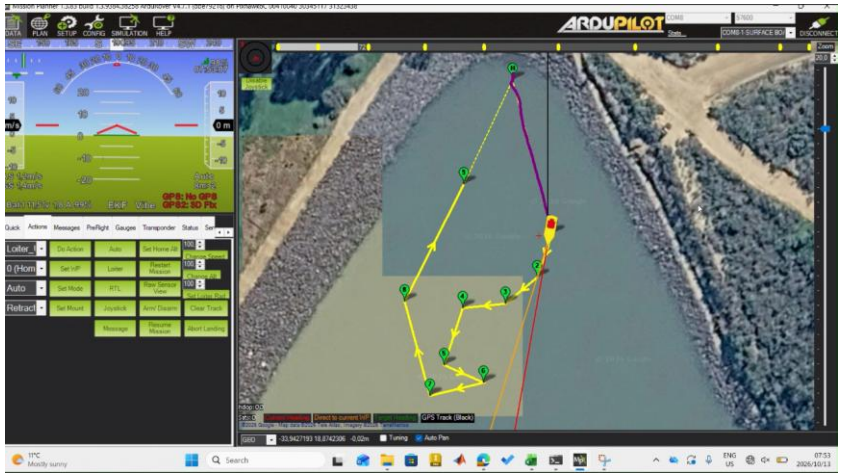
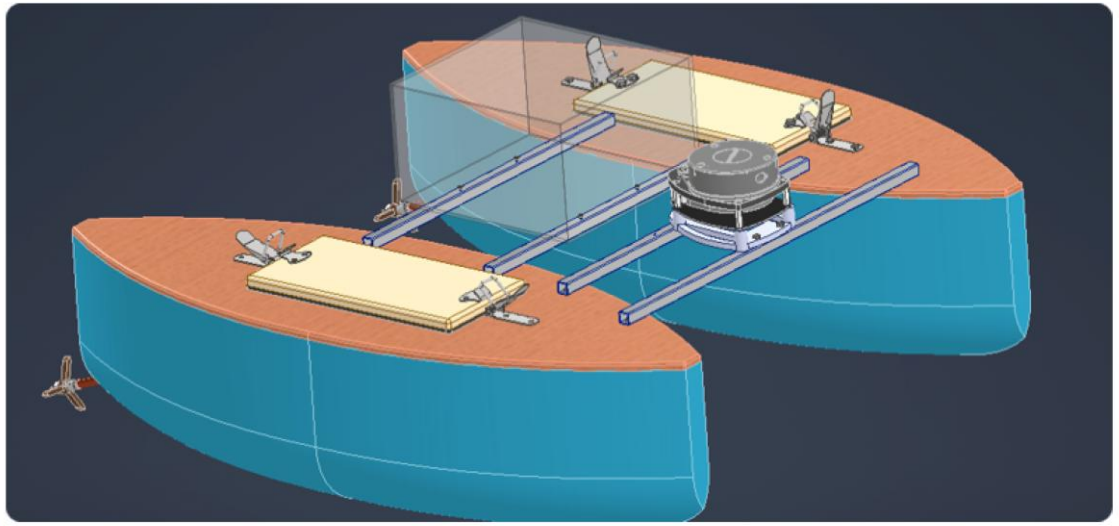
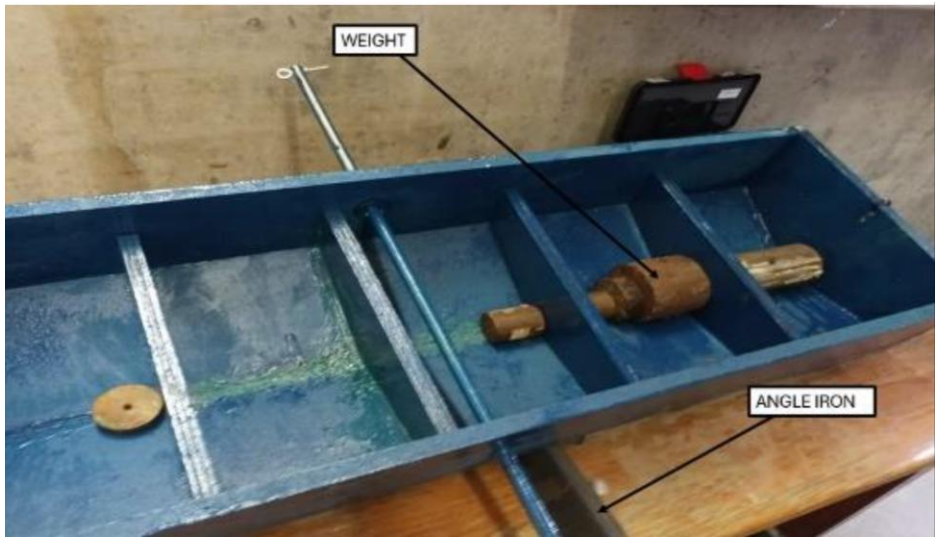
Design and development of a small-scale autonomous surface vessel

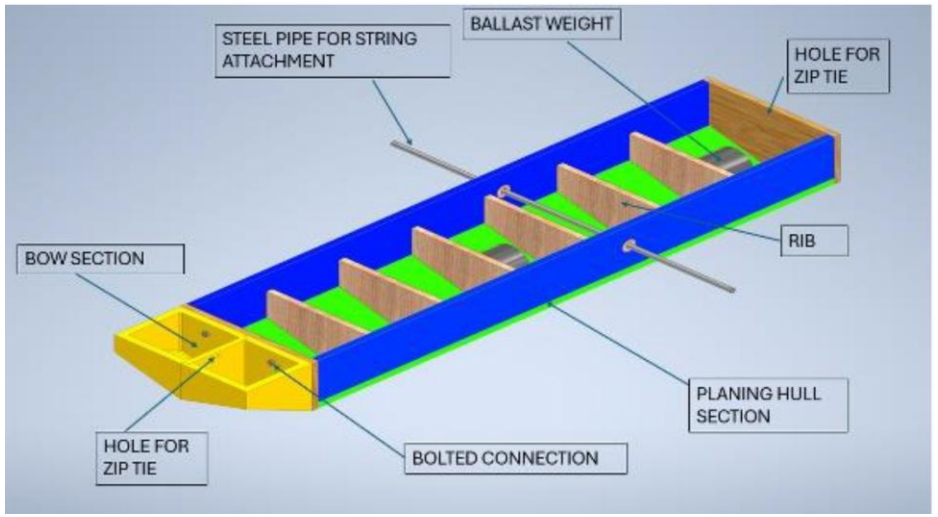


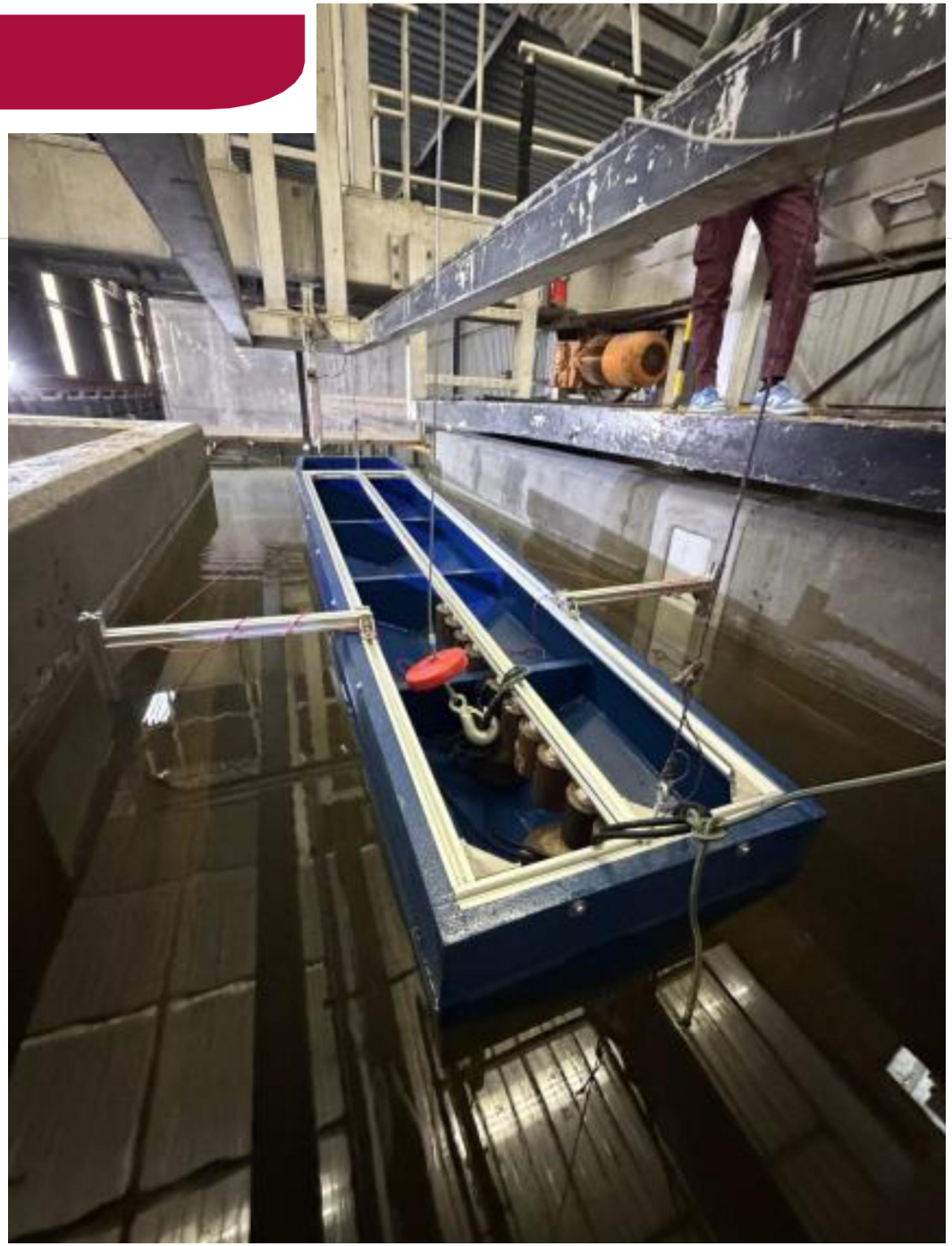




Design, build and test high speed boat







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Design, build and test high speed boat



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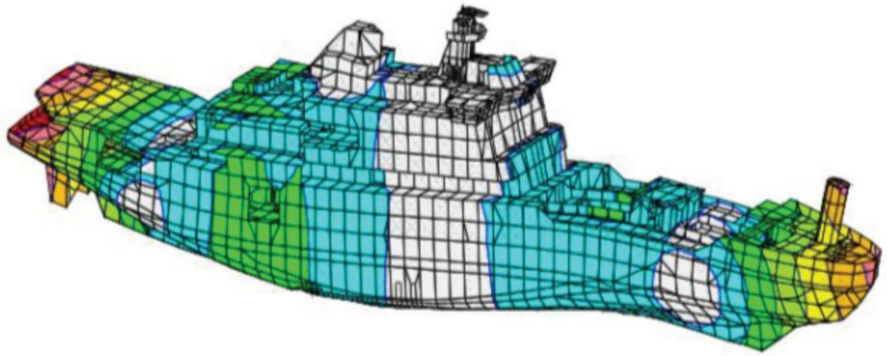
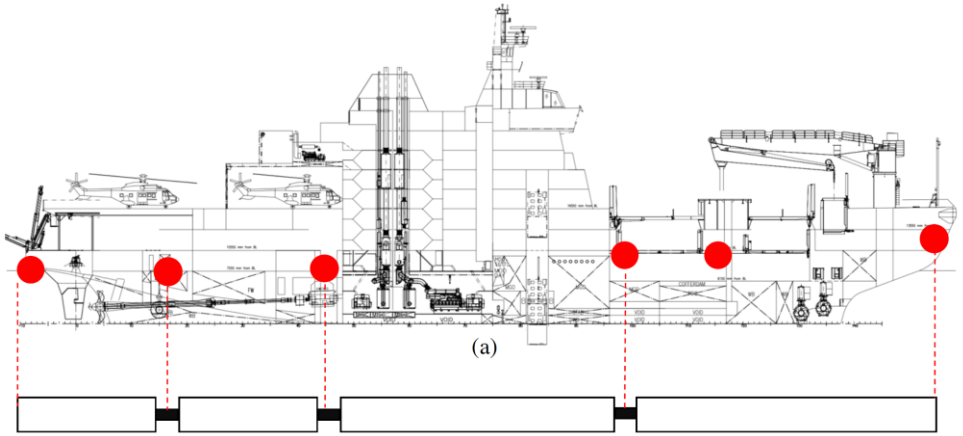
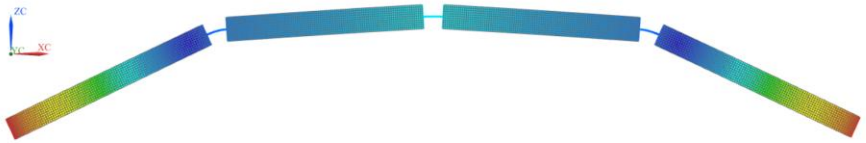
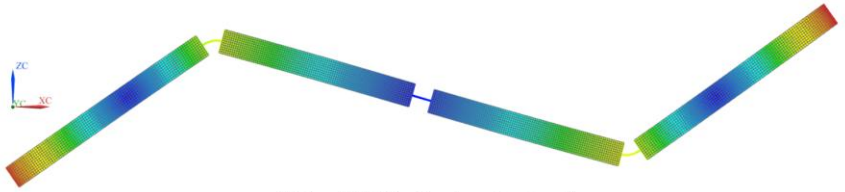
Backbone structures for scale-model hulls







(a) $f = 15.62\ Hz$, 2-node vertical bending



(b) $f = 29.08\ Hz$, 3-node vertical bending

In future



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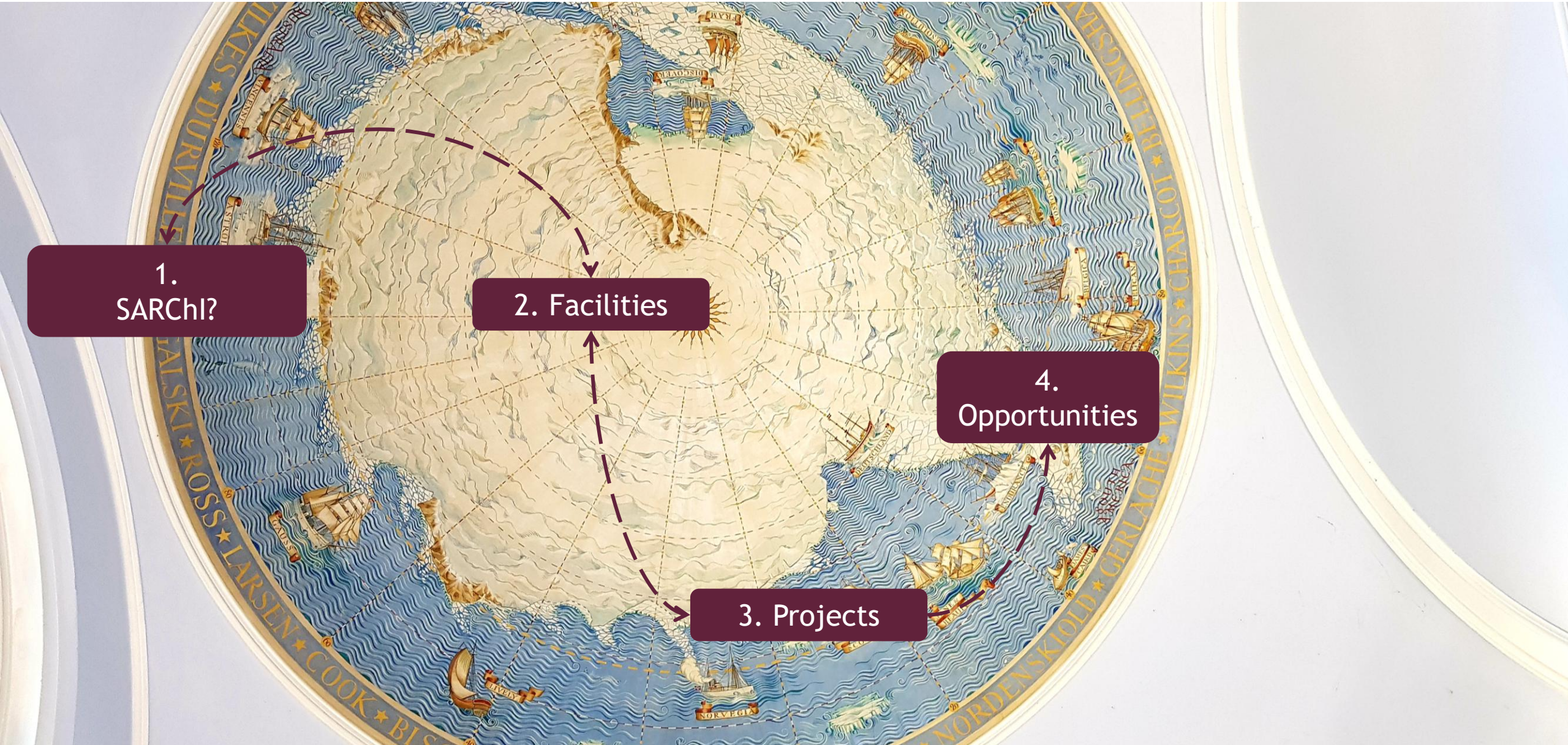

Opportunities

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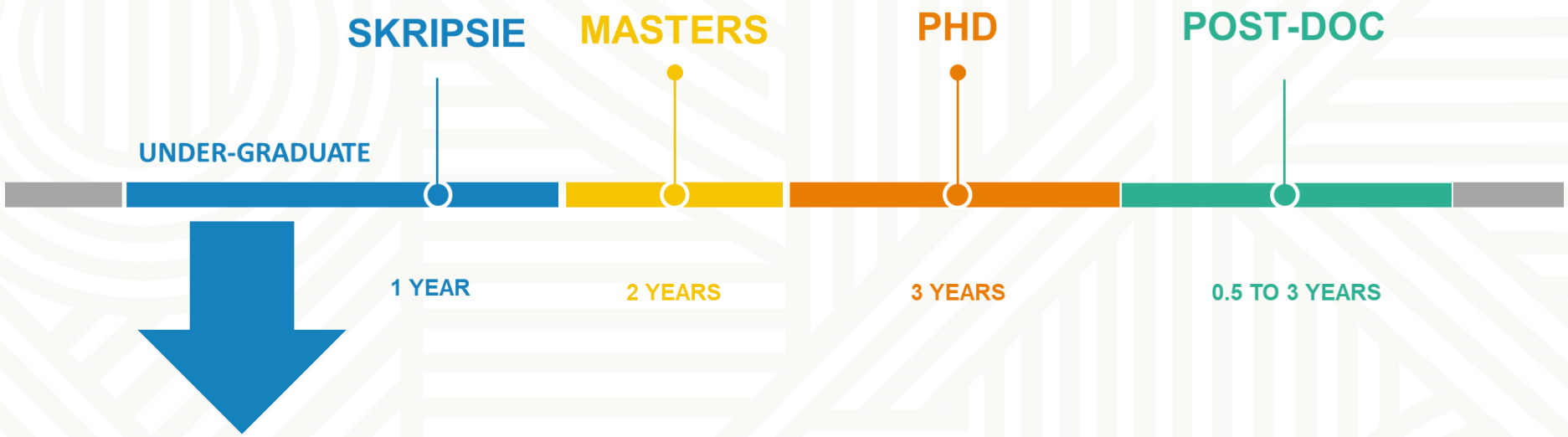
Host a student for vacation training



- **2nd year 4 weeks** - Vacation Training 341
- **3rd year 4 weeks** - Vacation Training 441

Opportunities

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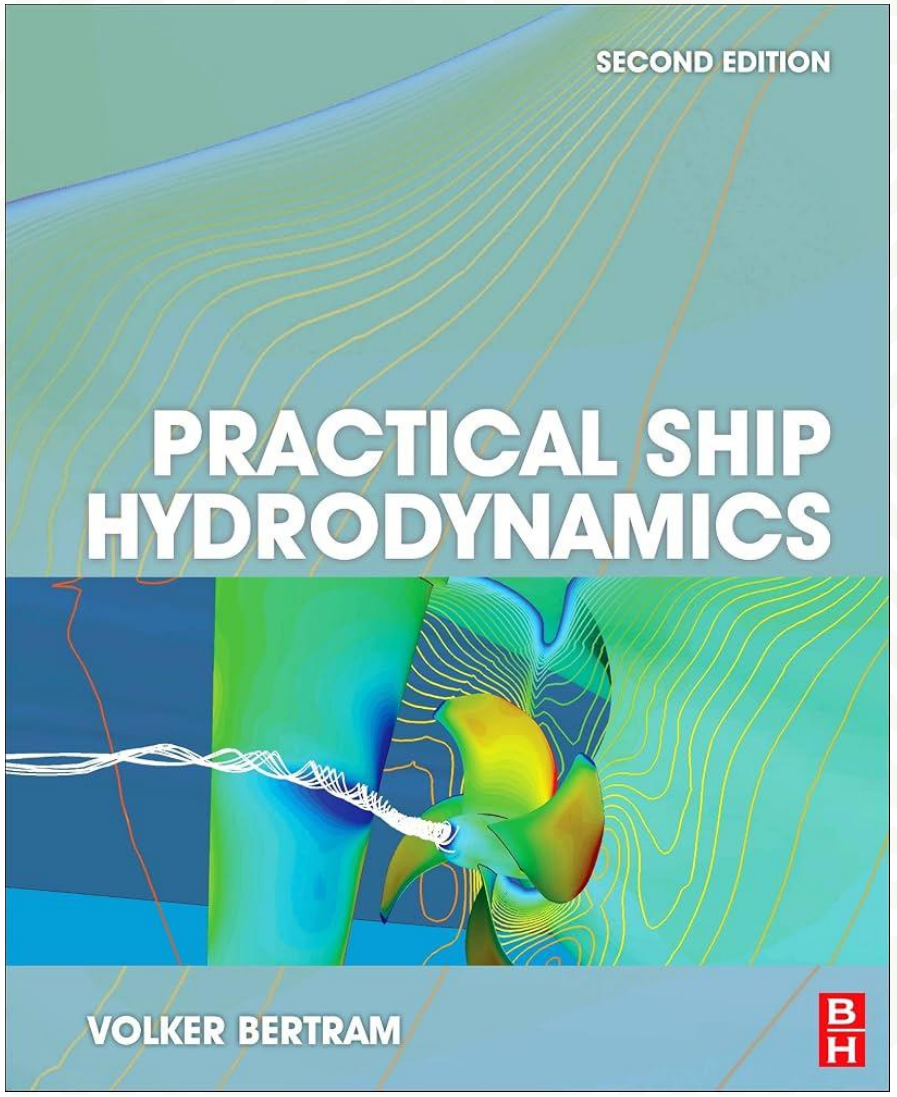
Upskill yourself

Dr Volker Bertram

DNV





- **November 2026 – Online lecture series**
- February – In-person lectures

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Contribute your skills to the Monaco energy boat challenge





Monaco energy boat challenge

FOUR RACING CLASSES

There's no single road to sustainable boating there are many, and each class here explores its own. Solar, electric, hydrogen, hybrid: different technologies, different frontiers, all tested where it counts on the water. Choose a class to meet the teams and discover the boats pushing it forward.



TEAMS · 2026

ENERGY CLASS

Clean-energy racing catamarans — electric, hydrogen and solar. The original and largest class.

DISCOVER THE CLASS



TEAMS · 2026

AI CLASS

Fully autonomous, pilotless boats that perceive, decide and steer for themselves.

DISCOVER THE CLASS



TEAMS · 2026

SEALAB CLASS

The master class — pure naval architecture, designing and building boats from scratch.

DISCOVER THE CLASS



ENTRIES · 2026

OPEN SEA XPERIENCE

Production electric and hybrid boats from the industry, in real open-water trials.

DISCOVER THE CLASS

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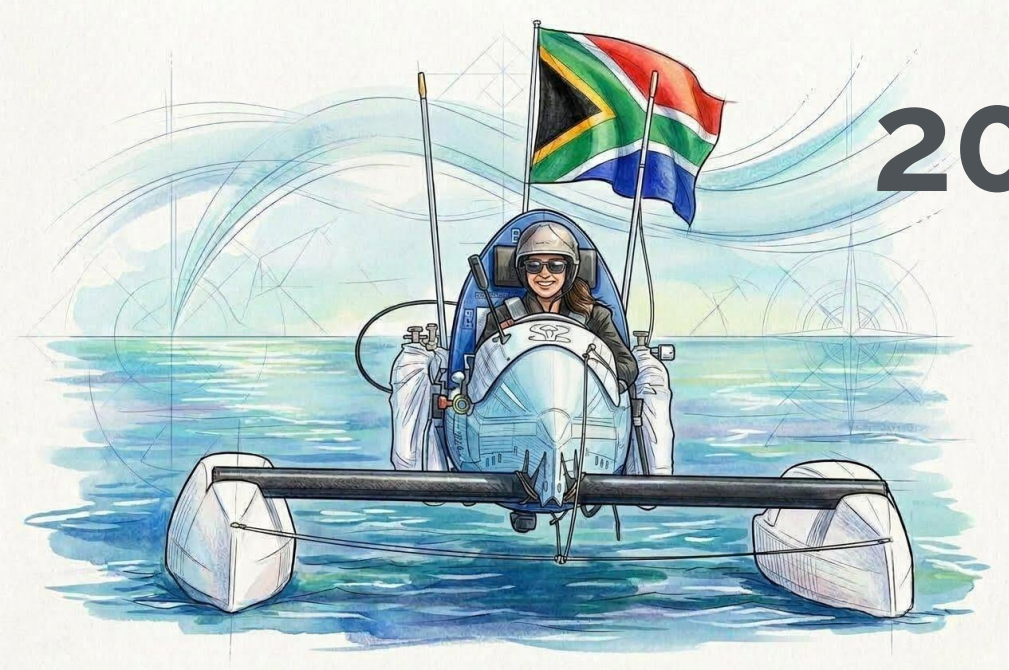
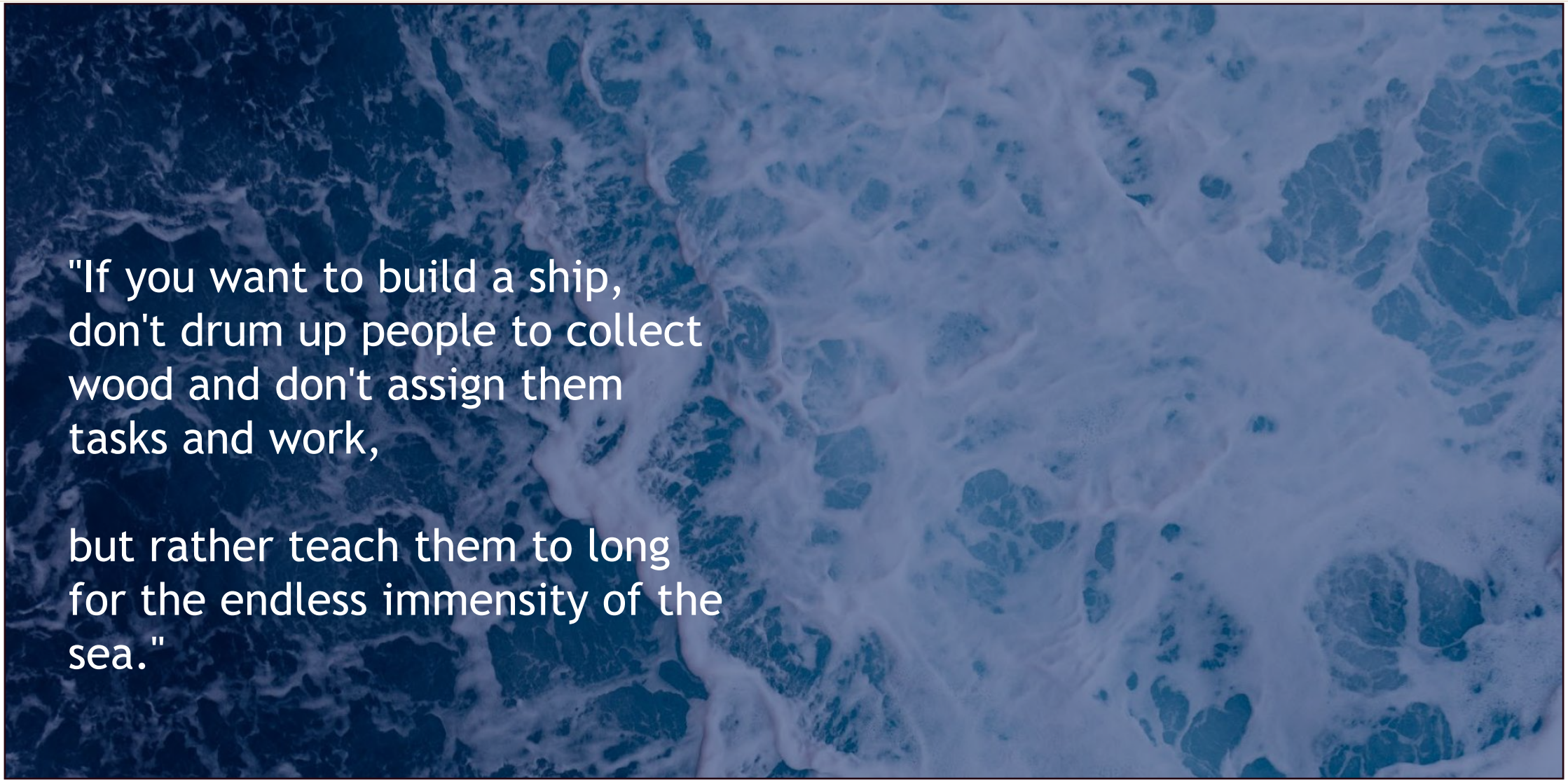


2028?


"If you want to build a ship,
don't drum up people to collect
wood and don't assign them
tasks and work,
but rather teach them to long
for the endless immensity of the
sea."

Thank you

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Annie Bekker
Professor
GIBELA Engineering Research Chair
DSTI/SAIMI SARChI Chair in Naval Architecture and Design
Department of Mechanical and Mechatronic Engineering
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Opportunities

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E ENERGY CLASS | AI AI CLASS | SL SEALAB CLASS | O OPEN SEA XPERIENCE

Energy Class · 22 teams — electric and hydrogen race boats compete across timed and endurance formats in the Stadium.



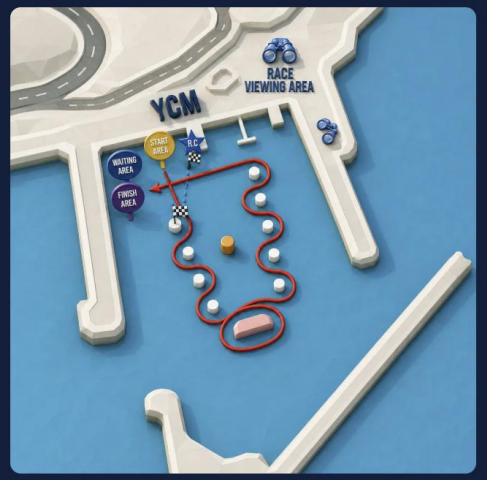
Qualifying Laps

Timed laps that identify the fastest boats and set the pairings for the Championship.



Endurance

Teams complete as many laps as possible within the allotted time.



Slalom

A technical course run in the fastest possible time while avoiding penalties.



Championship

A head-to-head format where two boats race directly to finish first.

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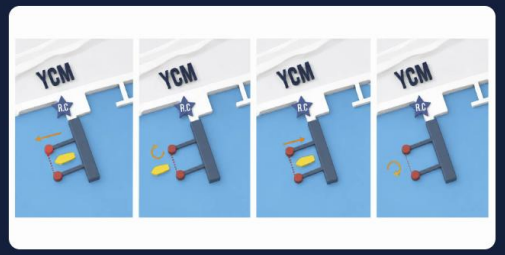
E ENERGY CLASS | AI AI CLASS | SL SEALAB CLASS | O OPEN SEA XPERIENCE

AI Class · 10 teams — autonomous boats tackle missions built around perception, decision-making, precision and speed.



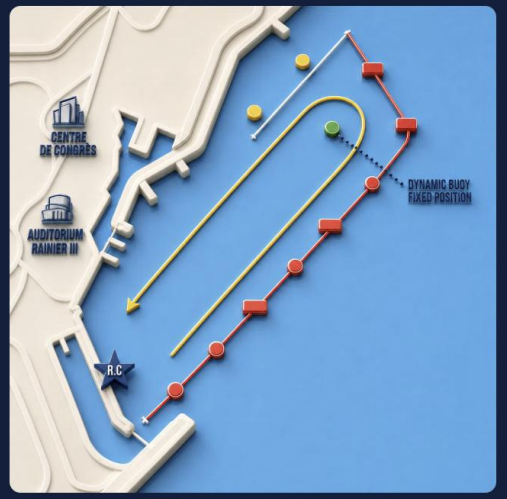
Slalom

An autonomous slalom around a moving object, testing speed and accuracy.



Docking

Leave the dock, run the course and return to stop precisely in the berth.



AI Fleet

A dash to a green geostationary buoy under 0.4 NM away — bearing revealed only at launch.

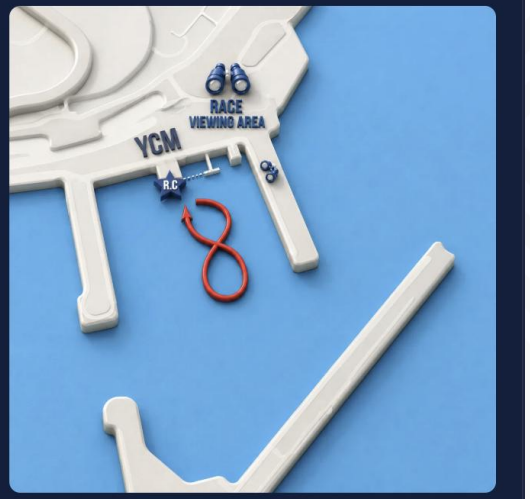


Figure 8

Complete a figure-eight course as quickly as possible.