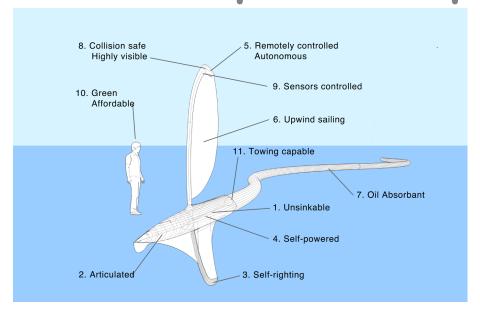
Protei technology development plan



Status of Protei development process as of September 2011

Color code

Achieved, tested and validated

Achieved, further test needed for improvement

Not addressed or not achieved

	Properties	Status	Detail	Future Need
1	Unsinkable		Use of solid foam volumes	Improve sea worthiness
2A	Articulated		Articulated, bespoke linear actuator system in trials	Reduce power consumption for articulation
2B	Inflatable		Tested and rejected	More rigid inflatable material
3	Self-righting		Not tested	Test it! And again!
4	Self-powered		Battery powered	Energy harvesting from its natural environment
5A	Remote controlled		Information successfully sent to controller	Increase communication range
5B	Autonomous		Not addressed	Autonomous agents
6	Upwind sailing		Boat sails in a straight line upwind	Test tacking performance
7	Oil absorbant		Oil absorbency tests carried out	Oil booms customizing and operation
8	Collision safe		Experimented with in Protei_005	Sonar, Radar and Vision
9	Sensor-controlled		Limit switches, GPS	Environmental sensing, actuating and forecasting
10A	Green		Made from recycled material	Recyclable and low footprint material
10B	Affordable		Not affordable for an individual, yet cheap for a large company	Production efficiency
11	Towing capable		Can pull a sorbent boom upwind	Test maneuvering and max towing load performance

How to develop Protei technology to achieve all of its functionalities?

Together with DNV, Protei has engaged a Qualification of New Technology procedure (QNT) following he DNV Recommended Practice A203 in June 2011.

"Qualification is the process of providing the evidence that the technology will function within specific limits with an acceptable level of confidence."

The QNT procedure consists of 6 steps and is projected to last until the end of 2014.



RECOMMENDED PRACTICE DNV-RP-A203

QUALIFICATION PROCEDURES FOR NEW TECHNOLOGY

SEPTEMBER 2001

Qualification Basis

System description of the technology, functional requirements, main parameters, reliability targets, operating envelope for transportation, installation, operation and abandonment.

Report available online end of September 2011

Technology Assessment

Dividing the systems into manageable parts, assessing novelty and identifying main operational challenges.

Report with Statement of Feasibility projected for March 2012

Risk Assessment

Defining risk as the combination of likelihood of failure and severity of consequences. Identifying and prioritizing failure modes according to risk.

Develop Qualification Plan

Setting acceptable levels of likelihood for failure based on previous experience, technical analysis, laboratory testing.

QNT Plan with Statement of Endorsement projected for December 2012

Execute Qualification Plan

carrying out planned analysis and testing as in the QNT Plan in order to document the margin to failure.

Performance Assessment

quantifying the overall reliability of the technology to confirm that the functional requirements laid down in the Qualification Basis are met.

QNT Report with Certificate of Fitness for Service projected for December 2014

What are the key aspects of this technology we want to deliver?

Autonomous

Artificial intelligent agent

Self diagnostic from sensor input

Self repairing or reproducing

Self reconfiguring software

Self-powered

Energy harvesting and storage

Minimal energy consumption (recovery, conversion, efficiency)

Green

Safe to humans and the environment

Use of responsibly sourced materials wherever possible

Low impact potential to pollute the environment for measurements or contamination

Open Source

Accessible

Modular

Publicly Licensed

Collaborative

What can you do with the technology when it is available?

As a modular, open source technology, Protei gives the user the option to re-purpose any aspect of the technology to address their own requirements.



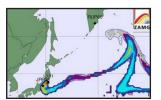
monitoring of marine protected areas (MPA)



climate and oceanographic research



recovering plastics and other materials discarded at sea



hazardous environment sensing and mapping

Come on board and join the Protei community!

Protei is developed together with:

Academic research: current and future projects

Universidad Austral de Chile (UACH):

Velocity prediction program

University of Southern Denmark (SDU):

Autonomous sailing vehicles

Technical University Delft (TU Delft):

Towing performance and Articulated hull testing

University Technology Sydney (UTS):

Biomimetics for artificial intelligence and sails

University of Southampton:

Single vessel intelligence systems

Goldsmiths University of London:

Oil spill study and long term remediation strategies **Stanford University:**

Land-Sea and Sea-Sea telecommunication system for Protei

Academic Coordinator:

Etienne Gernez <etienne@opensailing.net> +47 468 10 718

Industrial partners



DNV:

Hydrodynamics, Structures, Qualification of New Technology,



Stork:

3D machining for precision parts in Nylon and Aluminium.



Aeroclay:

Oil absorption clay polymers

Industrial Coordinator:

Cesar Harada <cesar.harada@opensailing.net> +1 617 230 0662 / +44 7853 286 216 / +31 686 2028 38

We are currently looking for industrial partnerships in the fields of Materials: bio-composites, non toxic, low impact, and recyclable materials Sensors and Actuators: integrated systems for environmental characterisation, autonomous vehicles Communications: data telemetry, management and analysis systems

as well as for financial support, see indicative budget for 12 months of development below:

Position	Cost per month (Gross USD)	Total cost
Research director	\$6,500 @ 100%	\$78,000
Project manager	\$5,000 @ 50%	\$30,000
Sponsor relationships	\$5,000 @ 33%	\$20,000
Marine Engineer	\$5,000 @ 100%	\$60,000
Mechatronic Engineer	\$5,000 @ 100%	\$60,000
Computer Scientist	\$5,000 @ 100%	\$60,000
Prototype maker	\$5,000 @ 100%	\$60,000
Community manager	\$4,000 @ 50%	\$24,000
Interns/Students	2*\$1,500 @ 50%	\$18,000
Operation expenses	\$12,000	\$144,000
Grand Total		\$554,000