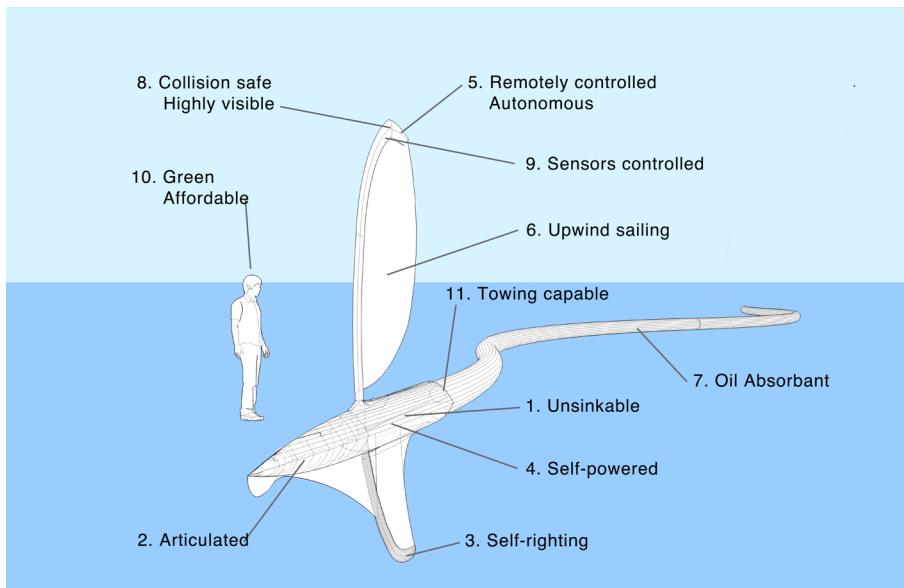


# Protei technology development plan



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

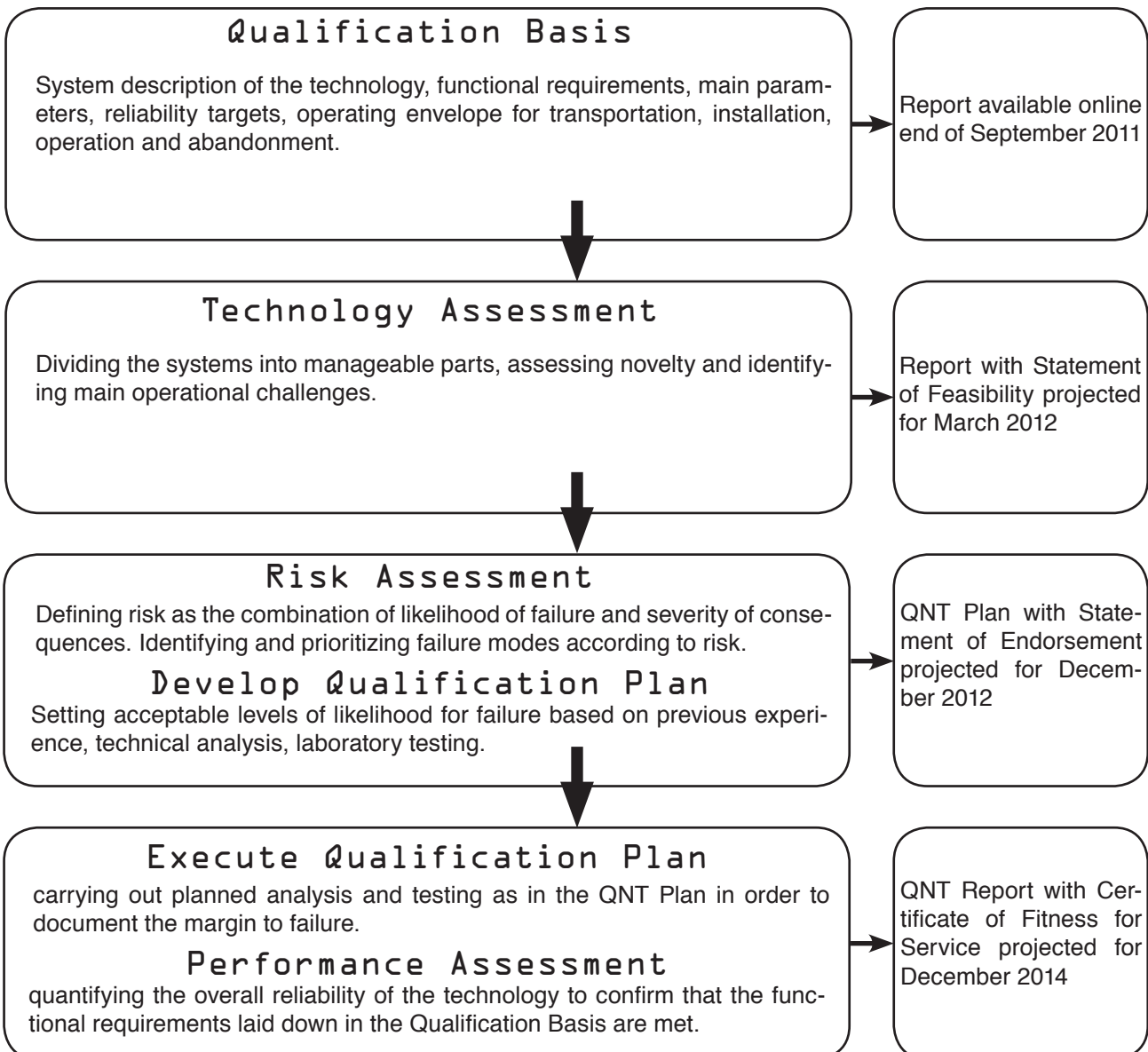
|     | Properties        | Status | Detail  | Future Need                                      |
|-----|-------------------|--------|---|--|
| 1   | Unsinkable        |        | Use of solid foam volumes                                       | Improve sea worthiness                           |
| 2A  | 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 the 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.



# 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

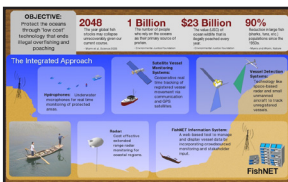
- Safe to humans and the environment
- Use of responsibly sourced materials wherever possible
- Low impact potential to pollute the environment for measurements or contamination

## Open Source

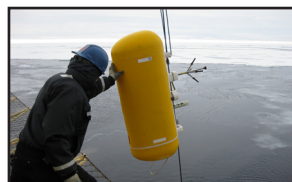
- Accessible
- Modular
- Publicly Licensed
- Collaborative

# 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.



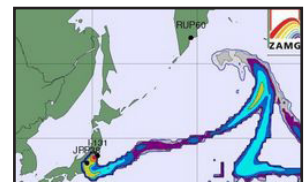
monitoring of marine protected areas (MPA)



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        |
| <b>Grand Total</b>    |                            | <b>\$554,000</b> |