# An innovative ASV for the monitoring of anthropogenic pressure on Wetlands


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European Geosciences Union

## Motivation

**SWAMP (Shallow Water Autonomous Multipurpose Platform) design and development is the base for an innovative class of highly modular and reconfigurable lightweight ASVs expressly addressed for remote areas and extremely shallow water applications like polar regions, swamp, marshes, rivers and coasts**



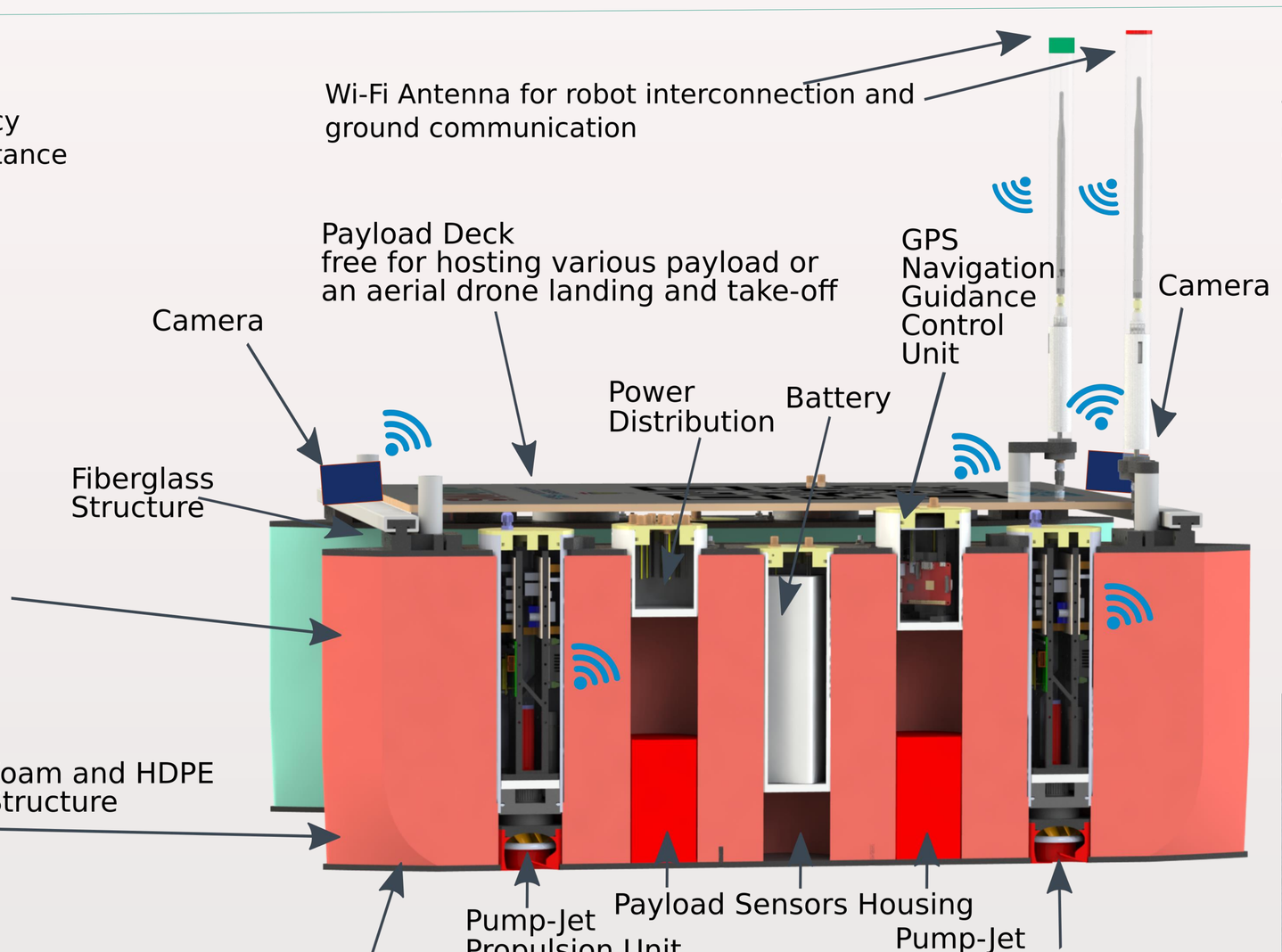


**The design of SWAMP-class ASVs is based on a holistic approach involving different aspects of robotics:**

- **Use of Innovative and soft materials to protect the propulsion, electronics and sensors**
- **Mechanical design of innovative Pump-Jet propulsion modules contained within the hull**
- **Modular hardware/software architecture for multi-agent distributed Navigation-Guidance-Control (NGC)**

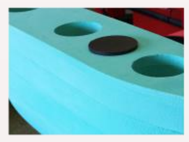
## The SWAMP (Shallow Water Autonomous Multipurpose Platform) vehicle

Modular Foam Hull Structure for buoyancy reserve, impact resistance and reconfigurability



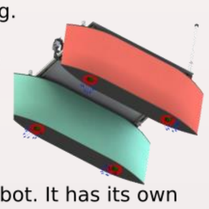

The hull structure and the propulsion system are suitable to work in extremely shallow water down to 15 cm

The structure is made of soft and impact resistant material. No problem of sinkage from damage in harsh environment.
High reconfigurability thanks to the modular construction technique



Thrusters are flush with the hull and studied to work without problems also in extremely shallow water.
The 360° steerable thrusters can be used for propulsion and steering.

The robot is highly controllable thanks to the use of four azimuth thrusters. Two bow and two stern

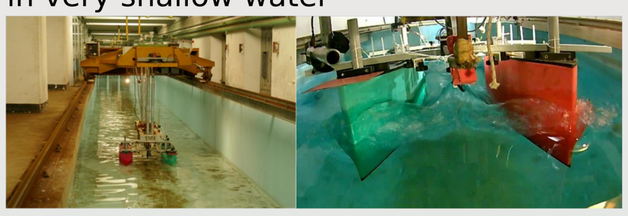


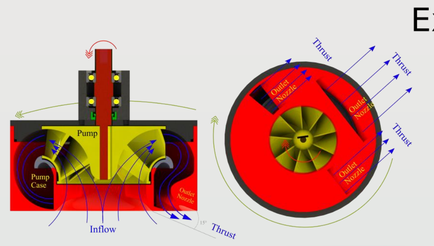
Each hull is a single Robot. It has its own battery, power distribution unit, thrusters, NGC Unit and wifi antenna

All the elements are wifi connected.
Thrusters, NGC Unit, Cameras and sensors are provided with wifi module.
The power supply is given by cables connected to a power distribution unit.

| | |
|---|---|
| Hull Type | Catamaran Wigley |
| Overall Lenght | 1230 [mm] |
| Minimum Width | 700 [mm] |
| Maximum Width | 1250 [mm] |
| Distance Between Hulls | 800 [mm] |
| Construction Height | 500 [mm] |
| Maximum Draft | 150 [mm] |
| Light Weight | 38 [kg] |
| Maximum Weight | 60 [kg] |
| Buoyancy Reserve | 120 [kg] |
| Autonomy | 2 to 6 [h] |
| Operating Speed | 1 [kts] |
| Maximum Speed | 3 [kts] |
| Maximum Power Consumption | 400 [W] |
| Battery Voltage | 37 [V] |
| Batteries | 2 [Ah] |
| 360 deg Azimuth Thrusters | 4 x 15 [N] |
| Cameras | 2 nr |

Hull tested in DITEN towing tank also in very shallow water









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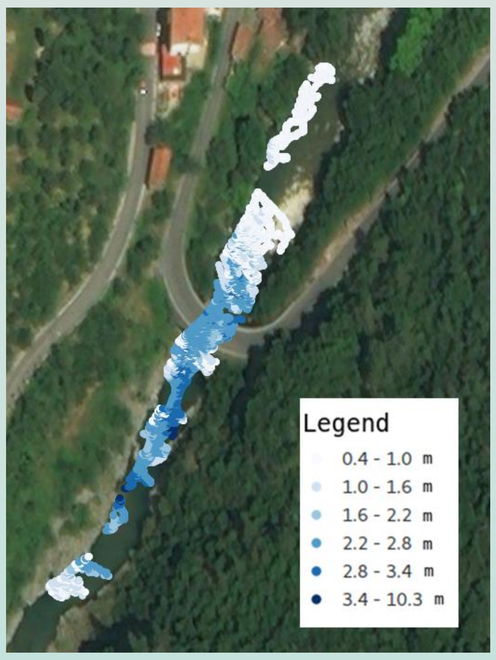
## Protection

**Hull foam is drilled to make SWAMP a completely modular catamaran able to host various types of tools: actuators, intelligent systems, samplers, and sensors that are, in this way, protected by the foam.**
**This is studied to extend the ability of monitoring anthropogenic impact in hardly accessible harsh environments where commonly the vehicles do not access**

## Case study

**Liguria is one of the European regions where extreme events related to anthropic changes have had the greatest number of negative effects**

**In this area the use of suitable robots can improve monitoring the impact of anthropogenic pressure in wetland ecosystems. A recent bathymetry survey took place with SWAMP equipped with a single beam sonar protected inside the hull in the area where Roja river flows not far from the Italy-France border**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**During the survey SWAMP proved to be easily transportable in a harsh environment**

**SWAMP proved to be capable of working in extremely shallow water without any risk for sensors and propulsion and to be highly manoeuvrable in narrow space**


The SWAMP prototype was designed and built during the Angelo Odetti Ph.D. in cooperation between the INstitute of Marine Engineer of CNR and the Electrical, Electronics and Telecommunication Engineering and Naval Architecture Department of the University of Genova with the title:
Study of innovative autonomous marine vehicles for the monitoring of remote areas in shallow waters
Tutor: Prof. Marco Altosole, Prof. Michele Viviani
Co-Tutor: Ing. Gabriele Bruzzone, Ing. Massimo Caccia