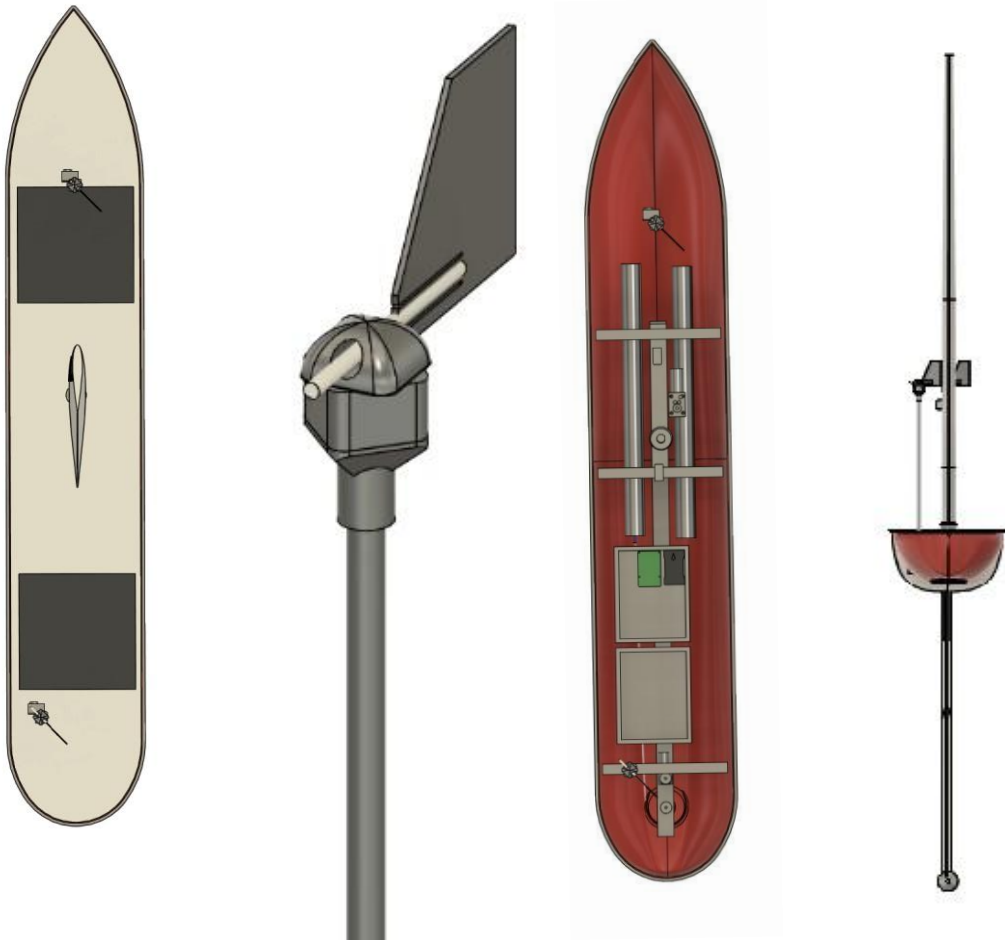
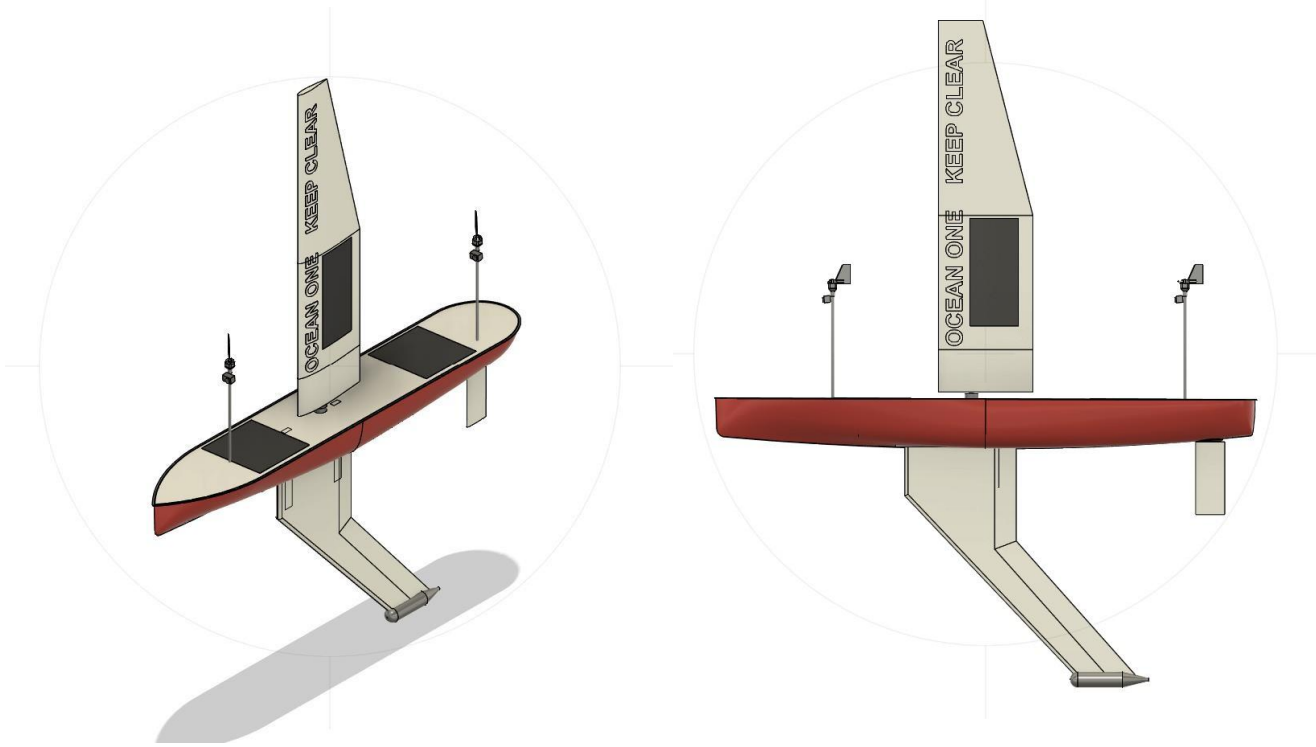


Trans ocean Self sailing research vessel

1.1 CAD model overview



1.2 Overview

An autonomous sailing boat designed to travel across the Atlantic with a rigid sail and autopilot.

1.3 Main goals are to gain practical experience in:

Engineering and mechanical design of the hull, rigid sails and actuator mechanisms
Programming microcontrollers and microcomputers in C++ and python
Exploring physics laws in practice and learning basics naval architecture
Building long lasting autonomous system
Developing problem-solving and research skills

1.4 Possible Applications

Biological research of the sea
Meteorology data collection
Geological and oceanographic research
Long-term autonomous monitoring of marine environments

2.1 Technical Details

2m*0.4m fiberglass hull with aluminium reinforcement
55 kg displacement
Rigid sail of an air foil profile with rotating mast
0.5 m² sail area
0.9 m draft with lead bulb of 20kg
4 solar panels, 55-watt total
12v 30ah LifePo4 battery = 1 week of sailing in cloudy weather (no sun)
Iridium satellite modem (access from anywhere on earth),
Linux computer and atmega based autopilot system
1000 nautical miles expected range
1.5 knots average expected speed

2.2 Current project status

Finished and tested sailing autopilot on a prototype vessel, prototype rigid sail design has successfully tested, debugging and long-time web dashboards finished, sensor and radio setup has been completed

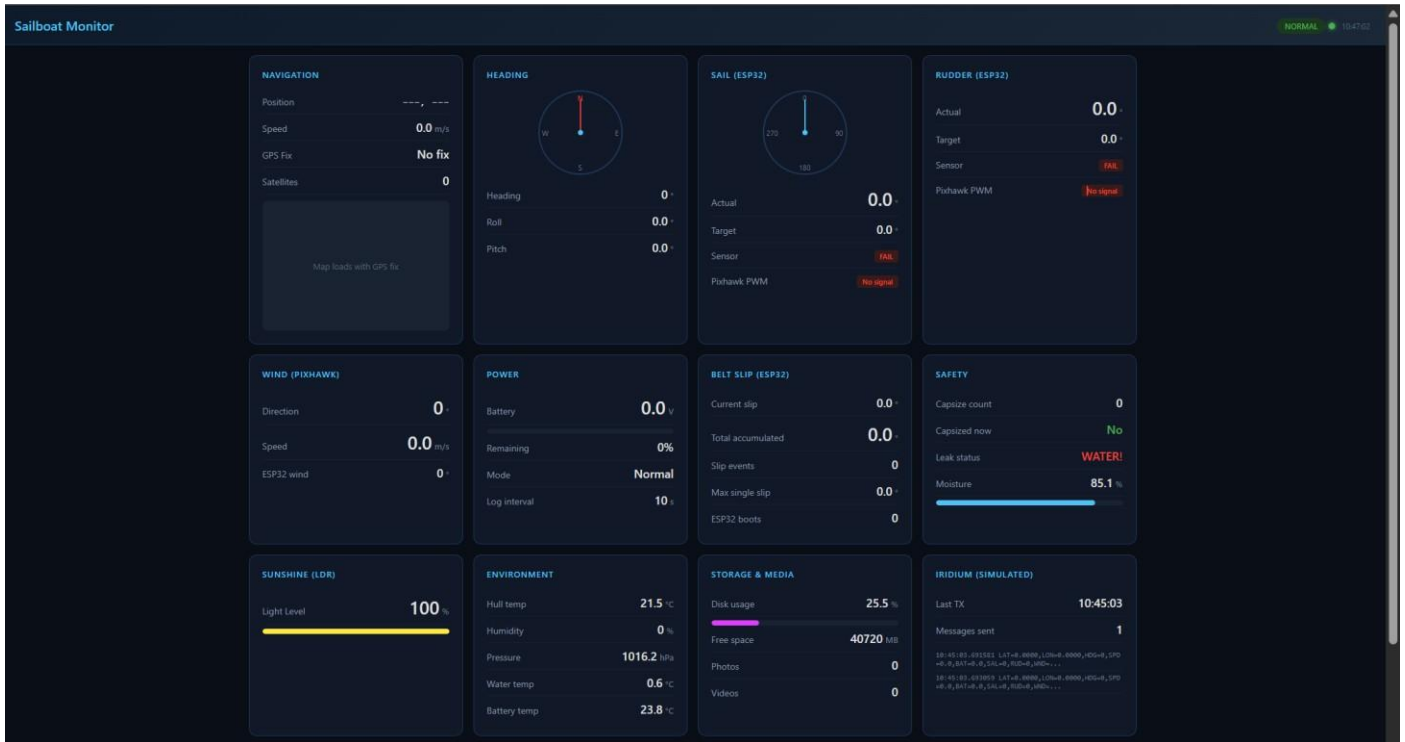
2.3 Main Development Stages

Vessel Structure 3D design in CAD
Aluminium frame
Hull and Sail construction
Sail and Rudder Mechanism – brushless motor with worm gear and gt2 belt with feedback in case belt slipped
Keel and bulb production (fiberglass, aluminium profile and lead) Electronic
Control Unit (ECU)final design and waterproof

2.4 Testing

1. Inland lake
2. First sea trials – Sado estuary
3. Mission #1 Setubal – Sines
4. Mission #2 Setubal – Lagos – Setubal
5. Mission #3D Cross Atlantic (850 nautical miles)

2.5 Pictures

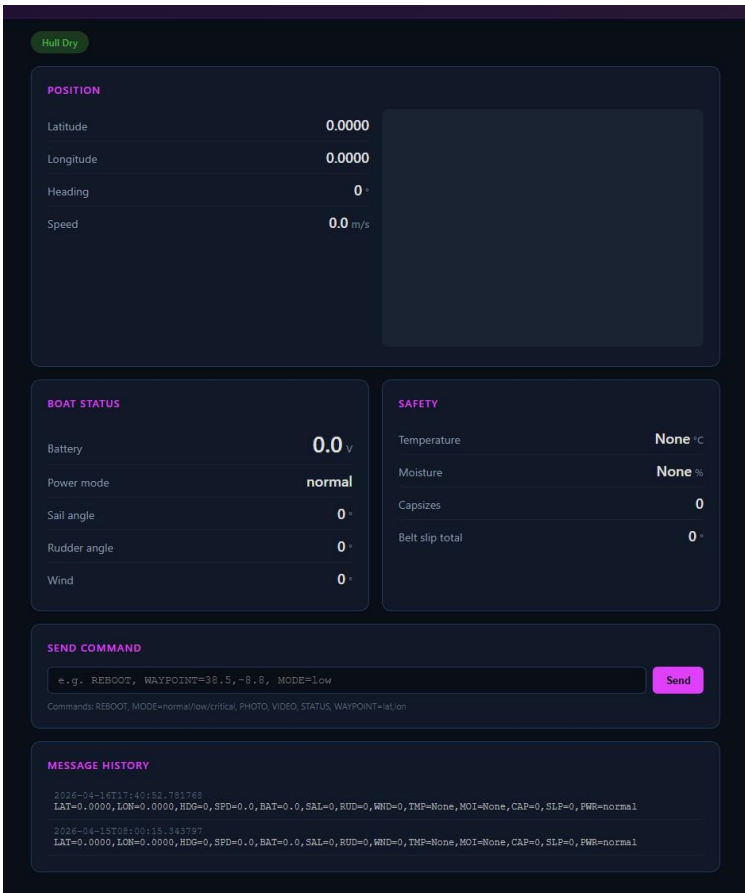


Debug dashboard – works through wifi –for land system check

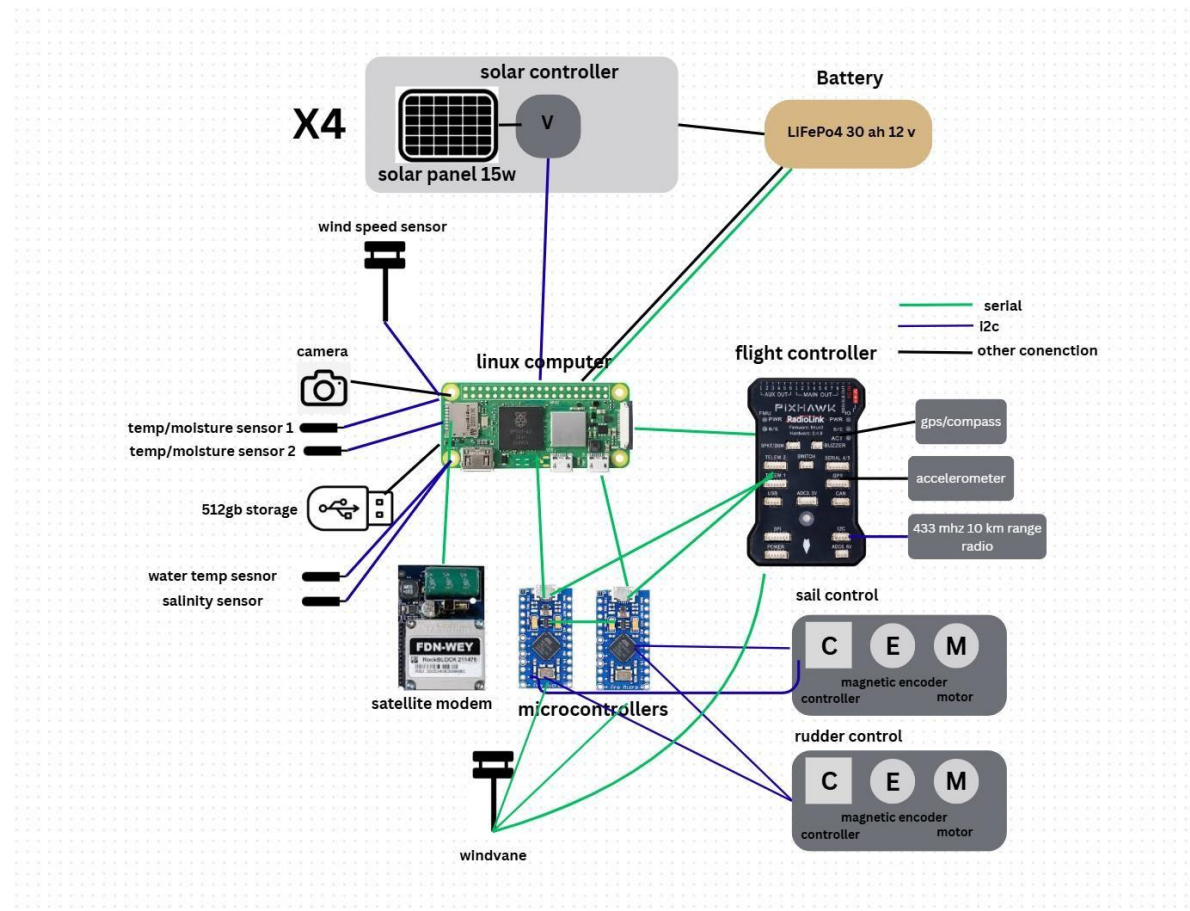
The screenshot shows the 'SYSTEM LOG' window with a dark background and a vertical scrollbar on the right. At the top right, there are filter buttons: ALL, PIX, ESP, I2C, SAF, IRD, STO, and PAUSE. The log entries are as follows:

```
18:02:44.648 [I2C] BME076 t=23.3 p=813.1
18:02:44.651 [I2C] PCF848 m=211 l=255 n1=65 n2=124
18:02:44.651 [SAF] LEAK ALERT! Moisture=83%
18:02:44.658 [IRD] Telemetry (96 bytes)
18:02:44.658 [IRD] Emergency leak alert sent
18:02:44.658 [IRD] Telemetry (102 bytes)
18:02:54.669 [I2C] BME076 t=20.8 p=1016.6
18:02:54.672 [I2C] PCF848 m=211 l=255 n1=59 n2=124
08:34:21.329 [I2C] BME076 t=20.8 p=1016.6
08:34:21.332 [I2C] PCF848 m=211 l=255 n1=61 n2=124
08:34:21.332 [IRD] Telemetry (102 bytes)
08:34:31.334 [I2C] BME076 t=20.9 p=1016.6
08:34:31.337 [I2C] PCF848 m=210 l=255 n1=57 n2=124
08:34:41.339 [I2C] BME076 t=20.8 p=1016.6
08:34:41.342 [I2C] PCF848 m=214 l=255 n1=57 n2=124
```

Debug logs



Main Dash board – works by receiving short(300 bytes) messages from iridium satellite system



Electronics scheme of the vessel (simplified)

