VORTEX ACADEMY
THE ART OF THINKING

VORTEX RANGERS

NON-ROV DEVICE

VERTICAL PROFILING FLOAT

Vortex academy
Alexandria,Egypt

MATE ROV COMPETITION

MATE

MATE24

1. Mechanical Design

MAKO -fig (1) was designed to flawlessly complete several vertical profiles. After reviewing numerous ideas and tests, the final design was created. The float consists of one enclosure made of PMMA that houses the float's brain and water storage volume that stores the water in it to increase the weight and change the buoyancy. Six syringes are linked with lead screw which operates by a DC motor to overcome the calculated torque according to the depth. The PMMA enclosure is sealed from both ends with HDPE caps for piston seal technique to act as a pressure relief system to meet the requirements (ELEC-NRD-004) and O-rings with a PMMA face for face seal technique to facilitate the dealing with components. Pneumatic cables are used to serve the water flow from outside to the float syringes. MAKO is designed and calibrated in such a way that the whole body remains stable while operating, allowing for successful vertical profiles.

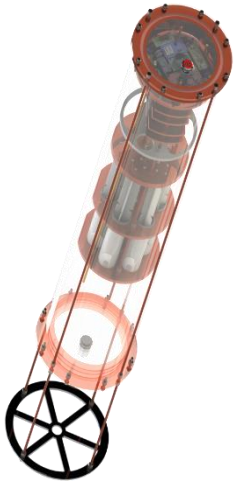

Figure 1: Vertical float engine design by Solidworks.

2. Electrical Design

Our float engine primarily relies on 16 AA batteries which meets the requirements (ELEC-NRD-004), organized into two sets of eight batteries connected in series to provide a 12V supply. To meet the required current demand, these sets are connected in parallel. The PCB features an Arduino Nano powered by a 7805 regulator to ensure a stable 5V supply. Additionally, the PCB includes pin headers for connecting power and signal cables to the DC motor, alongside integration for the HC-12, HC-05, and SD Card module. Last year, frequent battery replacements during simulations led to significant expenses and raised budget concerns. To address this challenge, A switch is integrated onto the PCB. This switch enables a seamless transition of the power supply from batteries to a direct source exclusively for simulation and code testing purposes. Through collaboration with the mechanical team, the power supply cable input is sealed to facilitate extensive testing. This approach not only optimized performance but also effectively managed our budget constraints.

3. Software Design

The communication setup between the float engine and the topside system -fig (2) relies on the HC-12 module for wireless transmission, chosen for its versatile channel-switching capability and long-range communication. The float engine includes an RTC module for UTC time acquisition, a bar30 sensor for precise pressure and depth readings, and an SD card module for data storage during profiling. Additionally, an HC-05 module enables over-the-air code flashing, enhancing functionality and easing testing processes. The receiver setup consists of an Arduino Nano and HC-12 module, with data integration into the Copilot GUI for real-time visualization using the Matplotlib Python library, ensuring efficient data monitoring and analysis.

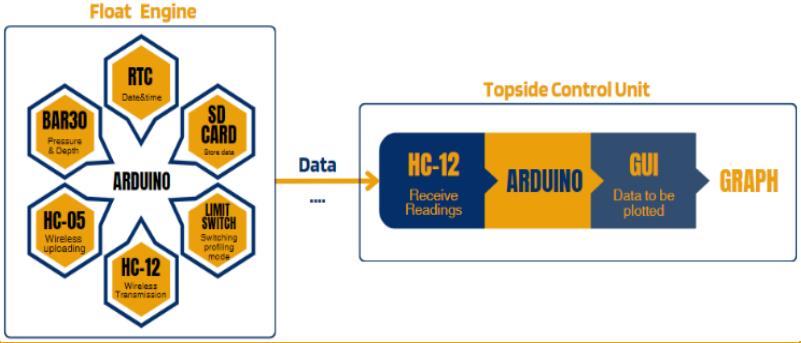

Figure 2: Float communication diagram