



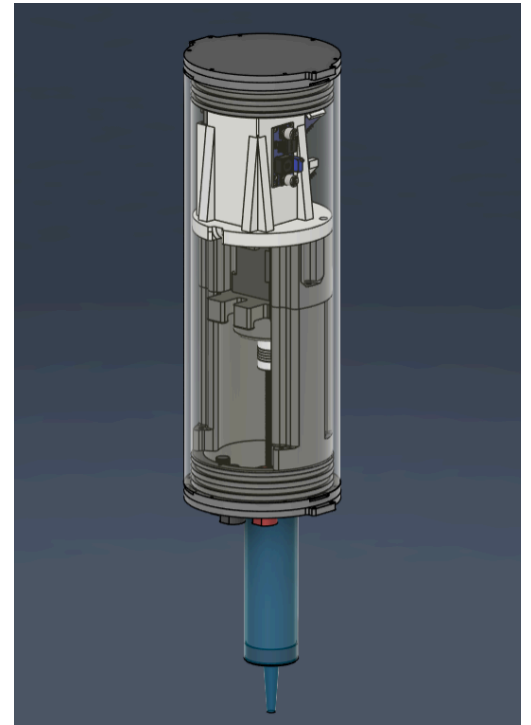
# Blue Lobster

## 2025 Non-ROV Device Design

One Degree North, Singapore American School (Singapore)

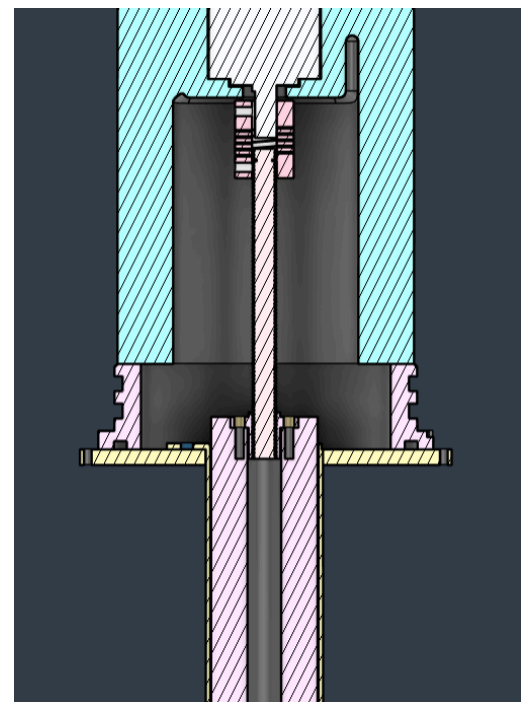
### Float Design

Blue Lobster implemented a single 100mL syringe buoyancy engine for this year's float to perform the vertical profiles. This remotely controlled device is housed within a 110mm diameter cylindrical enclosure from ROVMAKER to create a more streamlined design. This is important as the shape lets the float descend and ascend rapidly. The cylindrical shape does make it difficult to fit electronic components within, but with custom 3D-printed PLA structures, all components are safely secured within the enclosure. All electronics are mounted near the top to allow smooth communication between the ground station and float.



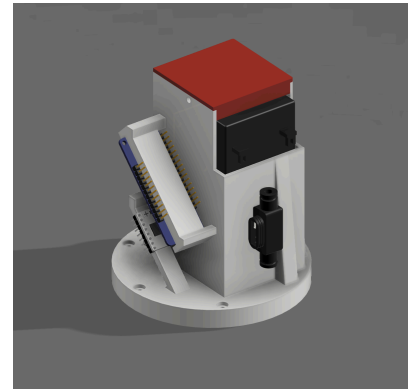
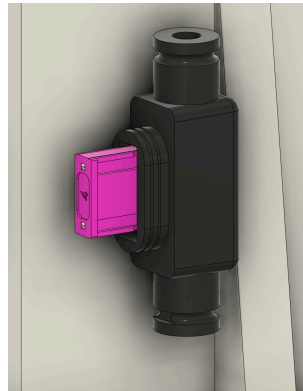
### Buoyancy Engine

Blue Lobster decided to use a 100mL syringe and Nema 17 stepper motor to control the buoyancy of the float. The stepper is connected to a threaded screw which pulls or pushes the syringe plunger when rotating. When the syringe is completely filled, the float's mass increases by 0.1kg while the volume remains constant. This will increase the downward force on the float while the buoyant force remains constant, which causes the float to sink. The float also has polyethylene foam to maintain positive buoyancy when the syringe is not filled to let the float surface.



# Battery Compartment

The battery compartment houses the Neuton Power NP1213 AGM battery, Blue Lobster chose this type of battery for its reliability and performance. This mount simultaneously acts the electronics bay with the stepper driver, fuse, step-down, and microcontroller. It is situated above the stepper motor compartment, fixed using screws. The battery is securely attached, and the fuse is directly connected to the battery to ensure safety.



# Electronics

The float is powered by a 12V battery connected with a 4A fuse. The power is split between the S109 Stepper Driver + Nema 17 stepper motor, and the Maker Feather AIOT S3, stepped down to 5V using the LM2596 Converter. The Feather will further step some of the power down to 3.3V to power the MS5837-30BA Pressure Sensor and Blue Robotics Underwater Switch.

Fuse calculations	
Full load current (FLA)	3.61A
Selected fuse size	4A

# Software & Communication

The Maker Feather AIOT S3 ESP32 MCU has an ESP32 module that enables the MCU to act as an WiFi access point. When turned on, a PC will be able to connect to the access point's WiFi connection and open a html site to control the float. When communicating with the MCU, the PC can send commands to make the float complete a vertical profile while collecting data and send over a graph of pressure/depth over time when the profile is complete.