1. Non-ROV Design: Float

CORAL CRUSADERS

1.1 Mechanical Design

The float in Figure 1 operates using a 200mL syringe and a 5cm linear actuator to control buoyancy. As the syringe fills with water, the float's volume decreases, thus changing its buoyancy and leading it to sink. When the phototransistor on the bottom of the float reads a small value, it means the float has reached the floor of the pool, and water is then pushed from the syringe to make the float rise.

The enclosure consists of two halves of a Nalgene water bottle and 3D-printed connectors. These connectors thread together and squeeze an O-ring to provide sealing. Connectors are attached to each half of the Nalgene bottle with silicone sealant.

Internally, there is a ballast holder designed to carry bismuth or lead pellets. The perfboard and other electronics are secured to these 3D prints. The antenna, LED indicator, and water level sensor are secured with O-rings on the cap. A 2.5cm rubber stop is used for pressure relief.

The float is 0.1m wide, 0.42m tall, and weighs 1.1kg.

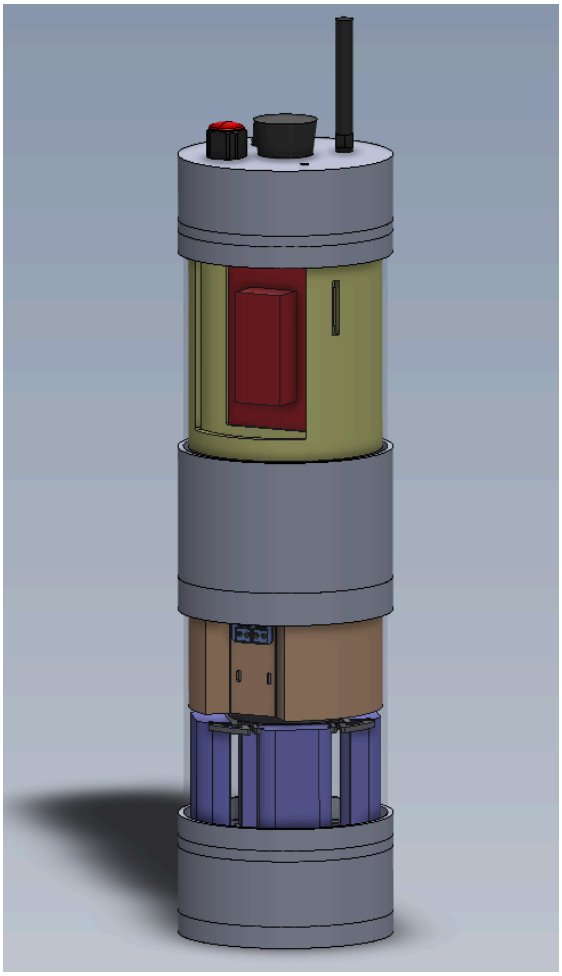

Figure 1.

1.2 Electrical Design

The float utilizes a Feather 32u4 with a built-in radio frequency module. The feather controls 4 sensors - a phototransistor for bottom detection, a water level sensor for surface detection, a PHT sensor to monitor internal conditions, and a pressure sensor to collect depth data. A normally closed reed switch allows for power to be switched on and off with an external magnet.

The battery consists of 8 AA batteries to supply 12V. This helps power the motor driver that runs the 5cm linear actuator for buoyancy. A 5v buck converter powers the Feather board and a 7.5 amp fuse is wired 5cm from the battery to provide overcurrent protection.

The RFM69 packet radio transmits time and pressure data to the surface station which has another Feather that receives the data. Then the station laptop reads the data through UART and automatically plots the data in Excel.