UWROV

Float Design Document

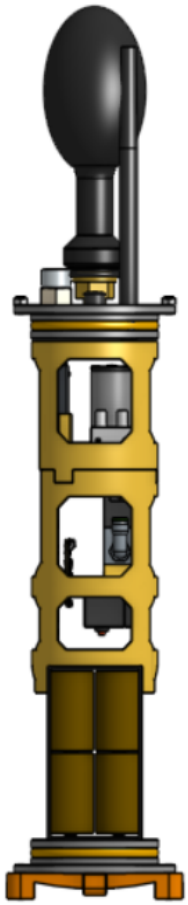


Fig. 1 Cad model of float

I. Core Functions:

- Operates independently from the ROV but can be held and deployed
- Completes two vertical profiles in the pool using a buoyancy Engine
- Transmits company number and current UTC time after each profile

II. Float Design:

Buoyancy engine design: One 12V vacuum pump and one Solenoid valve powered by eight 1.5V D cell alkaline batteries. A custom PCB that acts as a bridge between our microcontroller and the pumps allowing them to be switched on and off. The pump inflates an exterior bladder(balloon) when the float is at the bottom and the solenoid valve opens to deflate the balloon at the surface.

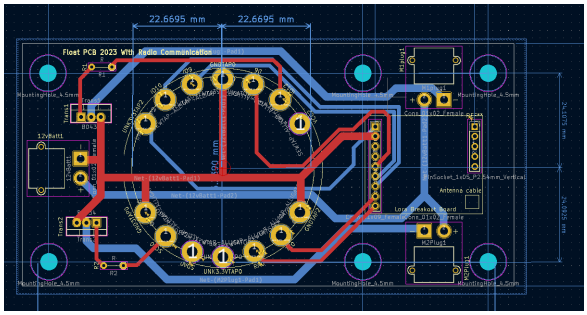
Interior float design: 3D printed frame holds the electronics and pneumatics in place and controls the wire management of the PCB.

Exterior float design: The pneumatic and electronic system is held within a 4 in diameter acrylic cylinder with two aluminum endcaps secured with O-rings and fasteners.

Safety: In order to make sure our pressure vessel is safe we added a ⅜" pressure relief valve to one of the endcaps that will release any pressure buildup over 1 psi on the inside of our float. We also have another opening on the same endcap that is secured with a schrader valve so that we can manually equalize the pressure if we need to.

III. Design Process and Alternatives:

Design Philosophy: This year, with the float already assembled, the focus was on updating and improving existing systems, both physical and in the CAD, as well as incorporating the antenna to the float, with an emphasis on reliability and simplicity. Changes were made to the We chose to use radio communication over wifi and bluetooth because we prioritzed range over direct control.



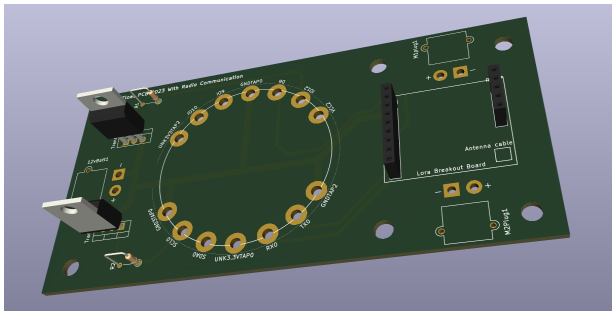


Fig 2 & 3 (left:Kicad model electrical connections in new float PCB, Right: 3d view of same kicad model)

PCB and electronics design: We decided to use the same microcontroller and motor/pump control method as last year but we needed to add radio communications to our board. We chose the the Adafruit RFM95W LoRa Radio Transceiver Breakout board so that the float could send information and receive commands.

Balloon attachment and improvements: One of the main focuses of the mechanical improvements made was to address issues with leaking. Multiple options were tried, including adding an inner structure to the balloon, and multiple different methods of attaching the balloon mount to the end cap. Ultimately we chose to use epoxy to attach the balloon mount to a metal fitting as this gave the customizability of the 3D printed mount along with the strength of a steel fitting. Additionally, check valves were added as a precaution should water enter the pneumatic system (and to prevent backflow). These components were combined with a rigorous pre launch testing procedure, including a soap bubble leak test and in lab submersion testing.