LEVIATHAN FLOAT DESIGN

Last year, we attempted the float, but various technical issues prevented it from entering the water. This year, we decided to continue tackling the float, carrying on our lessons from last year. We utilized a syringe and a servo as the buoyancy engine.

Learning from last year, where we had an excessively buoyant float, we reduced the total syringe volume from a single 350mL to 4 50mL syringes, giving us a total of 200mL capacity instead of 350mL capacity. The syringes displaced water, which would affect the buoyancy of the float, allowing us to rise and fall in the water. We reused the same Blue Robotics 4'' Acrylic Tube for the electronics housing and used similar end caps to seal the canister. The end caps were modified for a depth sensor to be used to measure the pressure and temperature of outside water, as well as a pressure relief valve to be added, preventing excessive pressure from building up. The end caps were also modified to allow for the four syringes to run through.

The syringe is connected to a lead screw, connected to a servo motor. Turning the servo motor turns the lead screw, which pushes/pulls the syringe. The servo is controlled by an Arduino MKR WiFi 1010, which controls the functions of the float. The Arduino is also connected to the depth sensor, gathering data about the outside water, including depth and temperature. The entire float is powered by AA batteries, each with a voltage of 1.5V. The Arduino is powered by 4 AA batteries in series, meaning 6V in total. This allows it to autonomously collect data, send commands to the servo, and communicate using Wi-Fi with an outside computer. The servo motor is powered by a separate set of 4 AA batteries in series. The servo motor is a component that requires more power when compared to other components and is, therefore, powered by a separate set of batteries. Both packs are fused by a 0.75A Fuse on the positive end, as well as a 1.5A Fuse on the common negative terminal. Details regarding the Float's SID and fuse calculations can be found on the next page.

Isometric view of a CAD design of the float

Side view of a CAD design of the float

The float is controlled via HTTP. Using Wi-Fi, the float can communicate with an external computer using the HTTP protocol, which it uses to both send data and receive commands. When the command to dive is sent from the computer, the float can dive down for a specified amount of time and will continuously collect data about the surrounding water. After the specified amount of time, the float will rise back up, and once the Wi-Fi connection is reestablished, the data can be sent back to the computer.

Float Electrical Systems Integration Diagram

Float Fuse Calculation

0.75A Fuse: 4 AA 1.5V batteries in series in a battery pack. As directed by the MATE ROV competition rules, the battery pack has a 0.75A fuse.

1.5A Fuse: Two packs of 4AA 1.5V batteries. As directed by the MATE ROV competition rules, a 1.5A Fuse connected in the common negative terminal of both packs