

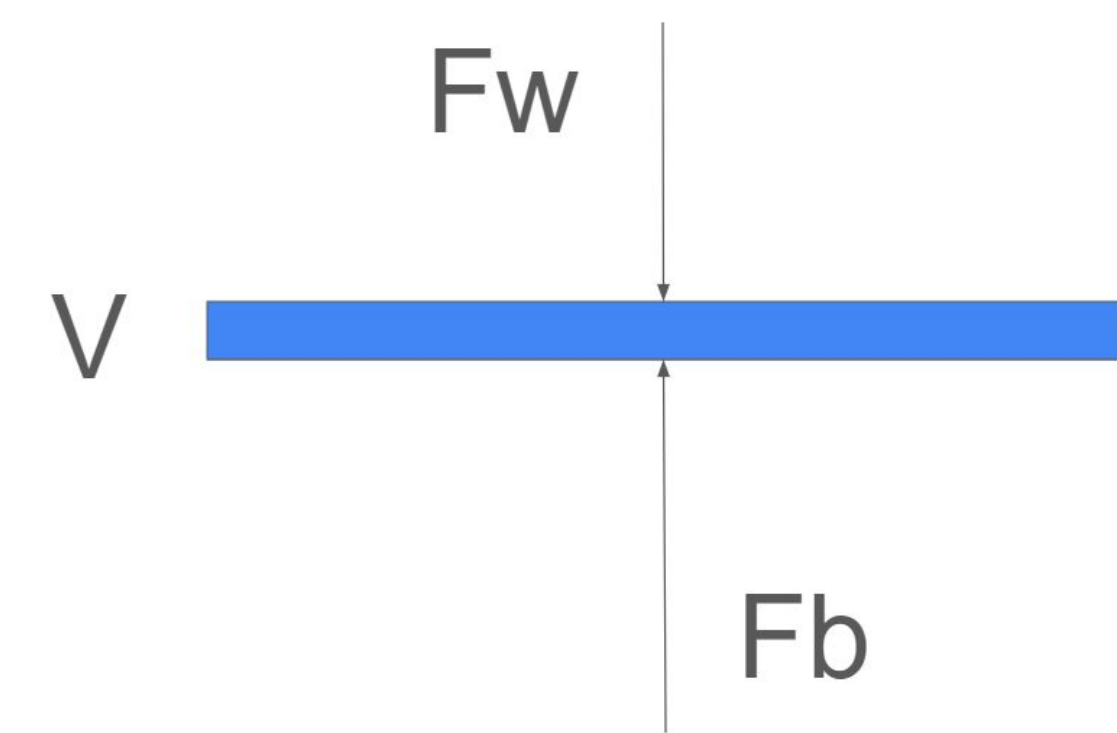
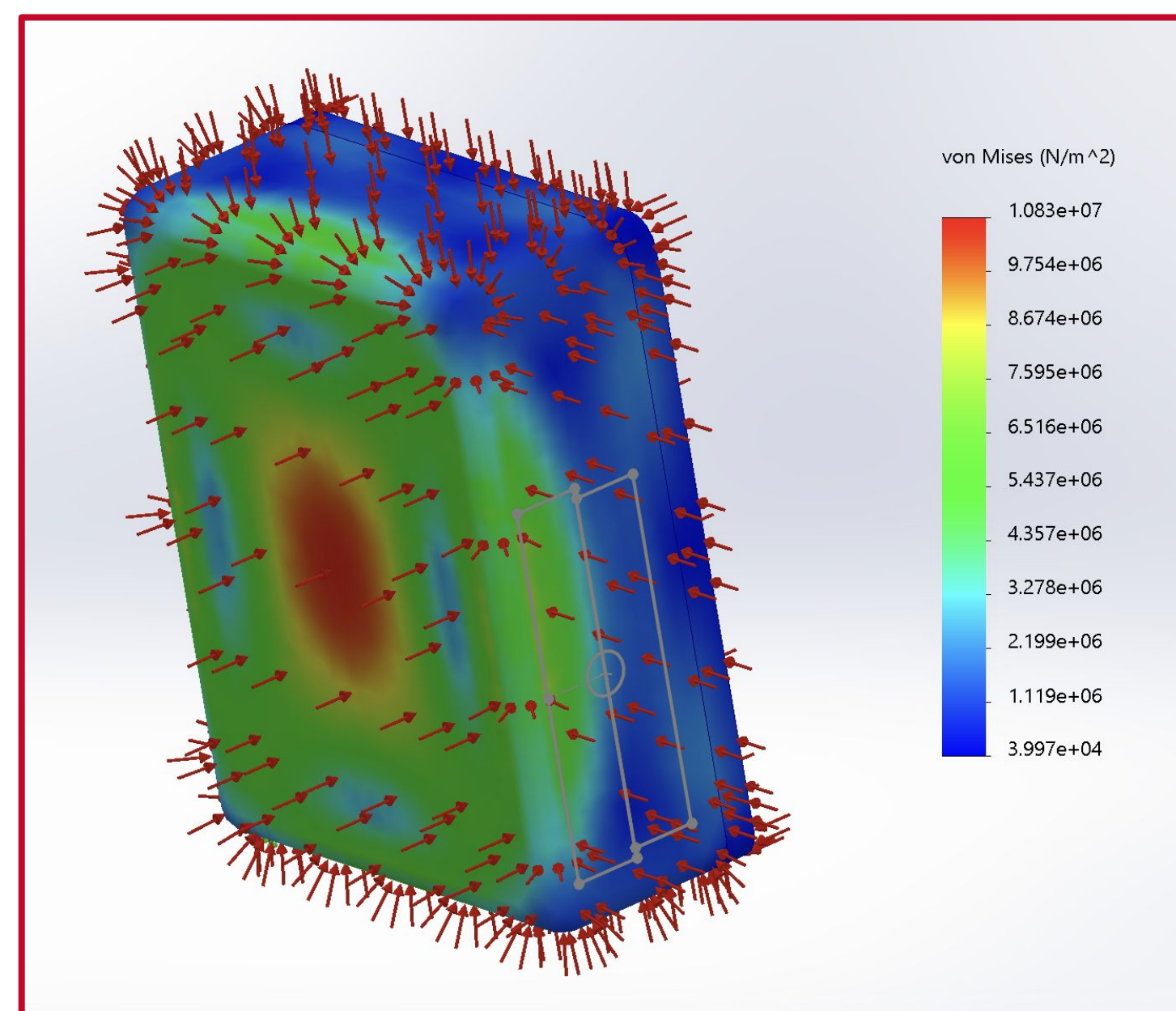
Problem Definition

Our aerial-aquatic quadrotor is designed to handle air and water movement to traverse a variety of different conditions to conduct surveillance and data collection. It has the ability to translate between both air and water while keeping a single compact design that can operate for an extended period of time.

- Customer Requirements / Product Functions**
- Waterproof to 2 meters
 - Weigh less than 7lbs
 - Fit in 3ft x 3ft box
 - Operate for 20 minutes
 - Cost effective under \$500

- Key Engineering Characteristics**
- Lift from propellers
 - Buoyancy
 - Flying/swimming speed
 - Water depth survival

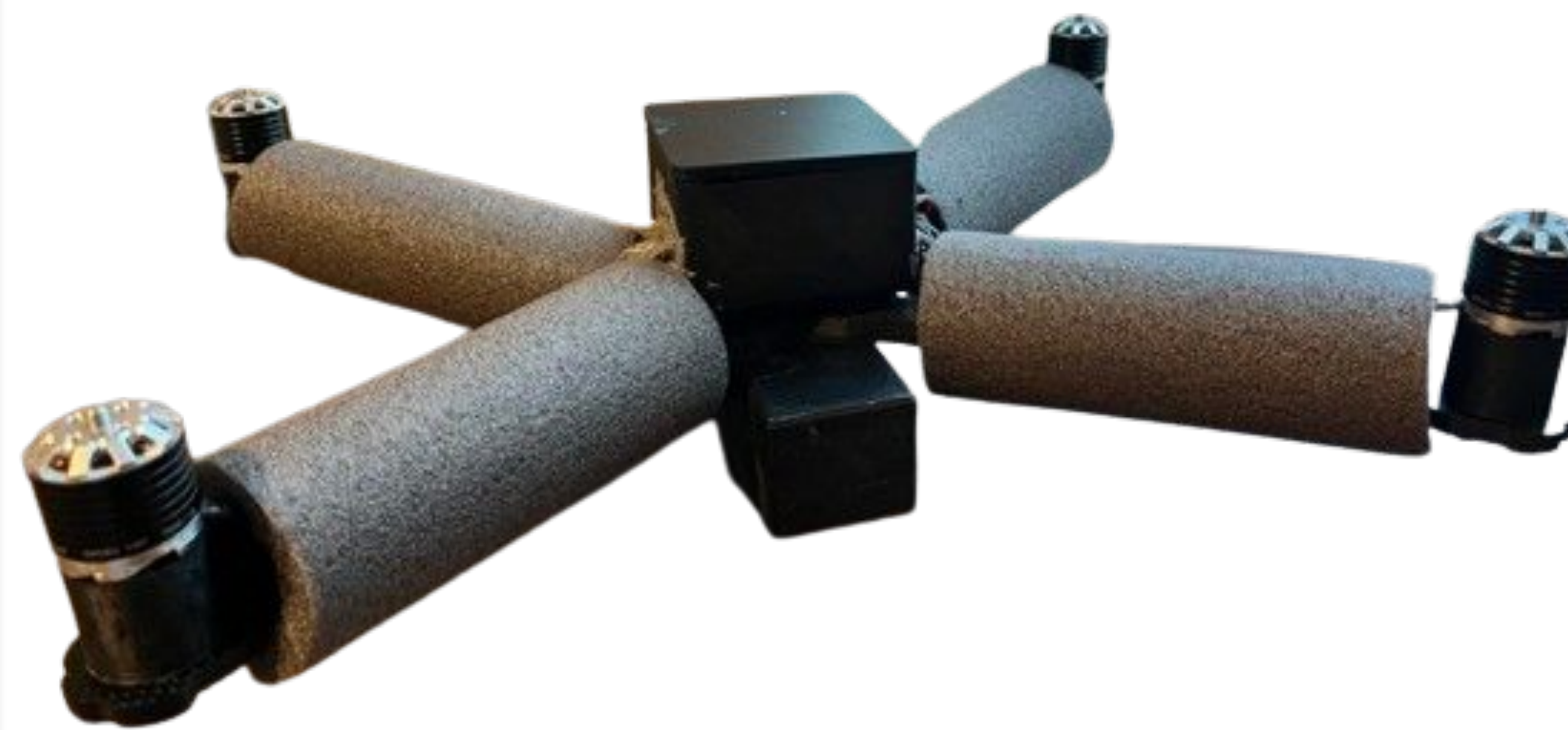
Design Calculations & Analysis



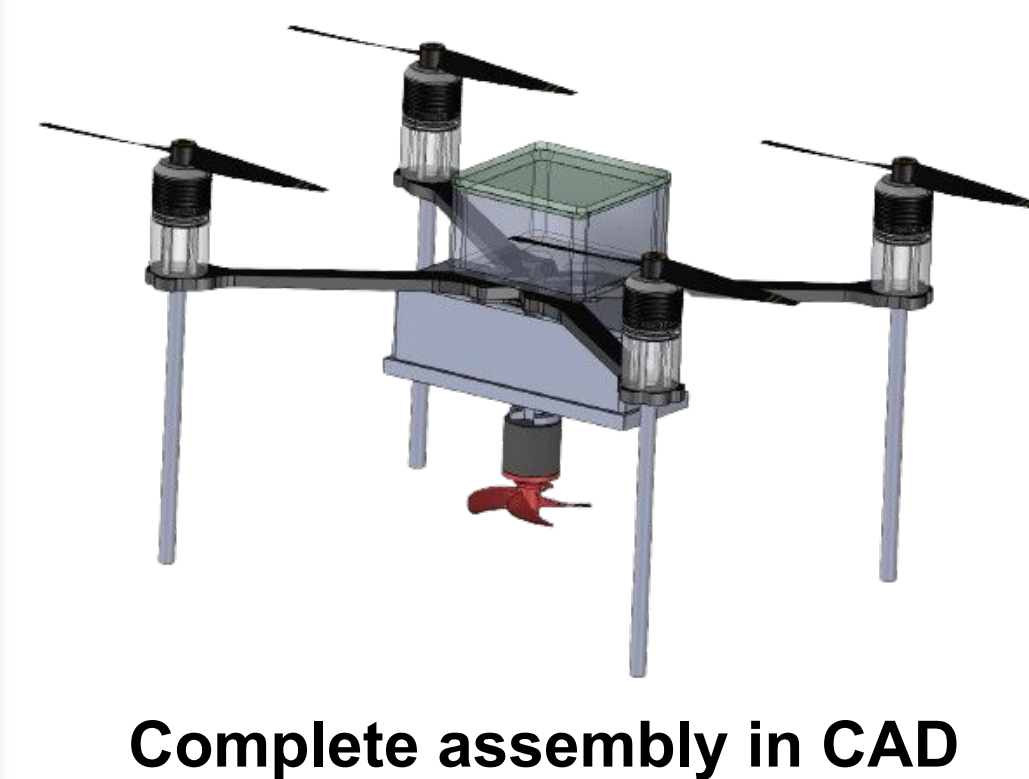
Using the formula $\rho \cdot V \cdot g = F_w$, we found the necessary Volume (V) from the density of water (ρ), gravity and the total downwards acting force (F_w). This also gave us the freedom of design for our floatation device layout.

Informed by the relationship between depth and water pressure, our operating depth, and the material properties of the resin, as well as printing resolution, we set our wall thickness to 0.1"

Final Design



Sealed with RTV and boxes bolted through chassis. Conformal coating applied to electronics inside for added security.



3D Printed Custom Parts

- Battery lid with motor stand off (PLA)
- Battery lid recessed sealing surface
- Battery Box with bolted mounting slots (Acrylic)
- 1" motor stand offs from chassis (Acrylic)
- Electronics box and lid with tapered sealing surface (Acrylic)

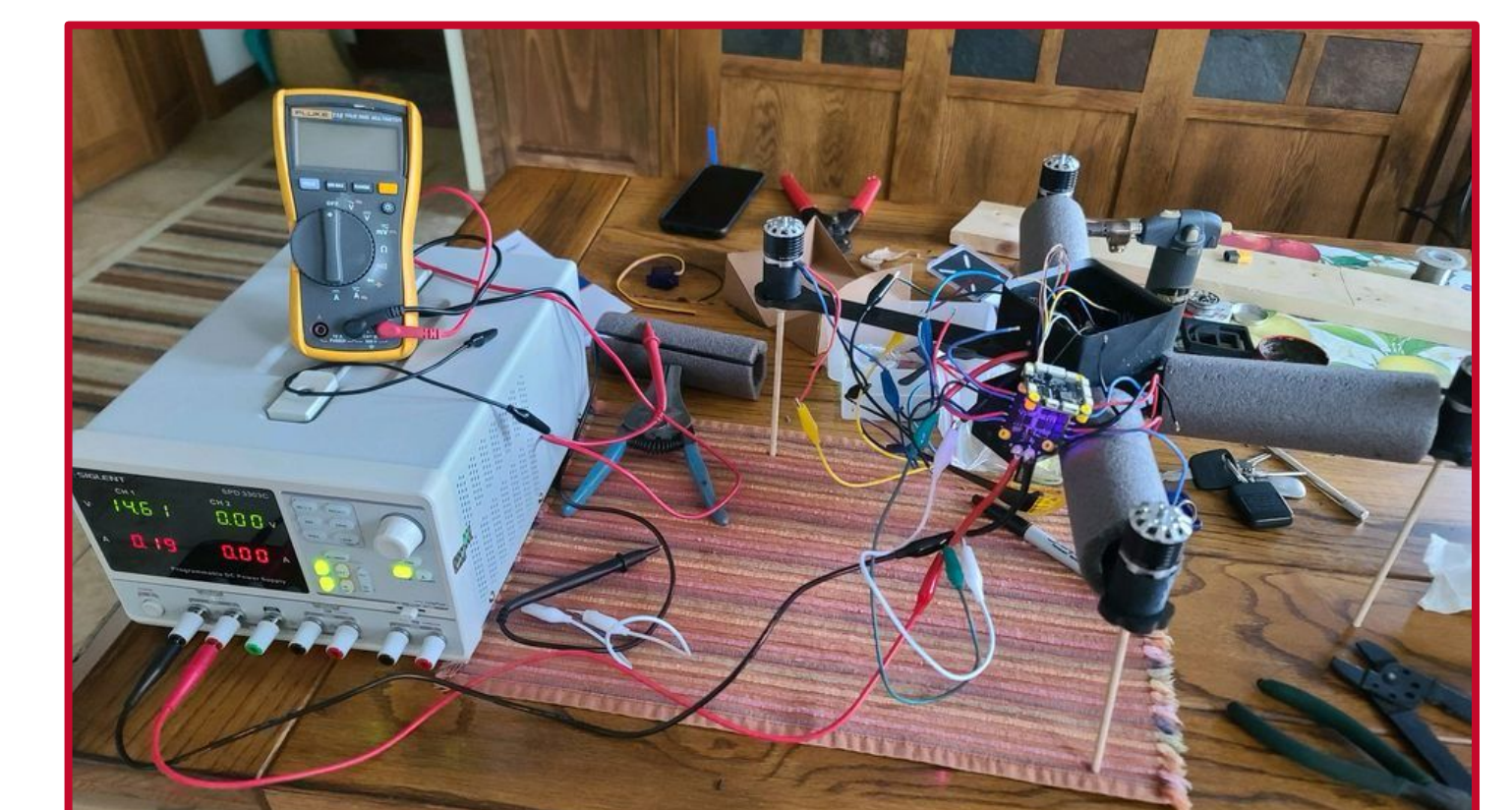
Additional Components

- Spektrum Receiver
- Second ECS for thruster control
- Compact Flight Controller and ECS Stack
- Brushless Underwater Thruster
- Zippy Compact 41.44wH Li-PO battery
- Lumenier FPV Quadcopter Frame
- KDE Direct FPV Motor

Prototype & Test Results



Buoyancy Testing: Ensuring the designated floats can support the quadrotor's weight just enough. Then the device was submerged to ensure its waterproof capabilities.



We conducted tests to ensure our electronics function correctly and are properly powered, even after delivery, integration, and waterproofing.