

Problem Definition



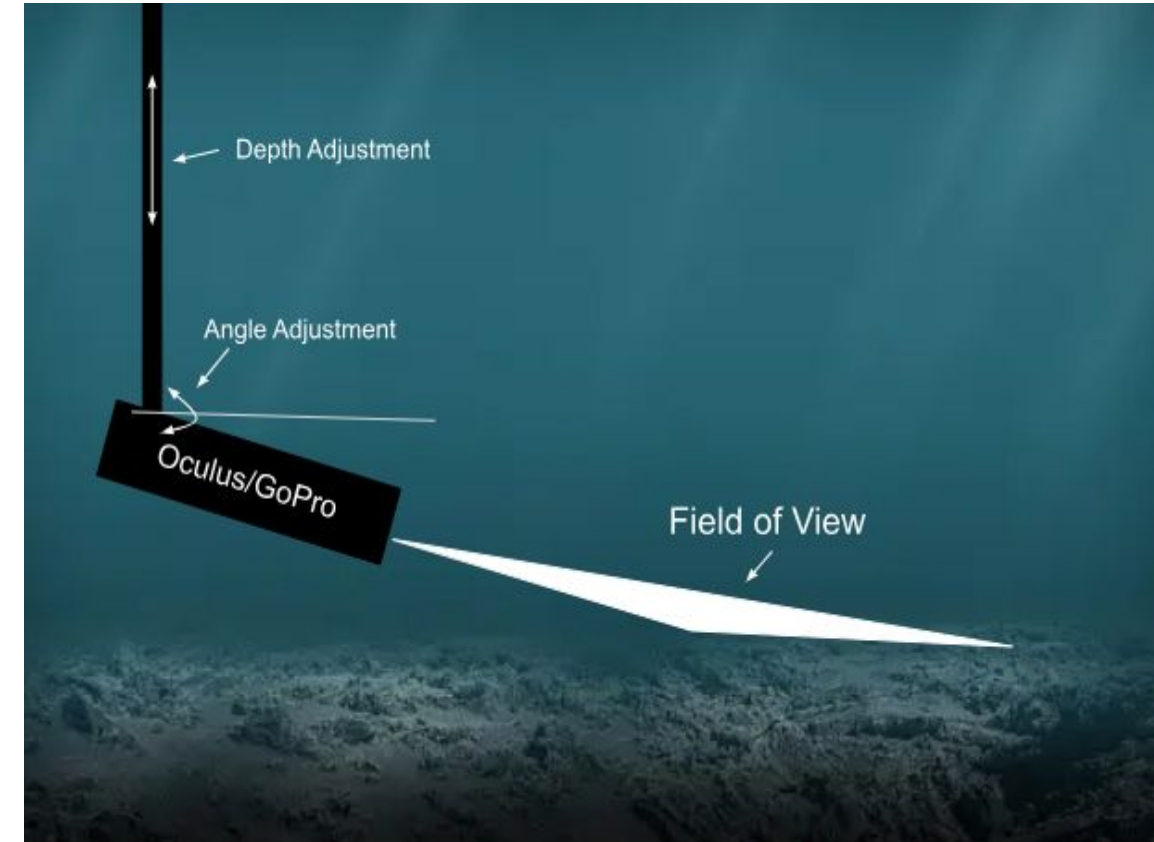
S3AM's research goal is to innovate the oyster farming industry.

Graduate researchers aim to survey the oyster beds via their ASV using a sonar and GoPro.

Our goal is to design a new mount to improve data collection in varying underwater landscapes.

Mount Requirements:

- Depth Adjustment
- Sonar Angle Adjustment
- Impact Resistant

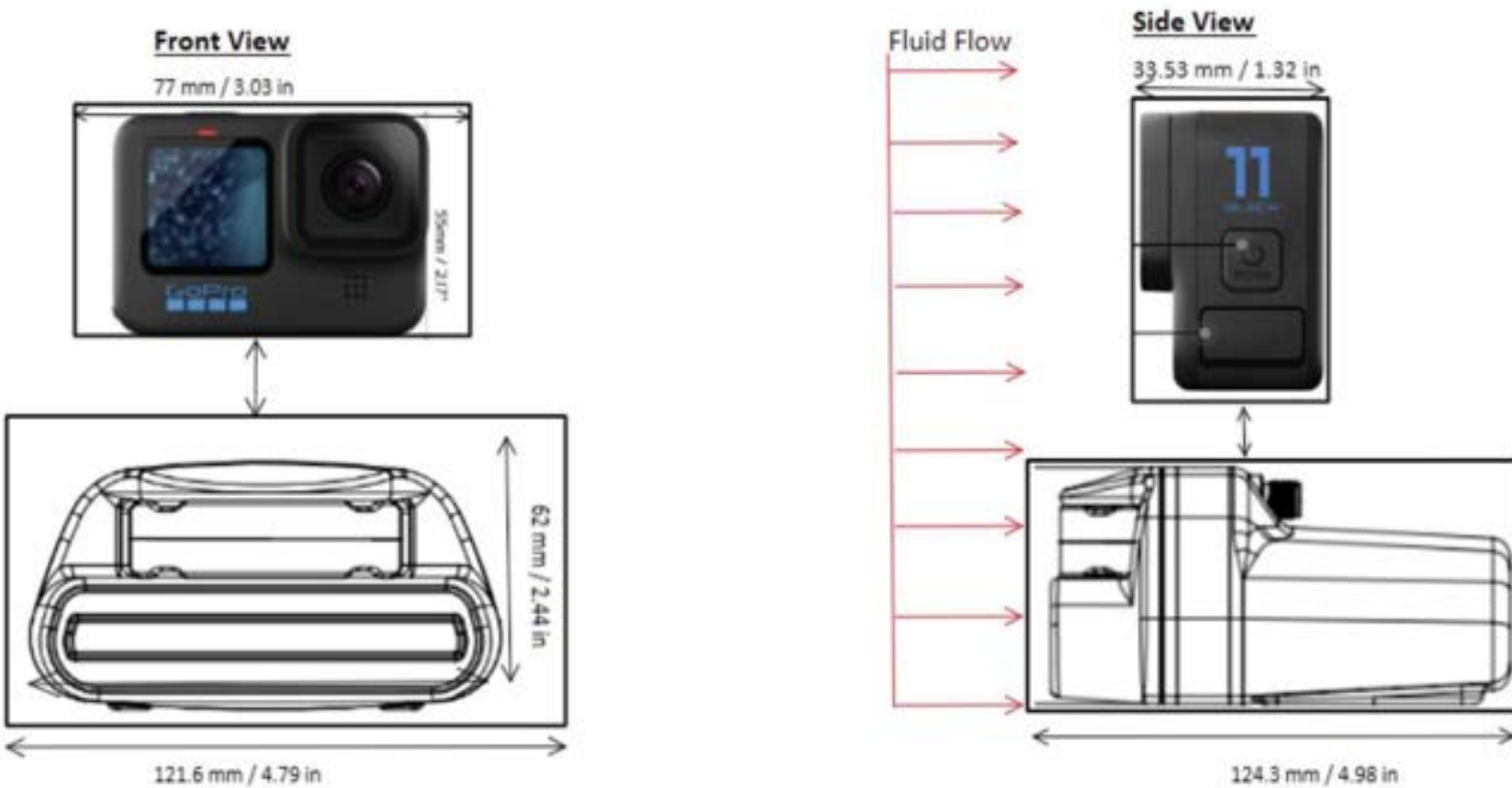


Conceptual overview of our sonar mount customer requirements.

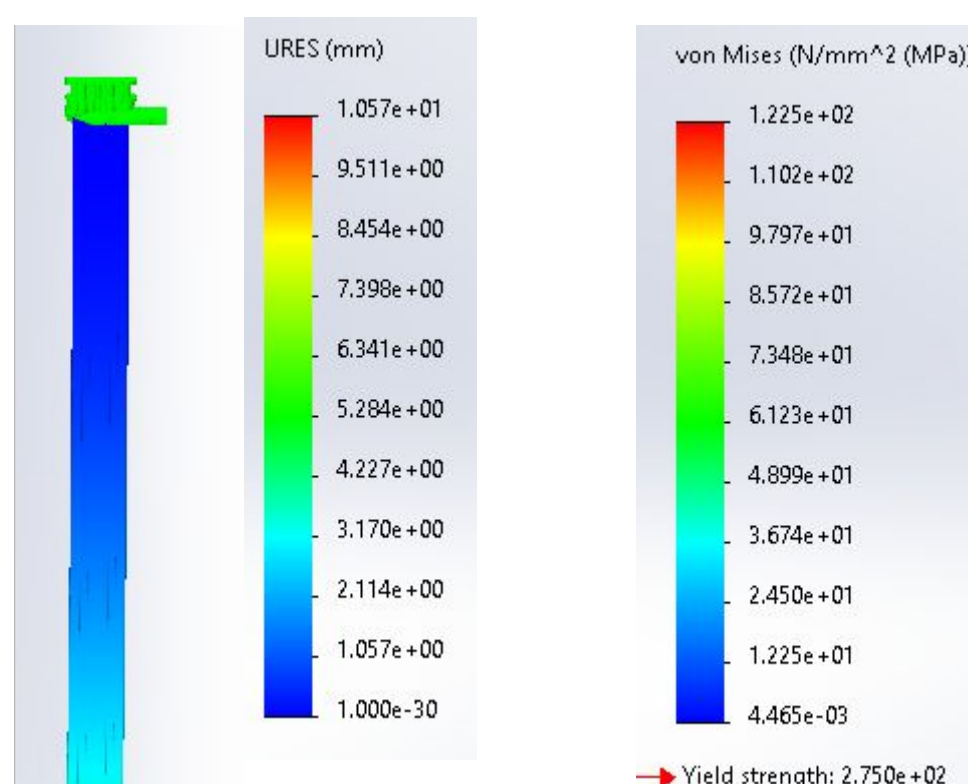


Current Autonomous Surface Vehicle (ASV) set-up with manual depth adjustment.

Design Calculations & Analysis



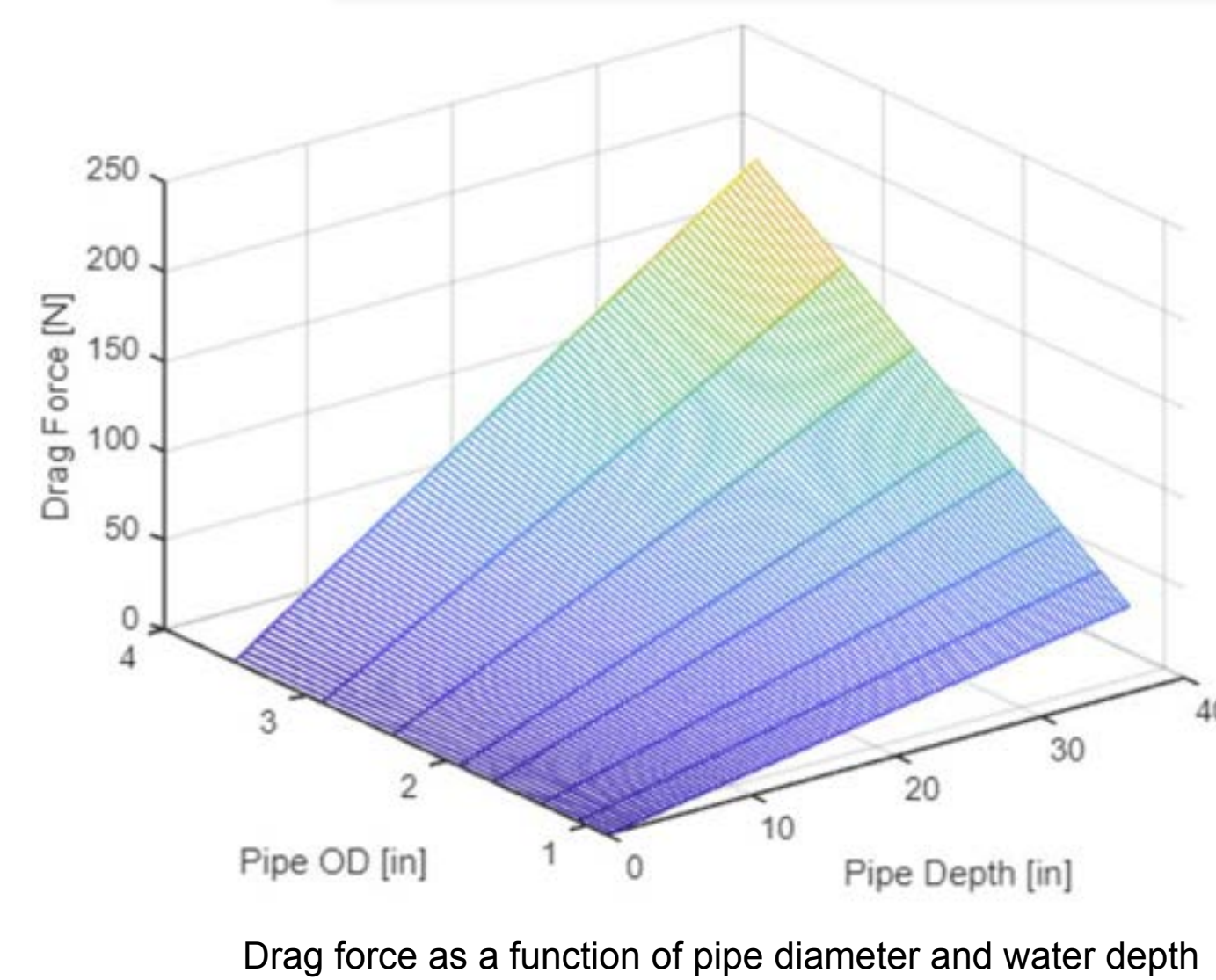
The dimensions of the GoPro and Oculus Sonar are the only fixed sizes in our mount. So we can calculate the face area as a constant.



Left: Deflection of the 80/20 vertical member. The maximum deflection at the end is 1.057 mm.

Right: Von Mises stress in the 80/20 vertical member. The maximum value is 57 MPa. The yield stress is 257 MPa.

Both tests were conducted with a 150 N force at the orange arrow.



Drag force as a function of pipe diameter and water depth

Critical areas of focus:

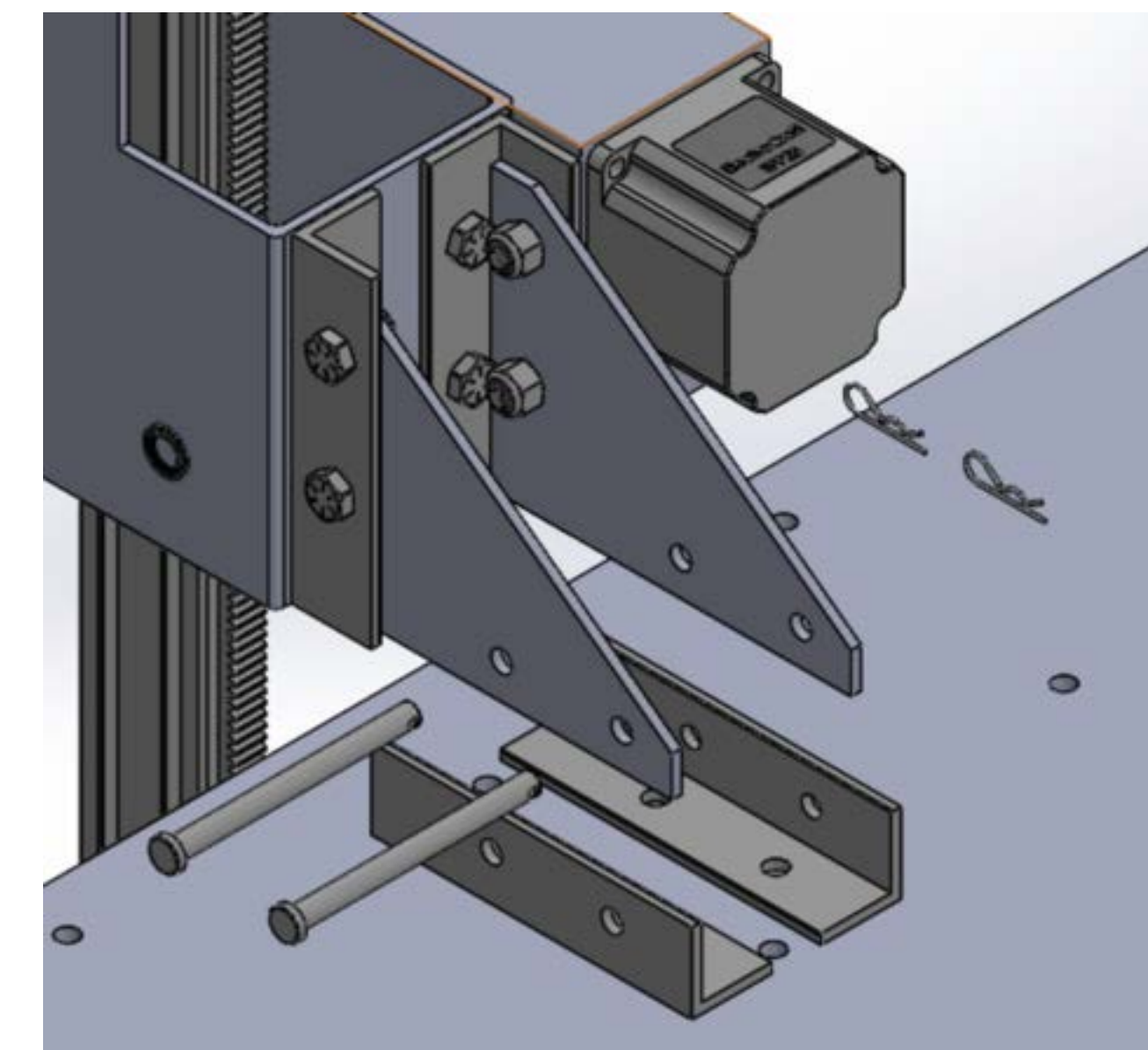
- Shaft sizing
- Fastener sizing
- Vertical member deflection
- Buoyancy
- Gearbox ratio
- Motor sizing

Final Design

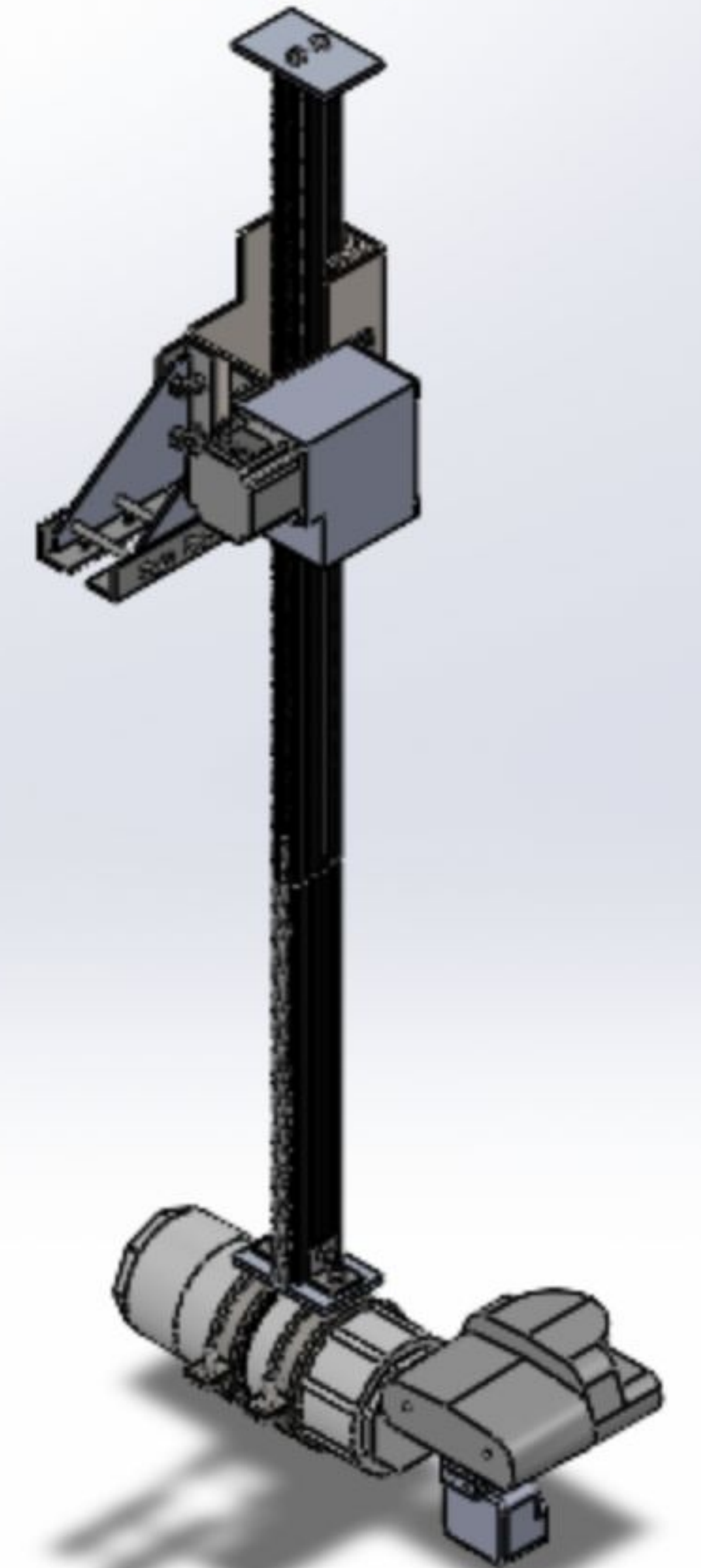
- Vertical actuation from 0-3 ft via rack and pinion
- Angular actuation from 16-45° via stepper motor and shaft
- Waterproof enclosure with shaft seal to allow angular rotation underwater
- Worm gear with self-locking mechanism to maintain position



Assembly inside the waterproof enclosure that provides angular actuation



Attachment method to the ASV

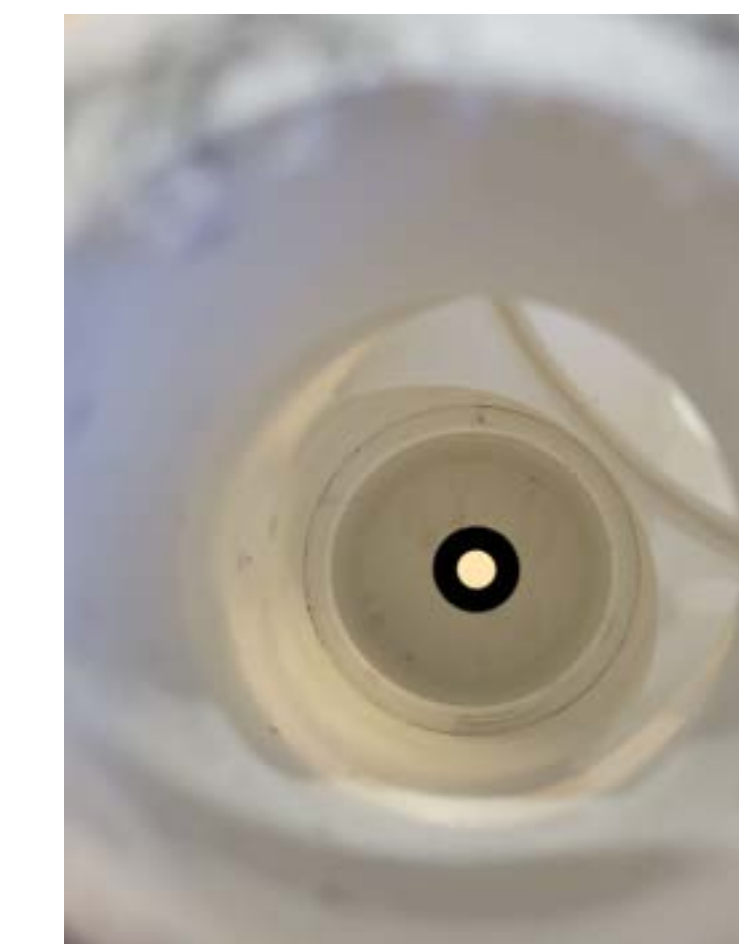


Full assembly of the product

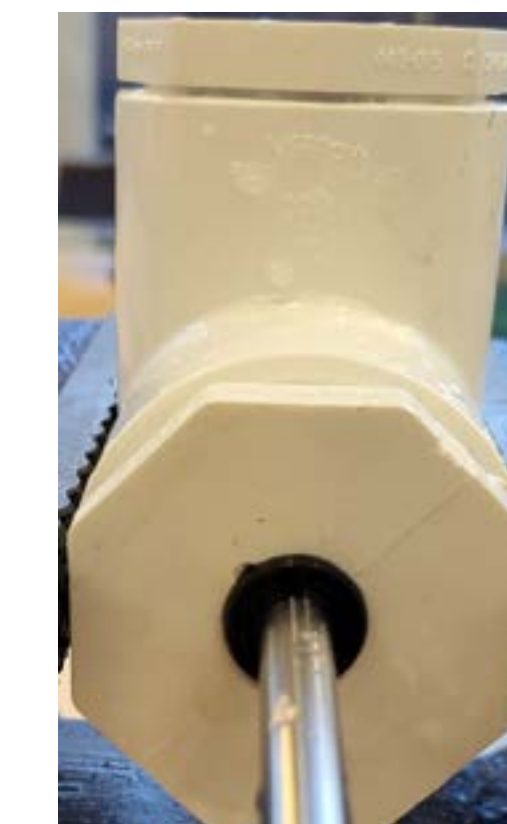
Prototype & Test Results



Waterproof Assembly submerged under water (rocks use to hold assembly down)



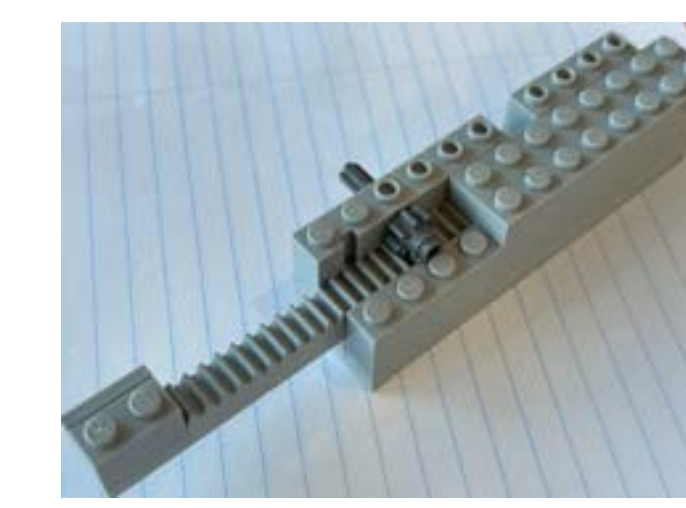
Visual inspection to ensure no water entered in assembly during submersion test



Waterproof Enclosure Prototype



First iteration of waterproof enclosure and rail connection



Rack and Pinion Model



First iteration of connection between sonar and rotating shaft