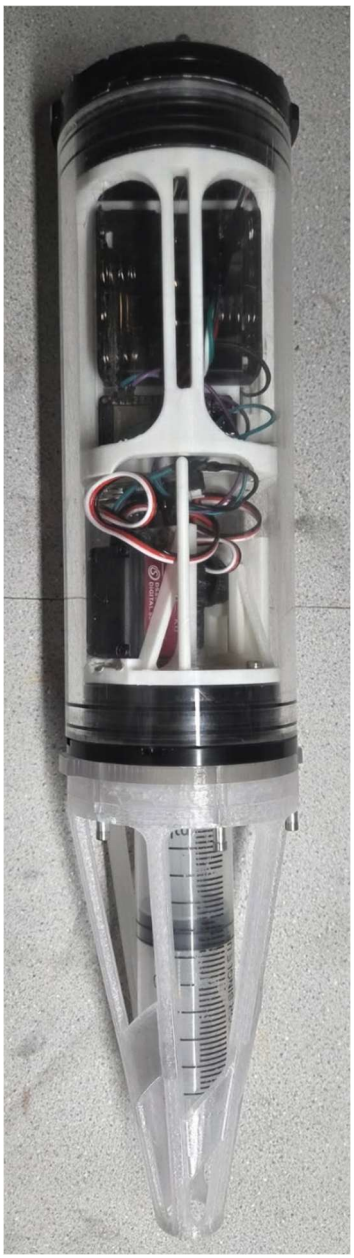
Wave Co. NON-ROV Device Design Document



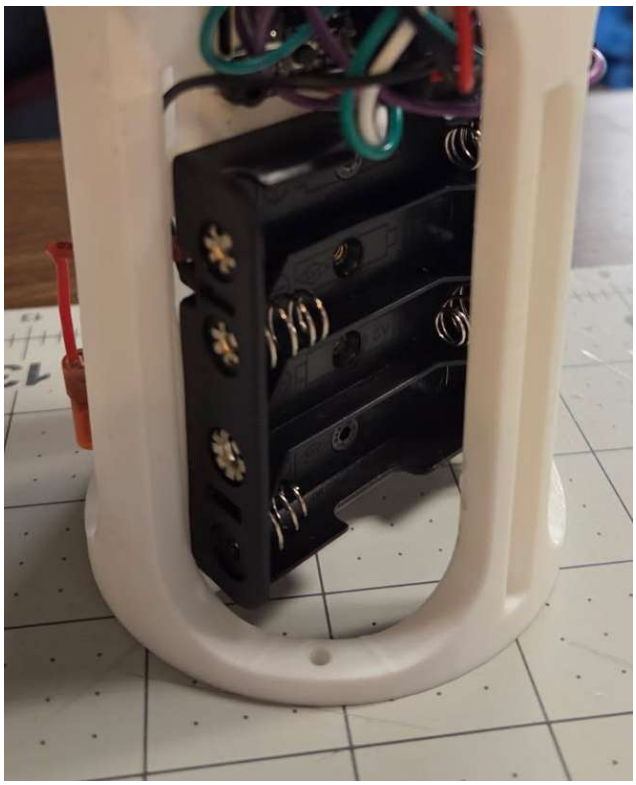
For this competition year, Wave Co. presents a significantly reworked and improved version of the previous vertical profiler. The main housing remains unchanged, a 76mm inner diameter enclosure from Blue Robotics that is cut to 222mm in length. The buoyancy change mechanism consists of a servo motor that drives a rack and pinion system to create linear motion from rotation. This linear motion acts on a plunger inside a syringe to expel or draw in water. To measure the current depth, a Blue Robotics Bar30 barometric pressure sensor is installed on the opposite endcap of the syringe. This sensor is also used for detecting the bottom of the pool through calculating the rate of change for the depth. Once the rate of change decreases to a certain threshold, it is registered that the bottom has been reached.

The profiler utilizes an ESP32-S2 microcontroller with the WROOM module for communications and computing. For shoreside control, the float will connect to a mobile hotspot and selfhost a webserver that can be interacted with from the shore. This webserver will allow instructions to be passed to the float, and depth data to be read from the float. The only command that will be sent to the float is the command to dive, which will be done via a button on the webserver. This command is sent from the webserver to the Arduino script via an HTTP_GET command. During the dive, the float will lose connection to the shore and will autonomously continue its descent to the bottom of the pool. Once a depth of 2.5m has been reached, the profiler will maintain that depth using a bang-bang controller. A PID controller was considered, however, it was determined to be unnecessary because the float may oscillate within ±50cm of 2.5m and collect full points.

The float is powered by AA batteries wired in a 4S1P configuration. We selected the 4S configuration as it was the lowest voltage our servo could operate at. The 1P configuration was determined based on dry testing the syringe mechanism while connected to a bench power supply with a current readout. Following initial testing, the FLA value was determined by submerging the buoyancy generator mechanism's water inlet port, enabling all profiler systems, and requesting the profiler to dive. Below are the results of this testing.

	Current (mA)
Idle	142
Buoyancy Change	412
Fuse Selected	500

Below are pictures of the fuse and battery pack



Data - - - - - - - - - -

Power ——————————

FLA (idle) = 142mA
FLA (buoyancy change) = 412mA
Next standard fuse is 500mA
Fuse will be 500mA