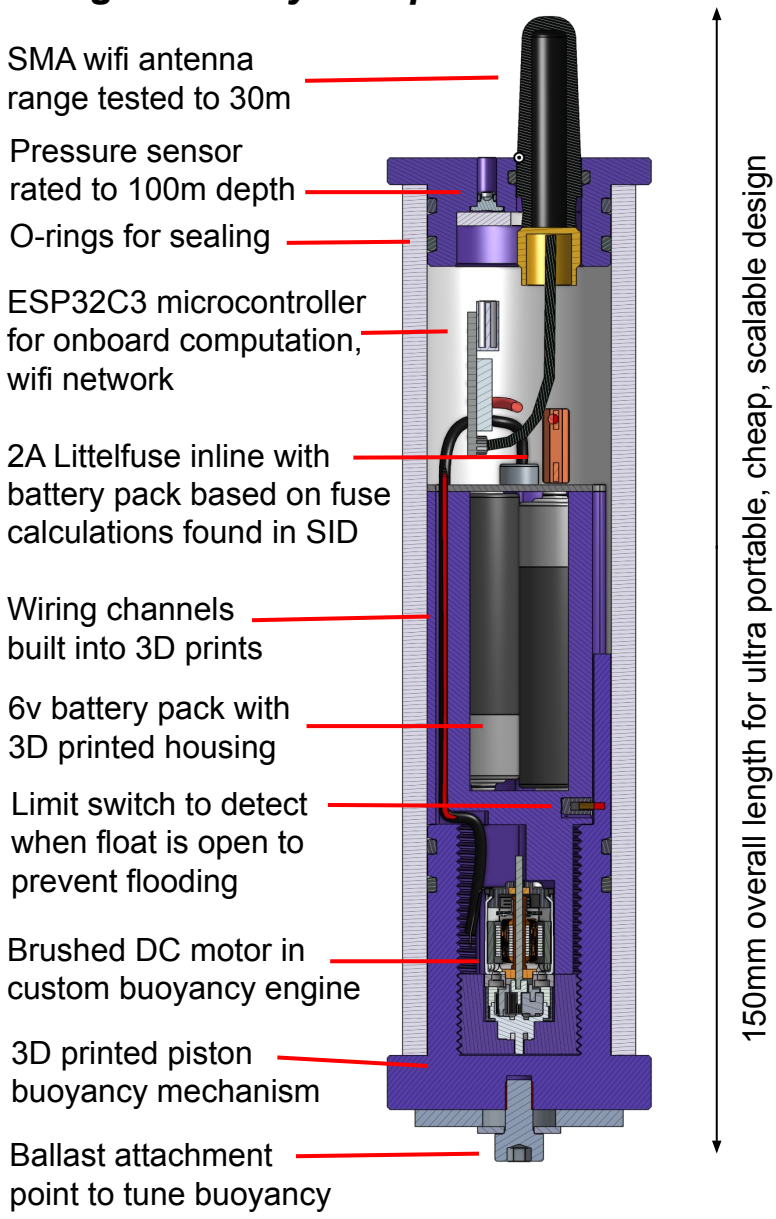
UWROV NanoFloat Design & Safety Compliance

UWROV's 2024 profiling float, the *NanoFloat* 1.0, is unprecedented in its innovative design, specially optimized for the 2024 MATE RFP.

NanoFloat is designed around two primary objectives: fast profiling for **Task 4: Vertical Profiling**, and remote pressure data transmission for **Task 4: Data Visualization.** To excel at these primary objectives, *NanoFloat* is built with reliability, and operational simplicity, and cost-effectiveness as its core design principles.

We prioritized *NanoFloat's* **Task 4** performance by maximizing buoyancy differential and wireless performance, while maintaining sufficient mission duration, processing power, and sensor accuracy.

The buoyancy drive uses a custom linear actuator to extend the bottom endcap, with a brushed DC motor-driven screw serving as the actuator. The central ESP32 microcontroller communicates with the pressure sensor and uses its data to inform motor actuation. When the float surfaces, the ESP32 generates a WiFi network to which the surface station connects for wireless communication and visualization of the logged data.



Safety Requirements Verification:

- ✅ ELEC-NRD-001: *NanoFloat* runs on a **6V DC** nominal **internal** battery pack with a **2A** fuse, which is **under** the 12V DC and 6A requirement.
- ✅ ELEC-NRD-002: *NanoFloat* does **not** contain prohibited devices (no cameras, no thrusters). *NanoFloat* **does use** a variable buoyancy drive that enables motion in the water column.
- ✅ ELEC-NRD-004: *NanoFloat*'s battery pack consists of **4 non-rechargeable (primary) alkaline AAA batteries.** Batteries are securely mounted in a custom 3D-printed **housing structure**.
- ✅ ELEC-NRD-005: *NanoFloat* uses a **2A Micro Blade Littelfuse** inline with its battery pack. The fuse is located **0.3cm away** from the battery pack, with a **1.2cm wire** connecting it to the positive terminal, which is **less than 5cm requirement**. It can be **easily inspected** by removing the internal electronics carriage from the housing.
- ✅ ELEC-NRD-006: *NanoFloat*'s design meets the requirement that the enclosure opens if internal pressure exceeds external. *NanoFloat*'s end cap, which is **2.6cm in diameter and exceeds the 2.5cm minimum diameter,** serves as a pressure relief plug.
- ✅ ELEC-NRD-007: The *NanoFloat* SID can be found in the SID section of the technical documentation.