Our vertical profiling float, *Dipper*, has a height of 70 cm, a diameter of 17 cm, and a weight of 8 kg. The float is operated by a buoyancy engine composed of a 500ml syringe attached to a linear actuator which takes in and ejects water from its environment. The float is slightly positively buoyant when the linear actuator is fully extended thus completely compressing the syringe (no water). At the surface, the float can transmit a signal of UTC and depth to the receiving deck crew via WiFi using a Portenta micro-controller and waterproof antenna. A pressure sensor is attached to the float to collect this data. When descending, the linear actuator retracts and expands the water volume of the syringe. At this point the lower pressure inside the syringe pulls in water from outside the float, increasing the mass of the float by 500g. Since net volume of the float does not increase, the increased change in density allows the float to descend. A programmed timer instructs the linear actuator to activate the syringe according to predetermined times for ascent, descent and pauses. The pressure transducer will measure the pressure in relation to time every 5 seconds. With the pressure measurements received, the software displaying the UTC and pressure data will also calculate the depth using the hydrostatic water pressure formula:

$$P=pgd$$

where hydrostatic pressure is dependent on density of water ($1.00 g/cm^3$), gravitational acceleration constant ($9.8 m/s^2$), and depth (m).

Power is supplied internally from two banks of four C batteries connected in series, totaling 12V DC. Following safety requirements, a 5amp fuse is attached to the power wire within 5 centimeters of the battery pack. A second fuse is wired to the negative side of the battery pack, also within 5 centimeters. (See Photos 1 and 2). A rubber plug with a diameter of 2.6 cm is located on the cap and provides an emergency pressure relief system. (See Photo 3). Additional measures were taken to neatly organize wiring and to cover sharp edges, including the ends of metal bracings and the ends of zip ties. (See Photos 4 and 5).

Photo 1: Fuse Location, 1
Photo by: Lisa Lininger

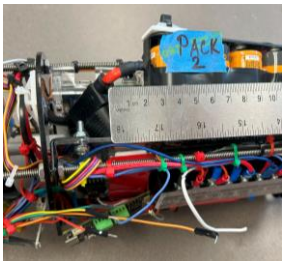

Photo 2: Fuse Location, 2
Photo by: Lisa Lininger

Photo 3: Rubber Stopper
Photo by: Ruka Ito

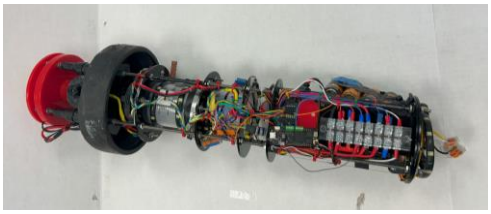

Photo 4: Internal Wiring
Photo by: Ruka Ito

Photo 5: Float (*Dipper*)
Photo by: Ruka Ito