

## Vertical Profiling Float Documentation 2022

HAWKS Engineering

Hoffman Estates High School

Ranger Class

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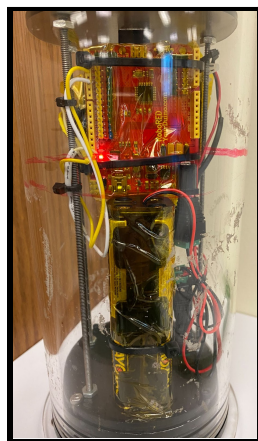
The vertical profiling float has the ability to complete vertical profiles with the help of an on-board buoyancy engine. The profiling float is initially slightly positively buoyant which allows the pilot to easily transport the float to the deployment site. Our buoyancy engine is a 500 mL syringe, which is open to the pool through a penerator. The amount of water inside the syringes changes the density of the float, which allows us to descend when water is pulled into the syringe and then ascend when the water is pushed out of the syringe. This is being done by software on the on-board Arduino that drives an H-bridge circuit which switches the polarity of the linear electric actuator allowing it to pull or push the syringe. In the software we have a cycle of 7 seconds where water is either being pulled into or pushed out of the syringe and a 30 second “waiting period” to complete profiles. This time cycle can be adjusted to accommodate any depth of water.

In order to meet MATE’s safety specifications the vertical profiling float is being powered by 8 AA alkaline batteries in series which provides 12VDC and is protected by a 3 amp fuse, which is the maximum current draw of the electric actuator. In order to counteract the pressure at the bottom of the pool we are using a 10.16 cm stroke linear electric actuator that draws 0.81 amps and provides a force of up to 1,000N. The housing for these components satisfies MATE’s dimensions by using a 45.72 cm long tube with a diameter of 11.43 cm. A watertight seal is accomplished by two aluminum flanges. These flanges can pop off if the pressure builds up inside.

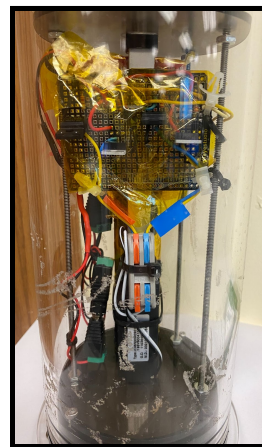
MATE has defined a buoyancy engine as moving air or liquid from inside the float to a bladder outside the float, changing the volume and thus the density of the float. Although we are moving a liquid from outside the float into a syringe to change the density rather than changing the volume, we are still using the same concept to accomplish the vertical profiles.



Profiling Float



Battery Pack and Arduino



Actuator Core