Vertical Profiling Float

The vertical-profiling float serves as a float that is capable of completing two vertical profiles after being deployed by the ROV. It utilizes a buoyancy engine to control the displacement of seawater and thus control the vertical height of the float. This buoyancy engine is composed of 3 separate modules. Firstly is the pressure accumulator that powers the system. Secondly is the pneumatic control system composed of the solenoids and bladder. This system controls the pressurized airflow to and from the bladder. The bladder's volume varies, which modulates the buoyancy of the buoy. The last module is the electrical housing, which controls the solenoid actuation timing.

Our design approach focused on rapid prototyping and testing for the development and construction of the float. To accelerate the design process we used standard parts like PVC piping that could be locally sourced. We also developed a basic python program that helped us determine the movement of the float given a few parameters like mass and volume. This program aided us in estimating the time to surface of 1 second in a 6-meter pool given a 2.5% increase in volume. This program proved the viability of our design before any physical testing. After the initial prototype took only 3 seconds to surface, we became confident in our design approach. With this newfound confidence, prototypes started construction.

These prototypes failed on many occasions, which helped us locate issues before the competition. One such issue was that our solenoids began to leak over time when the accumulator was pressurized at 40 psi. This proved to be a fundamental issue with the product thus the issue was bypassed by replacing the solenoids and purchasing a larger accumulator. Another issue was that the decreased hydrostatic pressure at the surface of the pool led to the bladder not deflating fully. Removal of the check valve to reduce barriers proved moderately successful. Together with the additional pressurized air volume provided by the larger accumulator and modification of the float buoyancy, this issue was resolved. In the end, our rapid failures and resulting solutions culminated in a successful test, and the fundamental design was finalized. We then turned our focus toward creating a proper housing and mounting system for the float.

Fig. 1 - Assembled Vertical Profiling Float

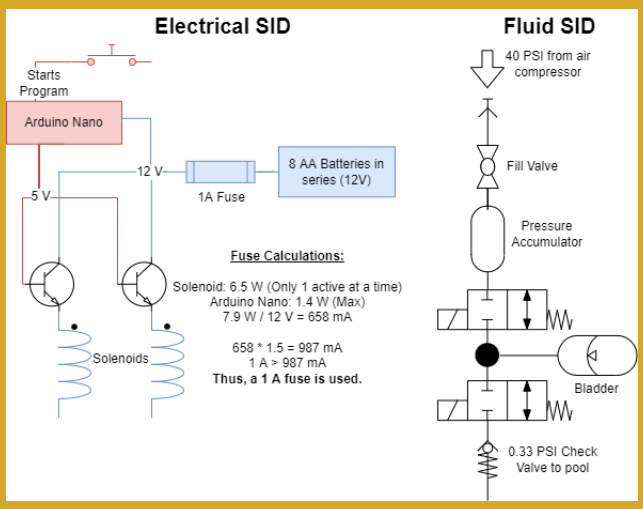

Fig. 2- System Intergration Diagram of the Float

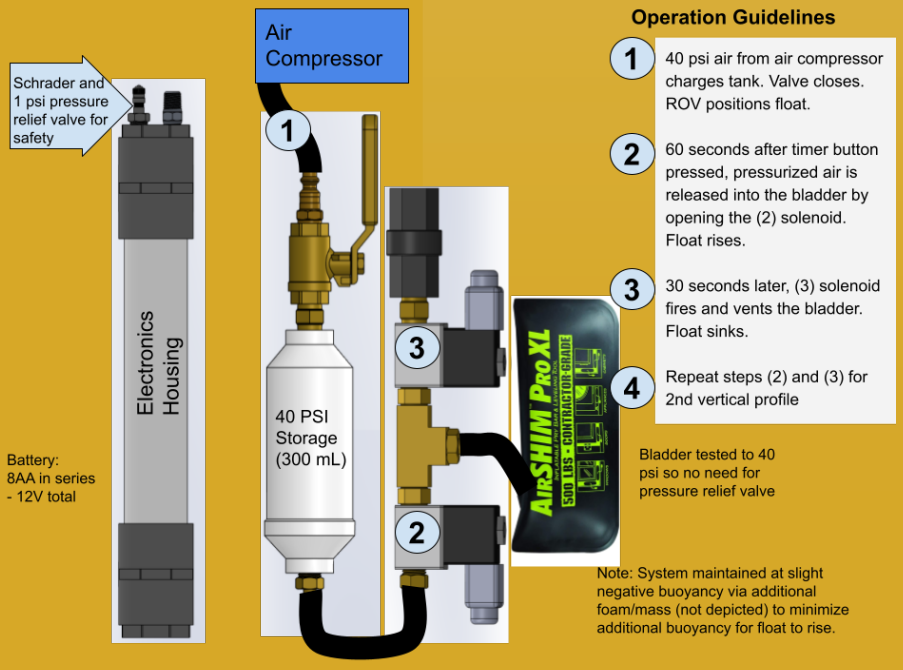

Fig. 3 - Operation Guidelines and Buoyancy Engine