

Remote Controlled Submarine the Versatile Submersible

Brandon Borah, Randy Holcomb, Scott Josey

Client: Dr. Choi

Advisors: Dr. Choi, Dr. Barnett, Dr. Sumner

Electrical and Computer Engineering, Mechanical Engineering
School of Engineering Mercer University, Macon, GA



Abstract

The overall goal for this project was to make improvements on the overall existing design first created by Team Aquabots in Spring 2013. The deliverables requested by our client, Dr. Choi, include improvement of the visual capabilities of the submarine in the form of a pan tilt camera and improved lighting, a stronger tethering line capable of supporting the weight of the submarine being manually pulled out of the water in case of power or systems failure, and a more streamlined hull to improve performance and eliminate the possibility of snags on debris. Finally, we are to ensure that our submarine is compatible with the wireless system being designed by the kayak team.

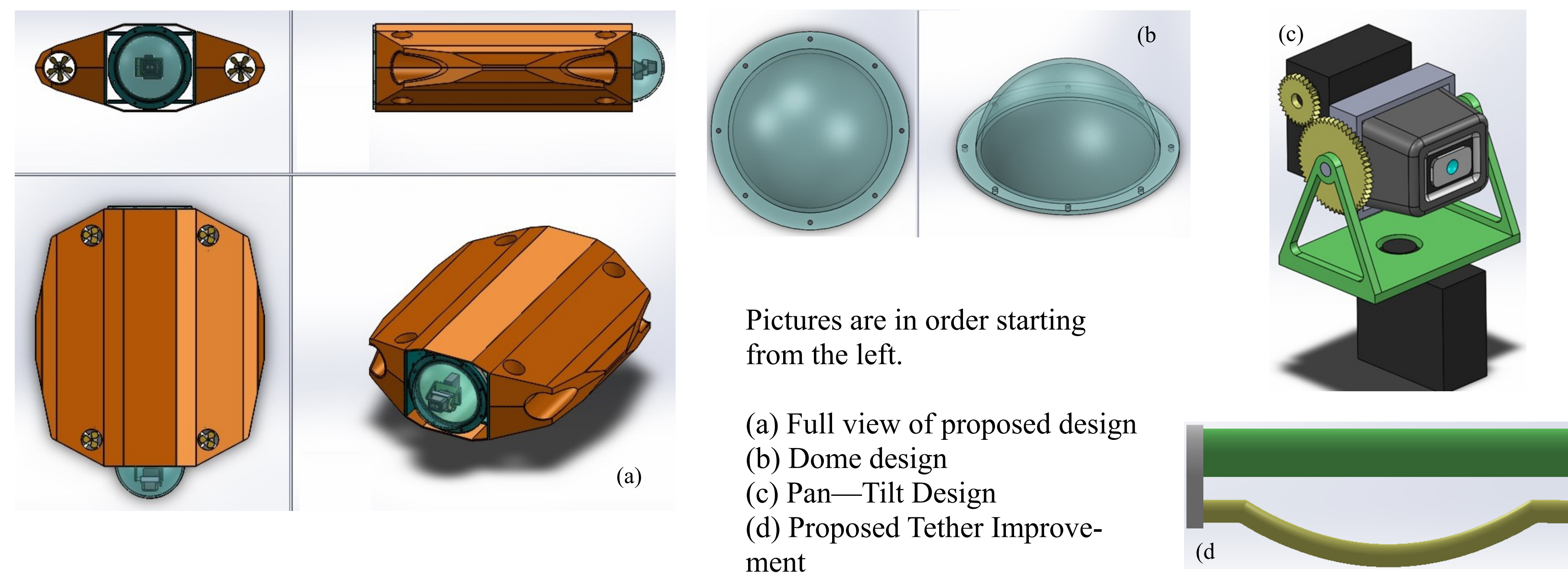
Our team completed designing and constructing the various improvements for the submarine. A pan—tilt device was installed to improve the overall vision of the submarine. The lighting was improved with the addition of Cree XLamp LEDs. The overall tether was reinforced to make snags less likely and power cuts. Finally the body of the submarine has been encased of PVC to extend the laminar flow region over the vessel and reduce drag caused by protrusions and other obstructions on the frame which will also reduce the number of areas where debris can become caught on the submarine.

Mechanical Improvments

Overall the mechanical improvements of the submarine were thoroughly successful. The first improvement was streamlining the hull. This was completed by the way of a shell. The outer shell of the submarine was designed to both improve fluid flow around the submarine and reduce the likely hood of snags due to hanging wire or debris in the water. The next mechanical improvement is the viewports. This included a new dome for the front of the submarine and a clear acrylic plate on the back side to improve overall vision of the camera system. With this dome, a pan—tilt device can be implemented and thus improve the vision of the vessel.

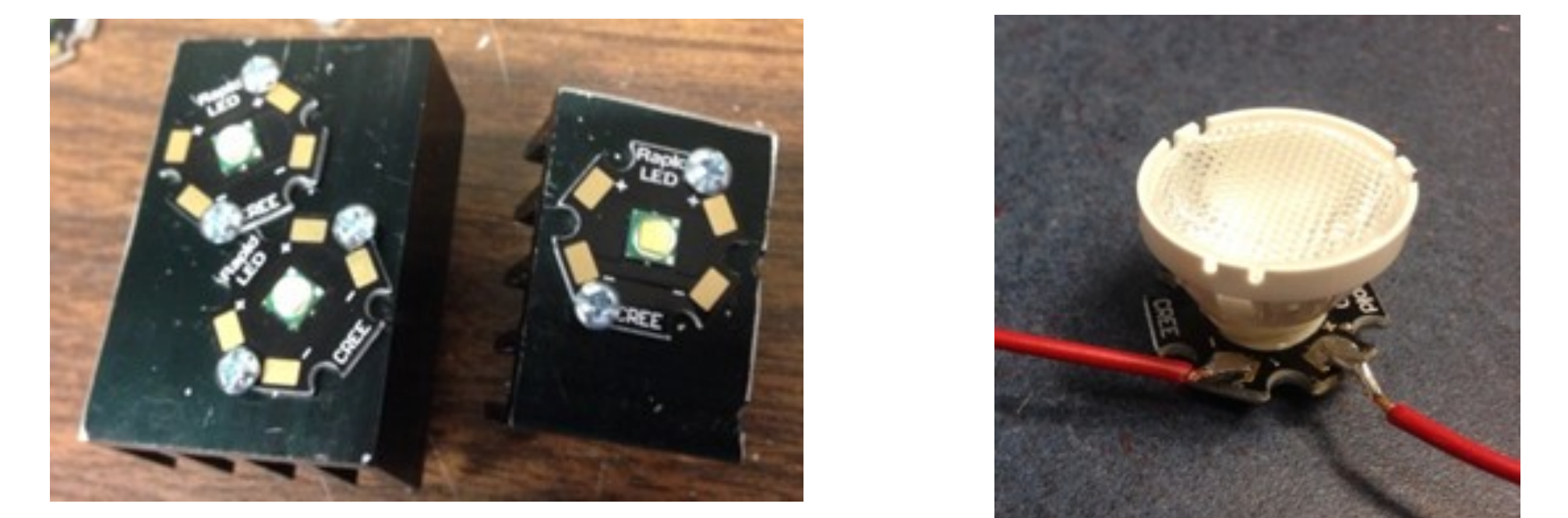
The second main mechanical improvement added onto the submarine is a new base for the electronics. The base needs to be stable so it does not shift while moving. The new base was created out of hardboard and the laser printed located in the Robotics Lab. The main design focus was modularity, stability in and out of the craft, and functionality for organizing all electrical components.

Theoretical Design

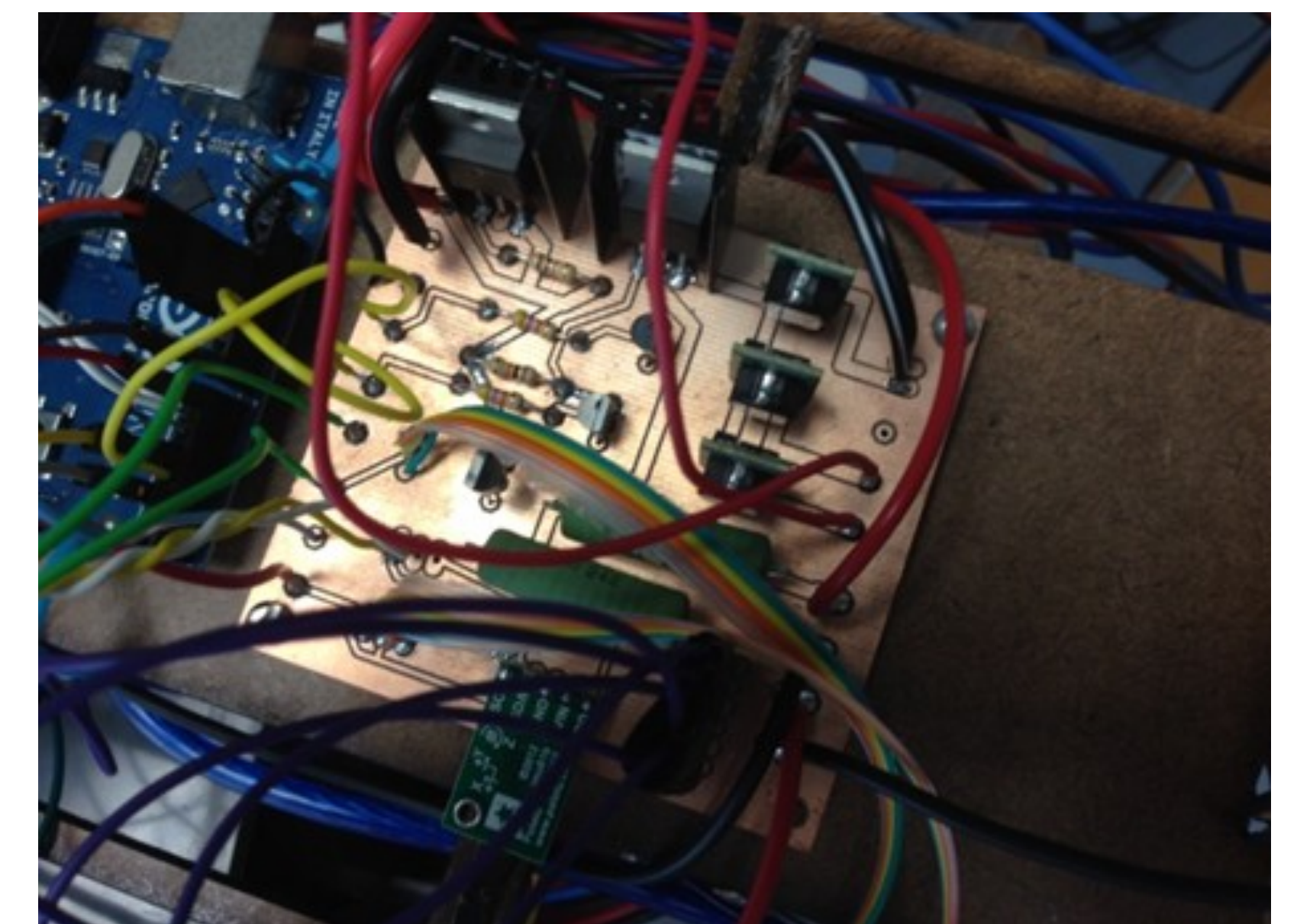
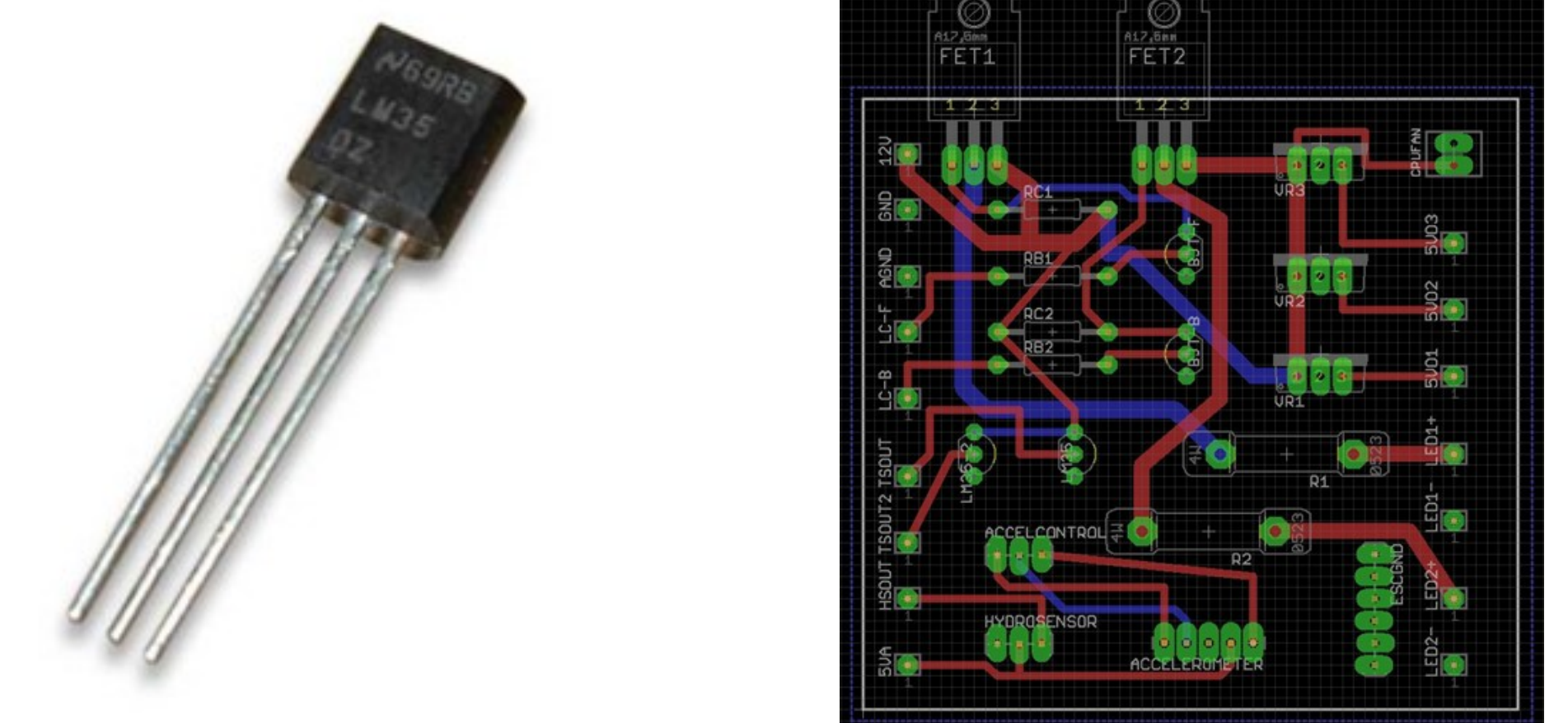
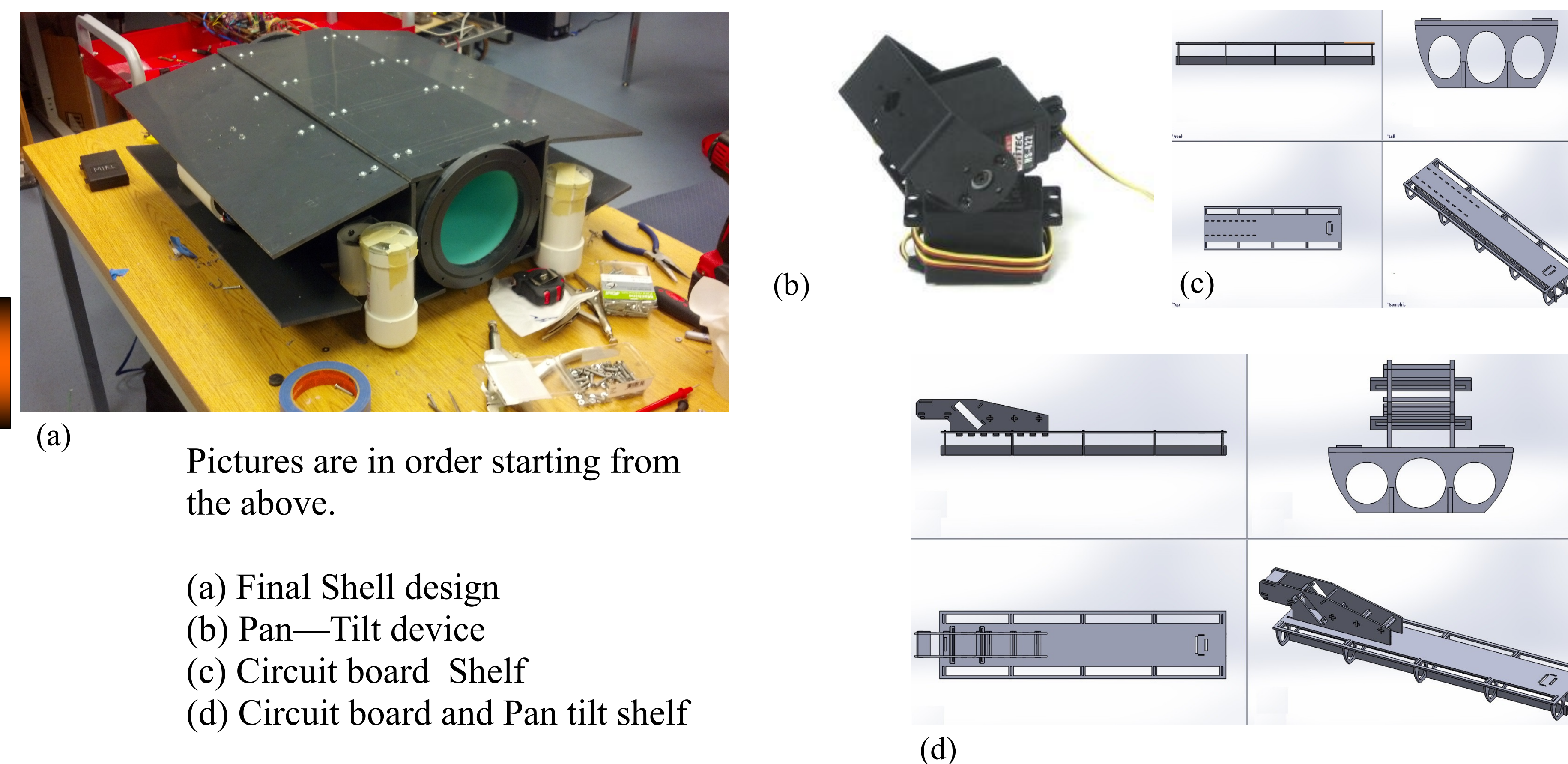


Inside Additions

To improve the overall lifespan and quality of the submarine, some additions were added inside the submarine. First, the old LED panels were replaced with high power 10W LEDs and heat sinks. Next, temperature sensor integrated to provide feedback for the user. Finally, a PCB was created to consolidate all electronics that did not require placement forward or aft of the craft.



Final Design



Recommendations

Although many new additions and repairs were implemented, there is still room for improvement. The first recommendation for future work is to replace the vertical motors. Next, all of the motors need to be properly mounted as some are off center and lacking a second brace. The shell is also not fully complete from the design specifications and needs to be finalized. Another is to further reinforce the tethering system and fully test the pressure vessel. Finally since there were many issues with the mechanical work, a final recommendation would be to redesign the framework of the submarine as there are many improvements that can be made.

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