OCEC ROV W24 Sub-Team Summary

Design/Structure

Sanchez, James

- After the initial idea of the ROV project was brought up, the camera system was quickly modeled shortly after in Solidworks. The main body was modeled after a PVC tube of 24” length and many other components such as the ribs, side panels, and hardware referenced after that PVC tube. However, a 2nd total redesign was done for a short 18” PVC tube. This was beneficial financially and wasn’t as unnecessarily large as the 24”. The main body was going to be sealed with o rings, pressed with multiple screws into the tube. After the 2nd total redesign, Jessey had suggested we forgo a compressive method to seal the insides. Therefore, we planned for gaskets to be cut out to compliment the compressive end caps. In order to connect the tube to the ribs, we designed brackets to hug around the tube and connect together with the ribs in the middle. We redesigned the thruster mounts as the thrusters that were premade had insufficient mounts. What resulted was a circular collar insert with a flange at the top to mount the thrusters. The benefit with most of the 3D printed components was that there weren't any permanent parts, and that everything could be disassembled for future repairs or upgrades. Jonathan had brought up a point for possible leakage if the rear end caps were to continue to be 3D printed as the higher pressurized water could make its ways through the layers of print and inside. To counter this, Jonathan suggested we make a 2 part rear end cap where both parts would be connected together with epoxy (or later, as Sabrina suggested, with marine JW glue) to create a more perfectly homogeneous layer to counter the water. Colin had asked us to create an electronics “tray” that could mount all the electronics in an organized fashion and could all be pulled out of the vessel all together.

Electrical

Colin Longbons

For the project's current iteration, the ROV is equipped with an Arduino Mega 2560 based model. This particular component has been chosen due to the increased amount of digital pins, and an overall increase in the size to function ratio when compared to the Arduino UNO.

For propulsion, the ROV is equipped with 12-volt A2122 1000KV 3-phase brushless DC motors with 30A ESC. These motors were chosen because of their low price point, and good balance of RPM to torque. I cannot confirm as no force testing has been done on the motors, but I can say that we will most likely not be using the full 30 amp capability. This is due to the high probability of overheating, and the fact that at 30A, the motor can hypothetically deliver 350 Watts of power per motor, which based on thruster layout, means 700 Watts for forward and upward movement. Keep in mind that a standard ebike is equipped with a 750 Watt motor. The reason we chose brushless motors is because brushless motors have no open contacts, meaning they won't short out underwater, and are more sustainable, due to no friction wear. We are planning on ordering bi-directional ESCs, which will be necessary for any type of coordinated movement underwater.

To deliver power, we are currently using a 350-watt PSU for prototyping. Power will be sent to the ROV from the PSU on the surface, and then DC power will be transmitted the the ROV via a 100ft power cord. Power loss over the length of the cable should be considered, as at 15 amps, there will hypothetically be a 2 volt drop.

The ROV is currently planned to be controlled by potentiometers for each motor. This is only for prototyping, and it is planned to use an Xbox controller at some point. The connection between the controller and ROV will be an 8-pin ethernet cable. This should give plenty of routes for any additional controller functions.

The camera has yet to be decided at this point. The options are an ESP32 camera or a GoPro. Pros of the ESP32 is that communication will be cheaper, and it’ll be easier to

integrate with the Arduino. The cons of the ESP are a worse video feed and that we don't already own one. Pros of the GoPro are better video quality, waterproof, and we already have one. Cons are more expensive cable, harder integration with Arduino circuit, and battery power.

In the future, we plan on integrating a sensor array to the ROV, including depth, rotational, accelerometer and moisture.

Project Management

- Jessey