# Frog-box III

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**Brunswick High School**

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## ABSTRACT

Frog-Box III was created through modifying a basic design to complete the tasks of the competition. For example, the arm and hook were created from the original thought of creating a claw. We figured the arm and hook design would be more efficient.

Also, through modifying the design we ran into many problems, some more pressing than others. The right propeller would fall off. After trying many things we finally found a way to put it on securely.

While testing the ROV at the YWCA we discovered that each of us were more apt to perform certain jobs. Whether it was driving the ROV or working on engineering together we are confident in our skills.

While working on the ROV we gained new skills.

## BUDGET/EXPENSE SHEET

- PVC - $4.00
- Paint - $4.50
- Noodles - $1.00
- PVC pipe cutters - $14.50
- Hooks - $10.00
- Pooper scoopers - $2.00
- Duct Tape - $3.00
- PVC for camera - $3.00
- Flashlight - $6.00
- Screws - $1.50

## DESIGN RATIONALE

Our original ROV design structure was based on the ROVs built and used by MATE and NASA. Those ROVs were constructed to accurately multitask at deep levels of water. We capitalized on the expert workmanship and technology that was used by experienced engineers to build these ROVs and incorporated the basic constructs of their sophisticated ROVs into our design to suite our basic purposes.

Therefore our original design mimicked a streamline rectangle

with directional propeller action located at the aft position of the ROV. Lifting and lowering propeller action was positioned at the center beam allotting for equal balance. Floatation devices were attached to both the lee and port side of the vessel further contributing to the overall balance and floatability of our ROV. Air holes were added throughout the vessel to aid in quick and stable submersion. Our vision was to create an assembled product that was a scaled-down composition of more expensive and complex ROVs currently in use worldwide.

## TROUBLESHOOTING TECHNIQUES

Drilling and using floatation devices is a great way to create the ideal buoyancy. We had to cut the floats in precise locations in order to make them the perfect size, thus giving the ROV the desired buoyancy. By drilling the holes in the PVC they became neutral in the water, adding the floats to the ROV made it rest just below the top of the water. As we worked with our machine we realized problems. Some of these problems such as the right propeller falling off were fixed by applying and using a different screw and plumbers tape. The up/down motor malfunctioning wasn't fixed, but simply replaced. The loose pipes were remedied with duct tape. The ever changing pipe lengths were a continual fix with just cutting and replacing. The length and width was adjusted multiple times as result of the task that required us to lift and place the electronics module into the central node. The hook was established in order to transport the power communication cable connector. Our ideas about the hook were derived from our original design were an arm with a claw was used. Through fixing these problems our design progressed and evolved, resulting in a completely functional machine.

## CHALLENGES

Along the way we had many challenges—some between our teammates and others about the tasks. One example is the right hand side motor. The challenge that we faced was that the motor and

propeller continuously fell off while we practiced with the ROV in the pool. To make things worse the pH level was off in the pool, so we could not physically get into the pool to retrieve the desired objects. In order to retrieve these objects we tried a number of methods. We were finally successful when we taped a net to a meter stick and used a PVC pipe to push the motor and propeller into the net and scoop them out. When we changed the length of the screw and secured it with plumbers' tape to keep the propeller from falling off, we achieved a stable and permanent fix to this challenge.

## LESSONS LEARNED

Pooling our resources to overcome challenges is the most valuable lesson we three learned. Not only did this lesson help us greatly improve our project, it also helped us in day-to-day life. We feel this lesson is the most important lesson one could learn. By using the resources available to us we found inventive ways to retrieve the ever straying propeller and the pipes that always seem to pop out of joint in crucial moments. Other important lessons include:

- Operation of drills
- Cooperate as a team
- Use of controls
- Technical skills
- Navigation of ROV
- Working with PVC pipe

## CAREER

Marine biology is the scientific study of animals, plants and other organisms that live in or near the ocean and other saltwater environments. The study of marine life results in frequent use of ROVs. Examples of marine biologists' use of ROVs are studying life in deep trenches where normal human

passage is impossible, such as hydrothermal vents, or looking through sunken vessels, like the Titanic. Most of the time a marine biologist will work in the office processing data, and the field work is fun and very rewarding. Swimming abilities, getting along with coworkers and computer skills are very important in this line of work. A master's degree is also recommended for this career. The salary for this type of job ranges from $65,000 to $75,000 per year.

## FUTURE IMPROVMENTS

In the future we will need to make a few minor adjustments. The adjustments include leveling out the right motor to create the ideal movements under the water. We will also repaint the body to make it more attractive, but keeping it the same neon green. A major factor that we would need to know is the exact measurements of the central node so we'll know where to put the hooks. We also need to improve our organization and keep more thorough notes on design improvements. It would be a great benefit if we could practice more frequently. This would help us perfect our system to complete tasks.

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