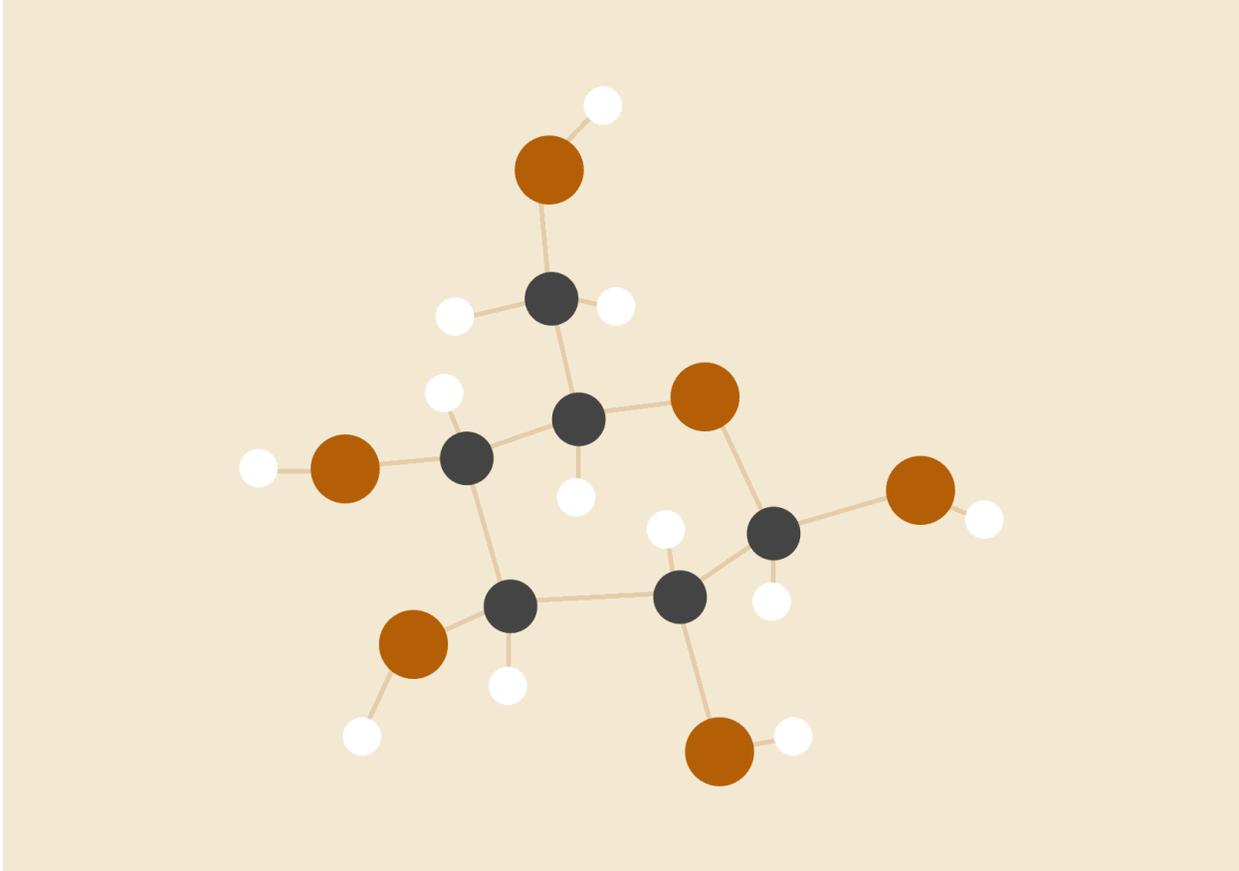


LA ROV Report



Lochside Academy

2019 ROV Challenge

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Abstract

This year was filled with firsts for everyone as this was Lochside's first ROV experience for both teachers and pupils. We used the MATE ROV 2019 guide as a guideline for what resources we would need to attempt to build a sufficient ROV. Our design was simple and effective. Despite this, we faced challenges with some of our limited resources being wasted and as a result adapting what had gone wrong to ensure the ROV could still be operated smoothly. We believe that as the first year we can set an example that even the simplest of designs can be successful and we hope they can adapt our model to better itself for the upcoming years competitions.

Mission Theme

To build and operate an ROV with the intentions for it to be able to collect resources.

Company Roles

Position	Name	Year Group
Chief Executive Officer	Ilona Sadovska	S5
Deputy Chief Executive Officer	Dylan Fettes	S6
Research and Development Director	Abigail Groves	S5
Health, Safety, Environment, and Quality	Kate Grayson	S5
Control Director	Mairi Whittingham	S5
Control Team	Kate Grayson	S5
Frame Team	Jamie Boylan, Laura Forsyth	S4, S6
Tooling Team	Rebecca Scott	S5
Finance Director	Rachel Milne, Erin Christie	S6
Presentation Team	Bethany Bain, Ailsa Clark	S5, S6
Mentors	Jack, JoJo, Scott	

Budget

Item	Cost (£)
Self tapping screws pozi pan head	£2.46
Bolt base stainless steel cup washers countersunk screw finishing washer	£2.42
Generic PVC pipe schedule sch 40 ½ inch (.5) 2-ft / ½ inch	£70.61
Everbuild P16PIPE P16 Plumbers PVC pipe cement	£6.26
8 x ½”white tee, high gloss, furniture grade sch 40 PVC 8 x ½” white 90 degree elbow, high gloss, furniture grade sch 40 PVC	£31.67
Fix point terminal strip (12, 4mm, 3A - white 2er set)	£2.82
Yasoo 5 pcs 100x60x25 black plastic cover project electronic enclosure instrument case DIY power junction box	£6.39
6x bilge pump 350/500/750/1100 GPH 12V plastic Bilge submersible water pumps (500GPH)	£116.86
Plastic online A4 size clear acrylic perspex sheet panel 297 mm x 210 mm	£3.48
Cylewet 12Pcs 1A 250V AC 2 Pins SPST Momentary Mini Push Button Switch Normal Open (Pack of 12) CLW1078	£7.39
13 Core Multi Core 12V 24V Cable Wire Trailer Caravan Automotive & Marine	£49.79
MASO Anderson Powerpole Connectors 10 Pairs 30 AMP Quick Disconnect Power Terminals Connectors	£8.99
Total Cost	£309.14

We were £9.14 over budget but we were still able to afford the remainder through personal funds.

Safety

Throughout our time building our ROV one of our main focuses was the safety of all the members of the company. Once our building plan was set up we looked into all the safety hazards that went along with each part of the build and ways in which everyone would be kept safe. We used saws to cut up materials, power drills and a round file to drill holes into the plastics, a heat gun to ensure all the wires were not in contact, and soldering kits to ensure all the ground can wires are soldered to the main can.

The safety precautions for these procedures were:

- Wearing protective goggles throughout the entire process to prevent any shavings and solder going into people's eyes.
- Wearing protective gloves whilst soldering and using the heat gun to prevent burns.

We also checked that everything was packed correctly and there were no loose wires that could come in contact with water.

Safety Checklist

Before using the ROV we would go over our checklist to ensure it was safe to use. This checklist included:

1. We would first check the ROV structure to ensure the frame pieces were together tightly, there were no exposed wires, that the motors weren't exposed, and that the wires were secured to the ROV and not in the way of the propellers.
2. When connecting the ROV we made sure that the colour coding was stuck to as to prevent positive wires being crossed, the ground wire was black and the positive wire was red.
3. Before the ROV was placed into the water we tested to make sure the motors and switches were functioning and that the power supply was working.

Waterproofing

To make our ROV water tight we used shrink wrap to prevent the wires coming in contact with the water. We also filled all of our electronic boxes with a waterproof composite capable of ensuring water being unable to enter. The bilge pumps we bought were already waterproof so there was no need to waterproof those ourselves.

ROV Schedule

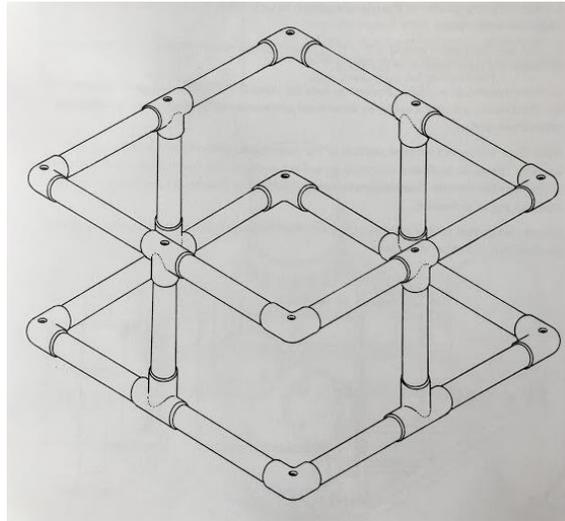
We met weekly, every Wednesday, to plan and buy parts for the ROV originally. We later used Wednesdays to build and then closer to the deadline started using Mondays and Friday afternoons to ensure the deadline for finishing the ROV was met.

Claw, Camera, Frame, Buoyancy, Tether, Control Box, and Onboard Electronics

Our claw consists of 12 inches of PVC piping and a hook attached on at the end.

Our camera is a fishing camera, this will be attached to the monitor which would be attached to our control box. Thankfully we were donated this camera by RGU which allowed us to simplify the visual system of our ROV and stick to budget.

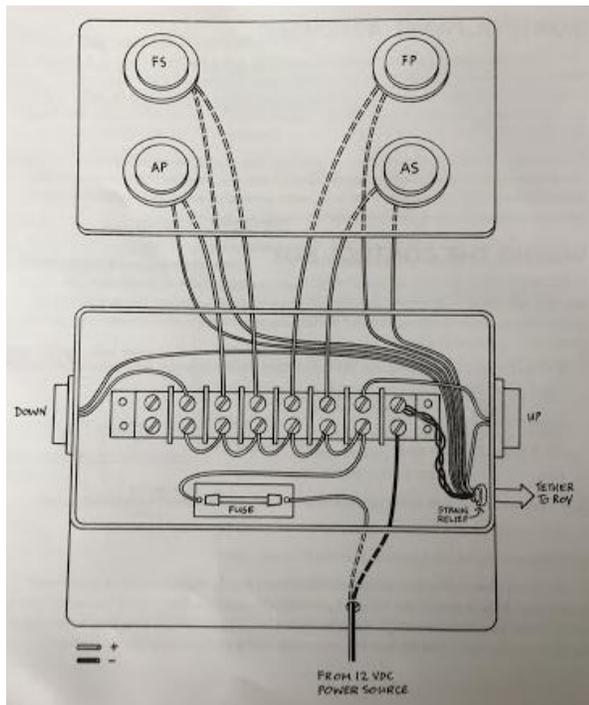
Our frame is made from schedule 40 PVC piping ($\frac{1}{2}$ inch diameter), we bought in 7, 2 feet long pieces which we then cut down to size. To connect the cut down pieces we used t-bone junctions and elbow junctions.



To give our ROV buoyancy we used slices of buoyancy, tie-wrapped to the top of the frame.

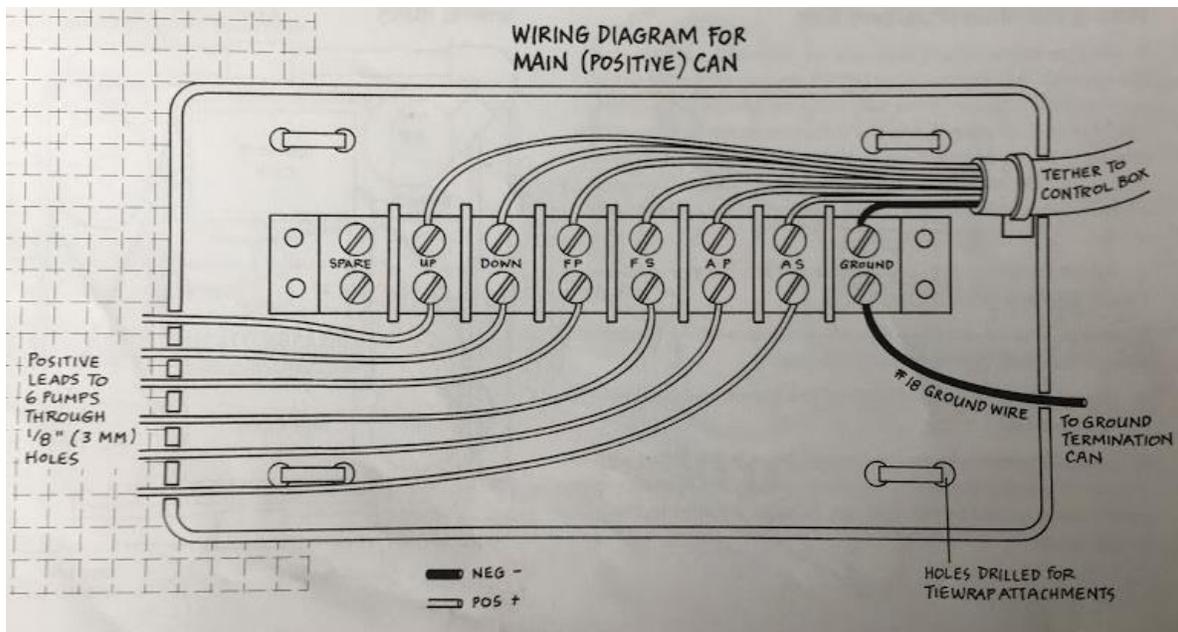
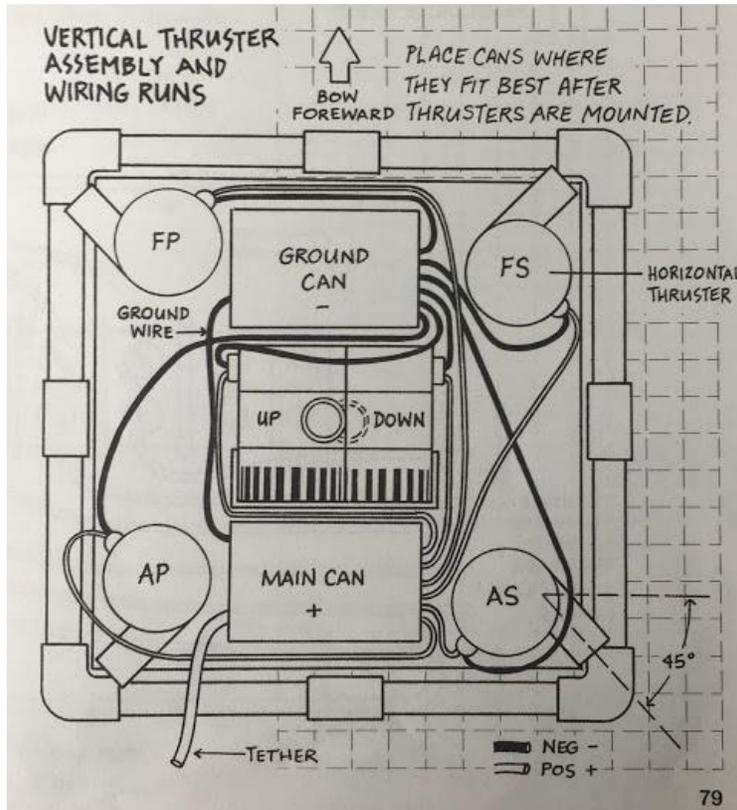
Our tether consists of a 10 metre length of 13 core automotive cable so that we can attach all of the necessary bulge pumps to the control box.

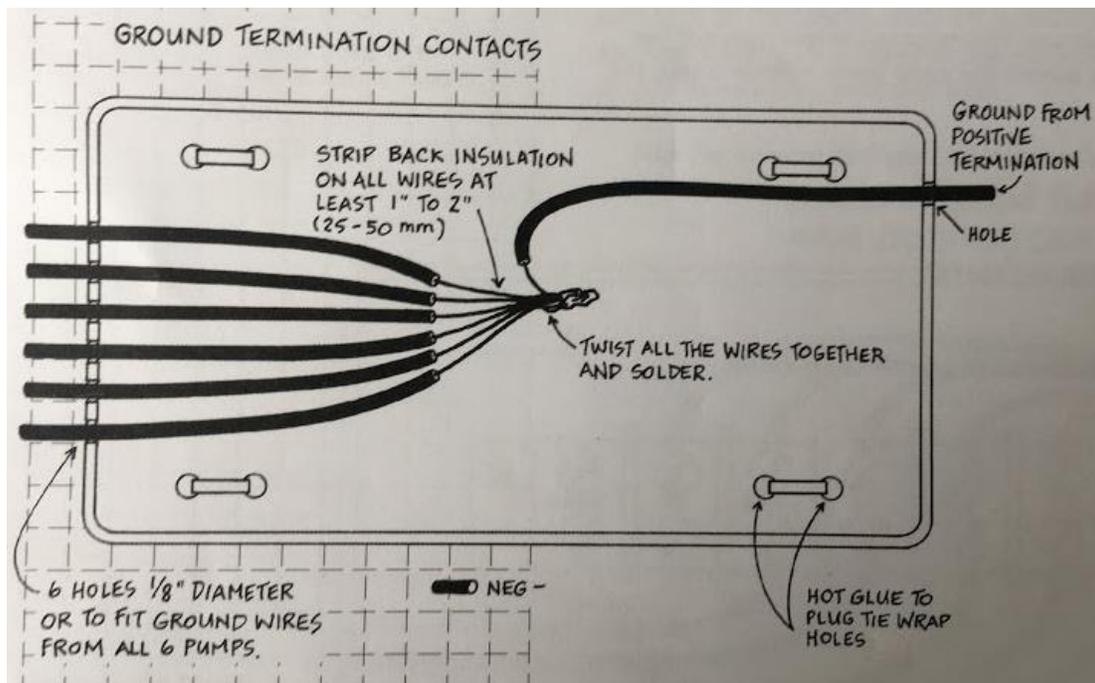
Our control box was a medium sized box that had an opening lid. We attached six buttons on the lid, the



tether wire through a hole in the side, and the power cable out through the back.

Our onboard electronics are as follows:





Challenges

Throughout our time we faced challenges such as limited time. We originally only met once a week for an hour but closer to the competition we had to commit over three times as much hours. The limited time meant we had to rush a little bit in the end but adding in the extra hours gave everyone peace of mind and work unrushed.

We had a small budget, just the £300 grant that we had received from RGU, this hindered the resources we could procure. This meant we had to find a simplified ROV design that would match our budget which involves procuring piping, plastics, bilge pumps.

A big challenge that we faced was the members who would come to meetings infrequently and would only partially start a job before leaving or becoming distracted and messing up the section they were doing. The CEO, with the company's best interests in mind, talked to those who would mess around or not show up and gave them the choice of staying and participating fully or leaving as it wasn't fair to the rest of the team who worked hard on the ROV.

Company Evaluation

For future reference, to improve our ROV, we would invest more time into the structure and assemblance of the ROV. To ensure the tight deadline is met, more frequent meetings throughout the week being held would be beneficial.

Acknowledgements

We'd like to thank our mentor and our teachers who volunteered countless hours of their valuable time to ensure we could meet the deadlines for the competition date. We would also like to thank our school for allowing us use of the Technology Department and the swimming pool to build and test our ROV. Many thanks must also go to RGU and the Regional sponsors who, without their help, we would not have been able to create our ROV

Regional Sponsors

