Technical Report

Taft High School-Lincoln City, OR

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JACKLS
Taft High School/Lincoln City, OR

Company Members

Cayden Fitch-- Captain, CEO, Electrical engineer Grade 11

Jenna Richards-- Co-Captain, Grade 9

Lee Wagoner-- Navigator, Grade 12

Kendal Gile-- Engineer, Grade 9

Adam Plummer-- Assistant Engineer, Grade 9

Shelby Hayes—Project Coordinator

From left: Adam Plummer, Shelby Hayes, Kendal Gile, Cayden Fitch, Jenna Richards, Lee Wagoner

Abstract

We are JACKLS and we are a part of the physical oceanography class at Taft High School in Lincoln City, Oregon. As a part of our class we were required to design, build, and learn about ROVs. ROV stands for remotely operated underwater vehicle. We received kits to start building our ROVs including rotors, motors, PVC pipe, wires, an underwater camera, and a control box. We designed the shape of the ROV and decided where to place our rotors and camera for easiest control and balance. We also designed attachments for the ROV that can be used for a multitude of tasks. ROVs are used for collecting data, creating bathymetric maps, finding new sources of oil, installing and doing maintenance work on underwater equipment, and accomplishing tasks that would be too risky for a human diver to achieve.

Safety

Safety was one of the biggest priorities to our company as we built our ROV. Once we started building we made certain safety precautions to protect ourselves and our ROV. This included

- Soldering the wires connected to the ROV to make them watertight.
- Learning how to connect and disconnect the ROV to a battery safely.
- Wearing protective gloves and eyewear
- Making sure all of the components of the ROV were self-contained so if it runs into anything, it will not break or break anything it comes in contact with.
- Labeling parts of the ROV that could be dangerous to people who don't understand what they do
- Color coding the wires to avoid an electrical hazard when connecting to a power source.
- Making a safety checklist to use before using the ROV

<u>Safety checklist</u>
(What we check for before using ROV)

1. Check ROV structure
    A. No loose ROV frame pieces?
    B. No exposed wires?
    C. No exposed motors?
    D. Are wires securely fastened to ROV?
    E. Are wires in the way of any propellers?
2. When connecting
    A. Call out when connecting/disconnecting
    B. Color coding Black wire=Ground Red wire=Positive
3. Testing
    A. Make sure all motors are working correctly
    B. Make sure all switches work
    C. Make sure power sources are working

Cost Sheet

ITEM	COST
MATE basic ROV Kit (Control box, motors, wires)	250.00
Additional PVC pipe	30.00
Underwater camera	300.00
Thermometer	FREE (Donated)
Additional 4 motors	FREE (Donated)
Total Cost	580.00

Design & Dimensions

Design: We chose this design after looking at the designs of ROVs used in the scientific community. We tried to make it as balanced as possible so it is a slightly larger size. We also have 6 motors which weigh our ROV down so we use foam to counter the weight of the ROV to keep it level and sturdy. Our camera is also positioned so we can see our attachment and our surroundings clearly, which was one of our main concerns. We chose PVC as our primary material because it was the cheapest. Our ROV was relatively cheap to make but it is still very functional.

Titan- Our ROV

Dimensions

Height: 14 cm

Length: 74 cm

Width: 39 cm

Weight: 3.47 kg

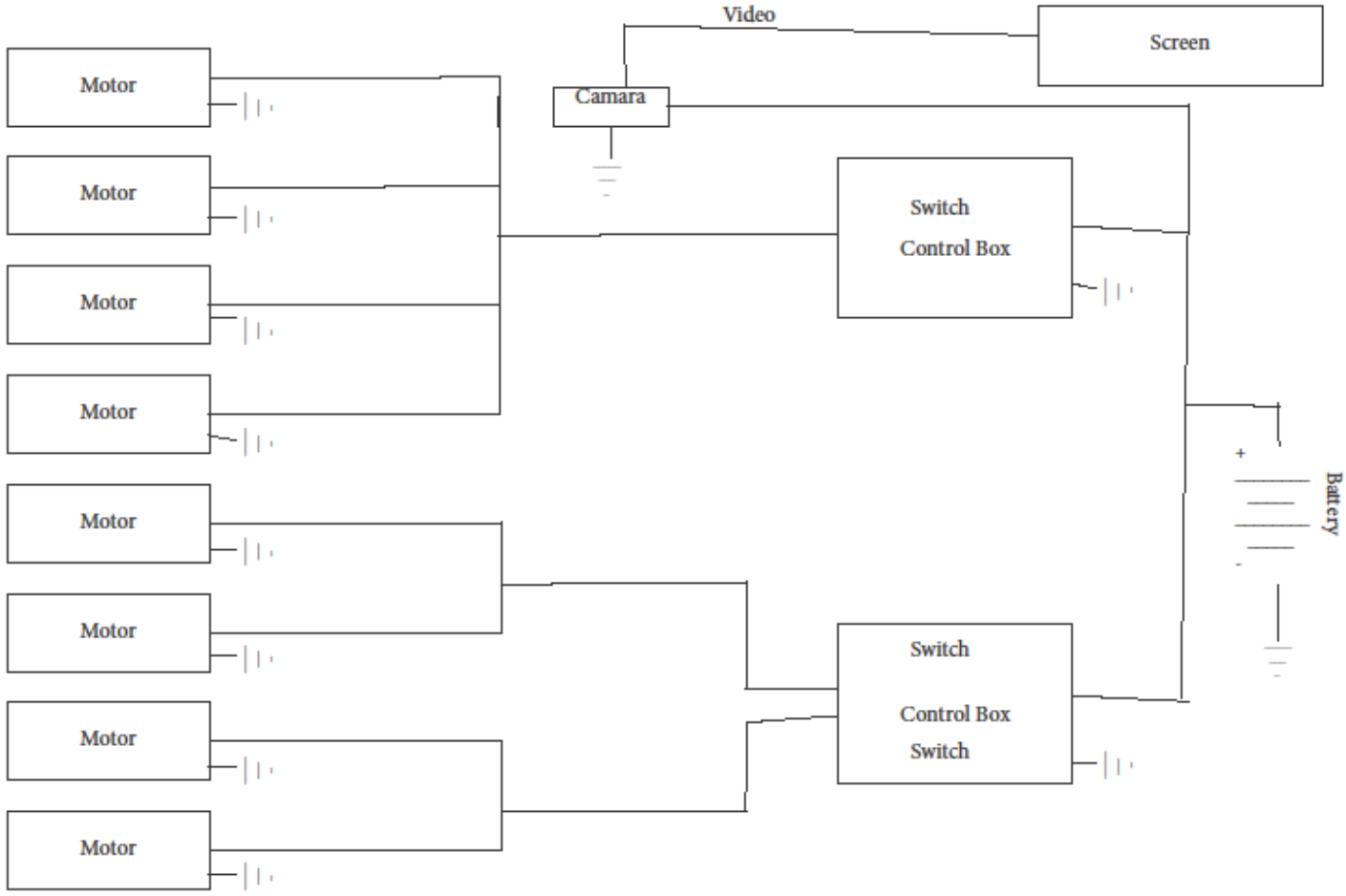
Attachments

Small hook attachment: Used for picking up/working with smaller items. Ex: Removing pin from elevator (Task 1)

Hook attachment used for picking up medium/large sized objects. Ex: opening door to the BIA (Task 1)

Hook attachment #2 used for picking up most objects. Ex: Transferring SIA to seafloor. (Task 1)

Electrical Schematic

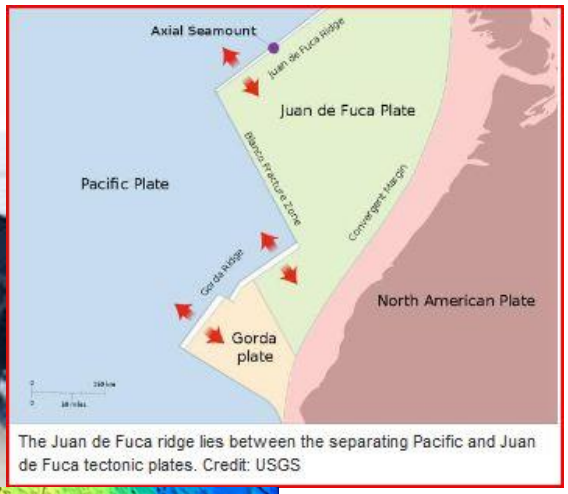


Salmon River Experience

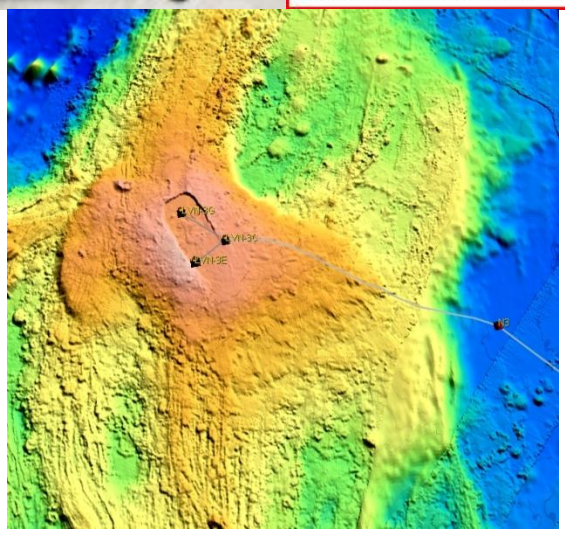
This year our company JACKLS worked with a local environmental group to help research a local pond by the Salmon River. We were hired to use our ROV to see if there was any wildlife in the pond, before it is excavated for the Salmon River boat basin restoration project. We took all of our equipment to the pond and we learned how to control our ROV with underwater obstacles such as currents, murky waters, and underwater plant life. The only wildlife we found was Newts, but the experience of using our ROV in a job-like scenario was very rewarding.

Theme: The Axial Seamount

In our physical oceanography class we learned about an underwater volcano called the axial seamount, which stands almost 1,100 meters tall. The axial seamount is located where the Cobb - Eickelberg Seamount Chain and the Juan de Fuca Ridge intersects, about 300 miles off of the Oregon Coast. Scientists have been using ROVs to install miles of electro optical cable to track what is happening at the seamount 24/7. They have also been using ROVs to observe the new lava flows, and the new life forms sprouting up near hydrothermal vents in the area. Using ROVs has almost become essential to building oceanic observation systems, and making new discoveries to help learn about and save the oceans ecosystems.



The Juan de Fuca ridge lies between the separating Pacific and Juan de Fuca tectonic plates. Credit: USGS

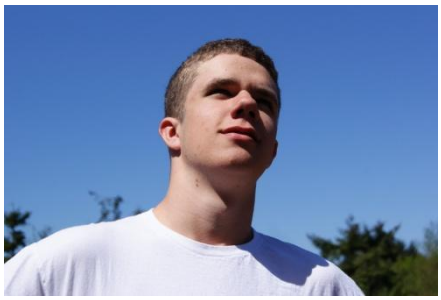


Top left: Bill Chadwick stands next to the remotely operated vehicle Jason on the deck of the research vessel Atlantis after the dive that discovered the new lava flow on the seafloor at Axial Seamount. (Photo Credit:Scott Nooner, Columbia University)

Top right: Map of the Juan De Fuca Ridge (tucsoncitizen.com)

Bottom: Bathymetric map of the Axial Seamount (http://www.ooi.ocean.washington.edu)

Company Reflections



“It has been a great experience! I have increased my knowledge in the field I want to go into. I can't wait for next year!” – Cayden Fitch, Captain

“Winning the regional competition was such a crazy experience. We never thought we could do it but we ended up doing a lot better than we expected. I am so proud to be a member of JACKLS and I wish I would have started this earlier!” – Shelby Hayes, Project Coordinator

“This has been such a great experience for all of us. We didn’t think we could do it but we have put in a lot of hard work to make it to Internationals this year and we are extremely excited about going!” - JACKLS

Acknowledgements

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