



# ROV



PARTICIPATE IT'S VERY EASY:

- STUDY
- Design
- Compete

Scout class  
2024



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## OVERVIEW

RUVs (Rescue Underwater Vehicles) play a crucial role in rescuing and preserving underwater life. These advanced robotic systems are designed to navigate and operate in the challenging underwater environment, enabling effective interventions and reducing risks to human divers. The importance of RUVs in underwater life rescue can be summarized in the following points:

- **Accessibility:** RUVs can reach depths and areas that are inaccessible or dangerous for human divers. They can explore underwater environments with precision and flexibility, allowing for targeted rescue operations.
- **Search and Rescue:** RUVs equipped with cameras and sensors can aid in locating and identifying distressed marine life, such as stranded animals or injured species. They can cover large search areas efficiently, increasing the chances of successful rescues.
- **Intervention and Assistance:** RUVs can be equipped with specialized tools and manipulators to perform various underwater tasks, including untangling marine creatures from fishing nets or debris, removing pollutants, or providing life support measures.
- **Data Collection and Monitoring:** RUVs can gather valuable data about underwater ecosystems and species, contributing to scientific research and conservation efforts. They can capture high-resolution imagery, record videos, and collect samples for further analysis.
- **Minimizing Human Interference:** By utilizing RUVs, the need for direct human intervention in delicate or hazardous underwater environments is reduced, minimizing disturbance to the ecosystem and ensuring the safety of both divers and marine life.
- **Public Education and Awareness:** RUV missions and footage can be shared with the public, raising awareness about the importance of ocean conservation and the challenges faced by underwater life. By showcasing the impact of human activities on marine ecosystems, RUVs can promote sustainable practices and foster a sense of responsibility toward preserving underwater habitats.

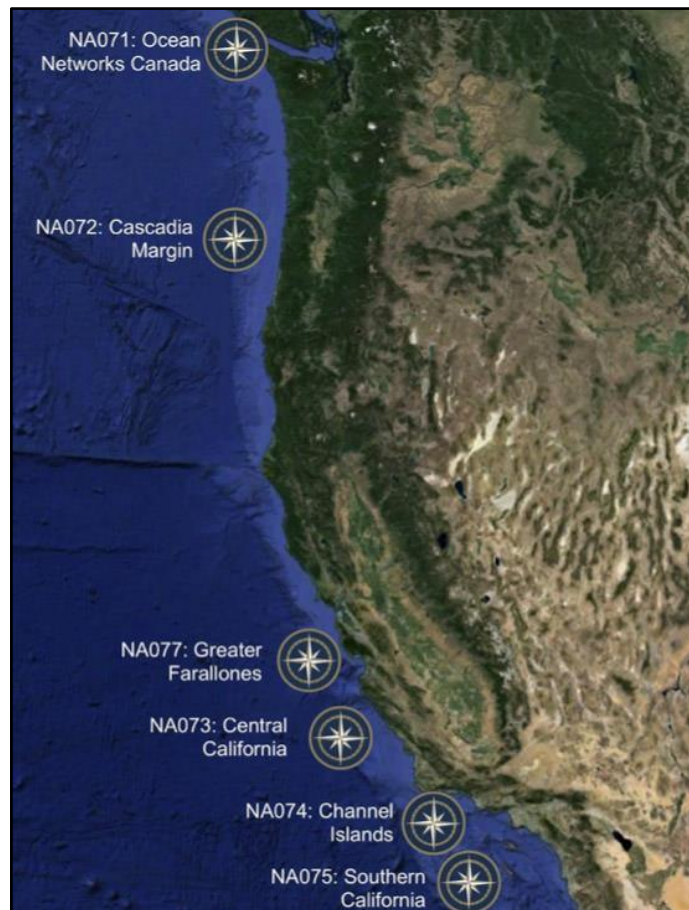
In conclusion, RUVs play a vital role in underwater life rescue by providing accessibility, conducting search and rescue operations, assisting in interventions, collecting data, and raising public awareness. Their versatility, precision, and ability to operate in challenging conditions make them indispensable tools in protecting and preserving underwater ecosystems and the diverse species that depend on them.



## COMPETITION THEME

Throughout the summer of 2016, NOAA's Office of National Marine Sanctuaries teamed up with the Ocean Exploration Trust to explore the marine ecosystems of the West Coast. Working aboard the E/V *Nautilus* and utilizing remotely operated vehicles (ROVs), scientists mapped and explored targets throughout the U.S. West Coast, from Canada to southern California, including five national marine sanctuaries.

NOAA Office of Ocean Exploration and Research provides support for the complementary ocean exploration program of the *Nautilus*, which operates under a similar paradigm as NOAA Ship *Okeanos Explorer*.



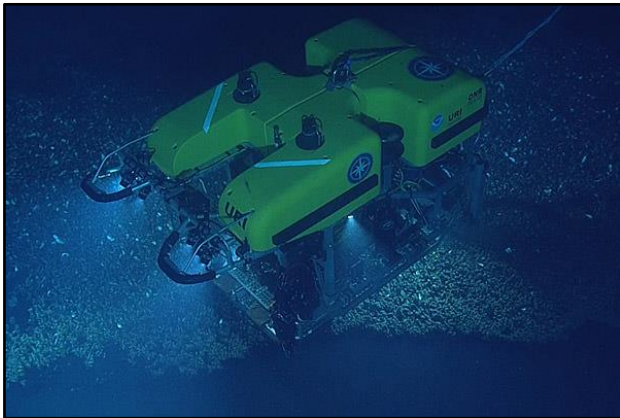
*Nautilus 2016 expedition map. Credit: OET*



*E/V Nautilus. Credit: OET*

The E/V *Nautilus* is equipped with telepresence, which allowed scientists from around the world to participate and contribute to the success of this mission. Plus, telepresence brought national marine sanctuaries and ocean science to the classroom, as students across the country directly engaged with mission staff and operations.

Details and photos from the 2016 expedition can be found below, and the archive from the expedition can be seen at [nautiluslive.org](http://nautiluslive.org).

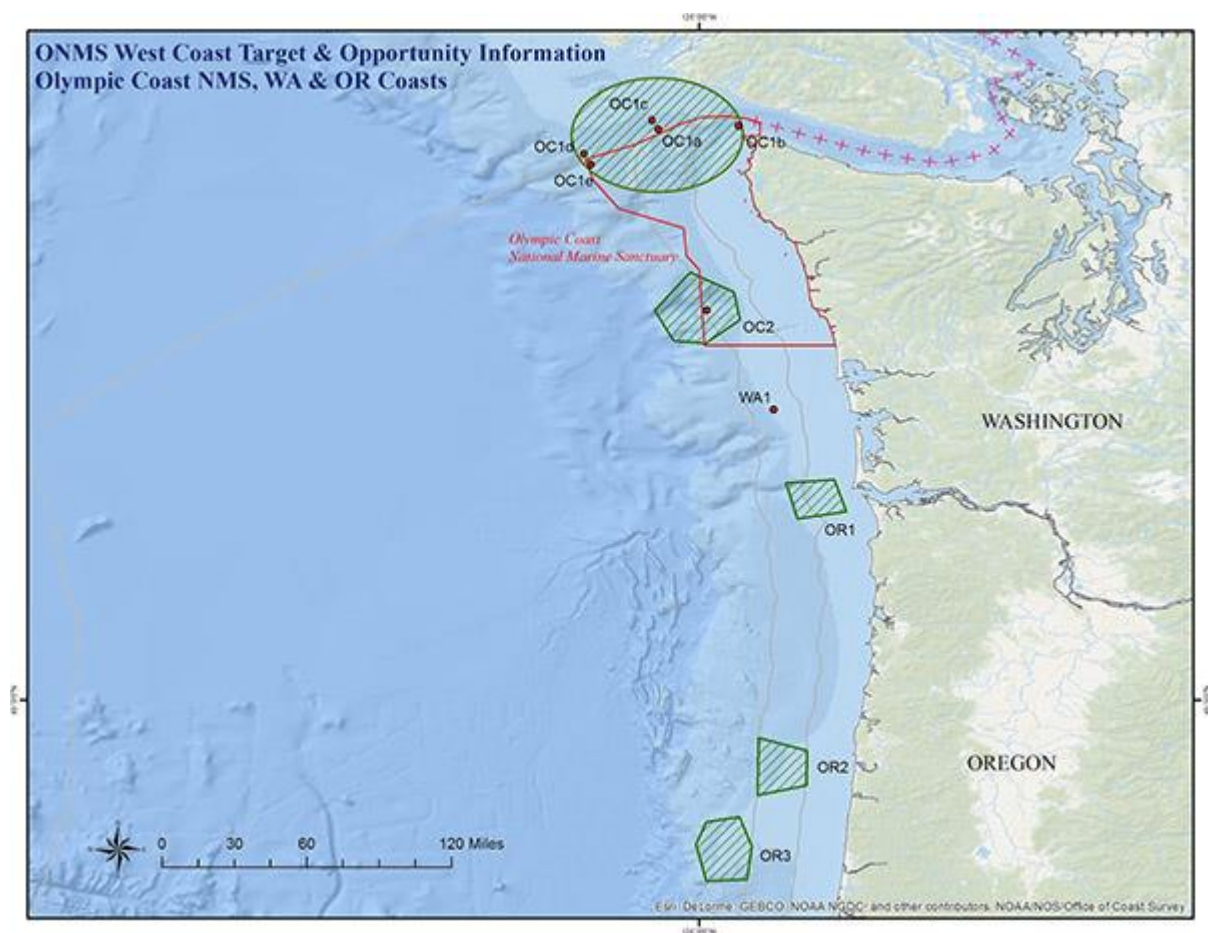


ROV Hercules. Credit: OET



Control room. Credit: OET

### Seeps and Ecosystems of the Cascadia Margin



Dates: June 1-19, 2016

Lead Scientists: Dr. Robert Embley and Dr. Stephen Hammond, NOAA Pacific Marine Environmental Laboratory





Area of Exploration: Washington state to San Francisco, California, including [Olympic Coast National Marine Sanctuary](#)

On this expedition, the scientists on board *Nautilus* will use mapping tools to survey the extent of methane seeps along the Pacific Northwest coastline. Methane is a powerful greenhouse gas and an important commercial resource that fuels many elements of our lives on land. Scientists are beginning to understand the complex and varied ways methane fuels life beneath the sea as well. As habitats are identified, the ROVs will dive on these targets to investigate the structure and communities they support. A well-explored baseline understanding of these dynamic ecosystems will be essential for understanding changes as they occur. During this cruise, *Nautilus* will also explore the wreck of the World War II freighter SS *Coast Trader*, located just outside Olympic Coast National Marine Sanctuary in Canadian Waters. The ROVs will conduct the first visual survey of this cultural heritage site as well as assess its condition and remaining vessel stability.

Scientists also plan to explore for the first time (by deep submergence vehicle), the unique geological features that define the jagged rim of Quinault Canyon within Olympic Coast National Marine Sanctuary on the Washington continental slope. Recent sonar mapping shows rock ridges, relict Pleistocene sediments, and reflectance from non-geologic formations that may indicate rich habitats for coral and sponge communities. Live underwater video will provide the first glimpse of the unexplored Quinault Canyon.



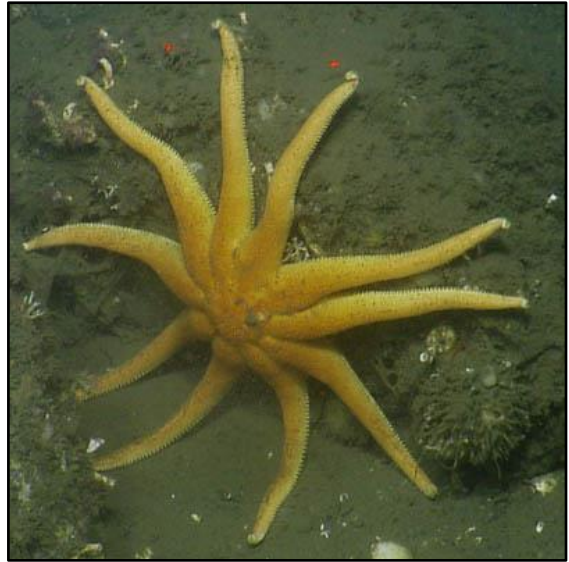
A fish hides in the wreck of the SS *Coast Trader*, an American merchant ship torpedoed by Japanese submarine *I-26* on June 7th, 1942 in what is now Olympic Coast National Marine Sanctuary. Photo: OET/NOAA



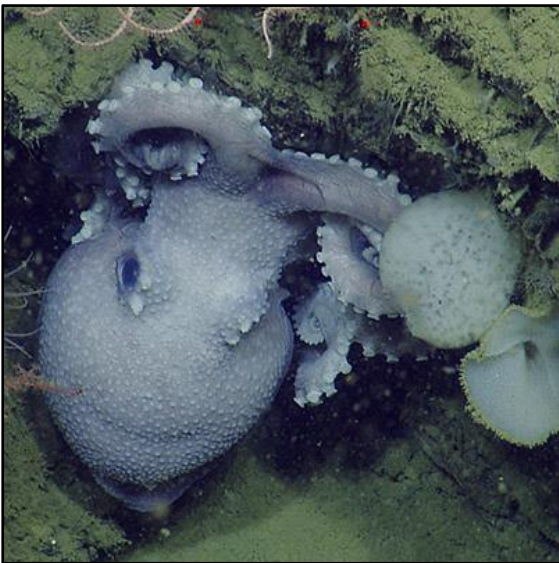
Quinault Canyon is the deepest submarine canyon within Olympic Coast National Marine Sanctuary. Many creatures, like rockfish and lingcod, call the canyon home. Photo: OET/NOAA



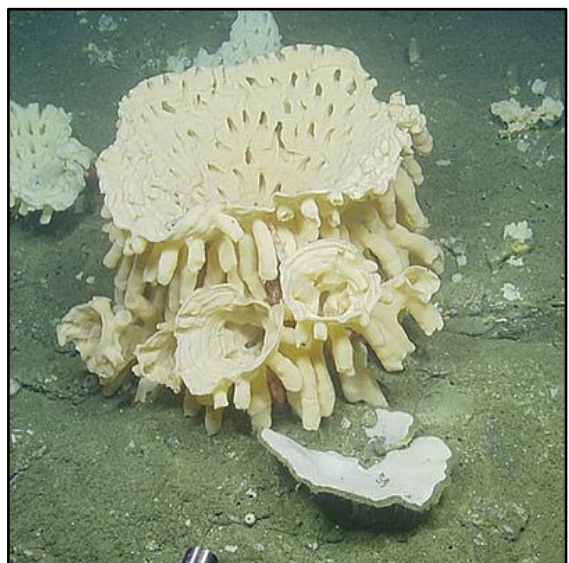
This sea star was spotted in the deep environments of Quinault Canyon in Olympic Coast National Marine Sanctuary. Photo: OET/NOAA



This octopus was spotted on an ROV dive near Olympic Coast National Marine Sanctuary. Photo: OET/NOAA



The *Nautilus* crew spotted this octopus while diving with an ROV in a canyon near Olympic Coast National Marine Sanctuary. Photo: OET/NOAA



Glass sponges are found in the deep waters of submarine canyons like Gray's Canyon, near Olympic Coast National Marine Sanctuary. These sponges are named for their integration of silica into the porous body. In collaboration with experts on shore, *Nautilus* researchers collected substrate and sponge samples in Grays' Canyon to give clues about the glass sponge's growing habits, morphology and species variety. Photo: OET/NOAA

## SCORING

Underwater tasks – 100 points

Safety – 30 points

Technical report – 100 points

Presentation – 50 points

## TIMELINE

<b>Registration</b>	9/3/2024 - 20/6/2024
<b>Technical Report Submission Deadline</b>	1/7/2024
<b>Regional Finals</b>	12-13/7/2024
<b>International Finals</b>	September 2024

## REGISTRATION

- Registration will be open from 9 March 2024 to 20 June 2024.
- All data should be written in English.
- The team members cannot be less than 5 and not more than 25 including mentors.

### Fees

7,000 EGP registration fees for Professional and Ranger categories teams in the regular registration period, for 10 team members in the team, 300 EGP will be added per each extra member.

For more information, please visit our website. [www.Africaniat.com](http://www.Africaniat.com)

### Awards

Qualified teams will participate in the international competition in Saudi Arabia in Sep 24

- Free accommodation for the team members in the international competition.
- 2<sup>nd</sup> place in professionals wins 2000 LE.
- 3<sup>rd</sup> place in professionals wins 1000 LE.

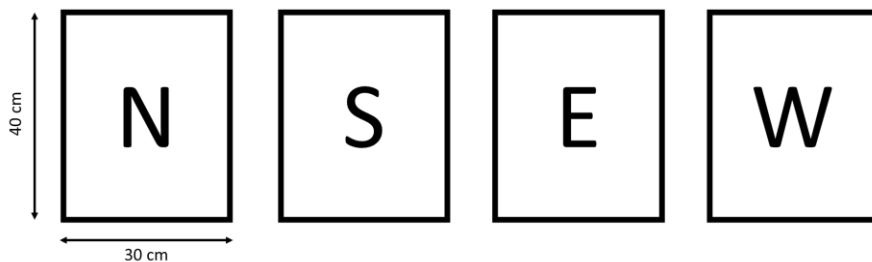


## UNDERWATER TASKS

Each team will have total time of 25 minutes allocated for the underwater tasks, which includes 15 minutes for the actual task completion, 5 minutes for preparation before the task, and 5 minutes for demobilization from the station.

### TASK #1: SEA FLOOR MAPPING AND SEARCH AREA DEFINITION (100 Points)

- Conduct a scan of the area, from the North to South and East to West directions (autonomous or manual).
- Mark the boundaries of the identified area using four markers.
- Add a label with the date of the discovered data.



- The vehicle must follow the existing lines to carry out all tasks correctly
- The vehicle must collect each marker from the center of the figure and place it in the correct place designated for it

[\\*Refer to Appendix \(E\)](#)

## SAFETY

Safety is of paramount importance in RUV competition. These competitions bring together teams of participants who design, build, and operate underwater robots, showcasing their skills and innovation. Ensuring a safe environment throughout the event is crucial, and the following points highlight the importance of safety in RUV competitions:

- **Participant Well-being:** The safety of all participants, including team members, event organizers, and spectators, is the top priority. Implementing safety protocols and guidelines helps minimize the risk of accidents or injuries during the competition.
- **Equipment Safety:** RUVs are complex machines with various electrical, mechanical, and hydraulic components. Ensuring that all equipment is properly tested, maintained, and operated according to safety standards reduces the likelihood of equipment failure or malfunctions that could lead to accidents.
- **Risk Mitigation:** Identifying potential risks and hazards associated with RUV operations is crucial. Conducting thorough risk assessments and implementing appropriate safety measures, such as wearing personal protective equipment (PPE), establishing restricted

areas, and implementing emergency response plans, helps mitigate risks and prevent accidents.

- **Electrical and Water Safety:** RUV competitions involve the use of electrical equipment in close proximity to water. Ensuring proper insulation, grounding, and adherence to electrical safety guidelines minimizes the risk of electrical shocks or short circuits. Additionally, implementing safety measures to protect against water-related hazards.
- **Operational Safety:** Establishing clear operational guidelines and protocols for RUV testing, deployment, and retrieval is crucial for maintaining safety. This includes proper handling of RUVs, adherence to weight and size restrictions, and following operational procedures to prevent entanglement or collision hazards.
- **Learning and Education:** RUV competitions provide valuable opportunities for participants to learn about engineering, underwater technology, and teamwork. Integrating safety education and promoting a safety-conscious culture among participants fosters responsible and informed practices in the field of robotics and underwater operations.

In summary, safety is a fundamental aspect of RUV competitions. Prioritizing participant well-being, implementing equipment and operational safety measures, and being prepared for emergencies contribute to a safe and successful event. By emphasizing safety, RUV competitions create an environment conducive to learning, innovation, and the responsible application of robotics technology in underwater exploration and research.

### **SAFETY NOTES**

- The teams must explain to the safety judge the fuse calculation.
- The team which uses a pneumatic must show to the judge pneumatic SID.
- There are two trials for the safety inspection, the score at the first trial is 30 points and 20 points for the second trial.

[\\*Refer to Appendix \(A\)](#)

### **TECHNICAL REPORT**

- Teams are required to submit a technical report that showcases their vehicle's features and highlights the advantages of their team structure. The report should be must be no less than 15 pages and no more than 25 pages (**100 points**).
- The report will be sent at the pre-determined date according to the competition schedule to the following email:
- The team should send their technical report in PDF format by naming it [Challenge Name\_ Category\_TeamName\_TechnicalReport\_2024]
- If the team is one day late in delivering on the specified date, (**10 points**) will be deducted from the grades allocated to the report, If the team is late for more than a day, all grades allocated to the report will be deducted.
- The team can use any required visuals to support your report

[\\*Refer to Appendix \(B\)](#)

## PRESENTATION

- The teams are required to deliver a well-prepared presentation in 15 minutes that effectively demonstrates the features of their vehicle as a product to be sold to the committee. The teams should emphasize the value of their vehicle in relation to its cost.
- The presentation evaluates teams' ability to effectively communicate their project, strategies, and results to judges and audience members.
- The goal of the presentation is to effectively market the vehicle and convince the judges of its value and potential success in the market.
- The actual time for the visual presentation is **25 minutes**, **15 minutes** are allocated for the team to present their project and explain their ideas in the way they see fit, **10 minutes** are allocated for the judges to present any questions or inquiries to the team

### Note:

Teams are required to deliver their presentations verbally and directly on the vehicle without the use of laptops, TVs, or any other devices.

\*Refer to Appendix (C)

## POWER SOURCE

The competition provides a power supply of 12 volts and up to 20 amperes for the teams. Alternatively, teams can use their own power supply, but only after passing a safety inspection.

Teams have the flexibility to use any power connector between the RUV and the power supply. However, direct wire connections are not allowed.

It's important to note that the competition power supply is the only permissible power source, and the use of other power sources, such as batteries, is not allowed.

## GENERAL RULES

- Only team members are allowed to work on the vehicle not mentors or supervisors.
- During the Underwater Mission, only five members are allowed to be in the station (a pilot, two co-pilots and two tether-men).
- Direct communication during the Underwater Mission is only allowed between the pilot and the co-pilots in the team.
- The tether-man can communicate with one of the co-pilots to know what task to do, to attach the required devices to the vehicle.
- The tether-man cannot throw the devices or mechanisms used in mission to the water, the vehicle should carry it and deliver it down.
- The time given is 5 minutes for setup, 15 minutes for the Underwater Mission tasks to do and 5 minutes to leave the station.
- The tether-man is not allowed to pull the vehicle from its tether, and the vehicle must go back to the surface under its own power.



- Any debris must be returned to the surface before the mission time ends.
- **Note:** In the event of non-compliance with these rules, 5 marks will be deducted from the team each time

## PENALTIES

The competition aims to foster a strong challenge among innovators and discover new applicable ideas, necessitating the enforcement of strict rules. The following scenarios will result in disqualification of teams:

- Disrespect towards judges or organizers.
- Engaging in cheating or fraudulent activities.
- Involvement of mentors or individuals outside the team members.
- Failure to pass the safety inspection.

In addition, the following actions will result in a deduction of 5 points from the team's score:

- Communication between the pilot and the tether man to indicate the direction of the RUV or provide assistance during tasks.
- Leaving any part of the RUV in the water.
- Delayed demobilization, beyond the allocated 5 minutes.

These measures ensure fair competition and adherence to the rules, promoting a level playing field for all participants.

## APENDICES

### Appendix (A): SAFETY CHECK LIST

<b>All motors are insulated properly?</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<b>All wires are secured in the RUV and control box?</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<b>The tether is completely sealed?</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<b>The power conversion inside the RUV?</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<b>All components attached to RUV are secure?</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<b>Minimal use for chemical insulation like epoxy?</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<b>The tether has one end to connect to the power source?</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<b>There are a sharp edges or elements of the RUV design that could cause injury?</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<b>A suitable fuse is used at the nearest point in the power supply connection side?</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<b>Fluid power used? If yes, the pneumatic SID must be submitted.</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No

## Appendix (B): Technical Report

The document should demonstrate:

Technical Report (Maximum Points: 100)	
<b>1. Introduction</b>	<ul style="list-style-type: none"> <li>• Cover page</li> <li>• Table of contents</li> <li>• Clarity in introducing the team, including objectives and scope.</li> <li>• Concise summary of the report structure and key findings</li> </ul>
<b>2. Design Specifications</b>	<p>A clear explanation of the design in all its aspects, including:</p> <ul style="list-style-type: none"> <li>• Photos of design and real RUV</li> <li>• Vehicle Design</li> <li>• manipulators</li> <li>• Drag force calculations</li> <li>• Mobility</li> </ul>
<b>3. Electrical systems (Hardware &amp; Software)</b>	<ul style="list-style-type: none"> <li>• Vehicle components</li> <li>• Station components</li> <li>• Movement techniques</li> <li>• Stability techniques</li> <li>• Autonomous system</li> <li>• Image recognition techniques</li> </ul>
<b>4. Electric power</b>	<ul style="list-style-type: none"> <li>• Fuses</li> <li>• Power conversions</li> <li>• Power distribution</li> </ul>
<b>5. Fluid power</b>	<ul style="list-style-type: none"> <li>• Software and hardware components</li> </ul>
<b>6. Mission tools</b>	<ul style="list-style-type: none"> <li>• Additional devices</li> <li>• software and hardware components</li> <li>• The methods used to solve the competition tasks</li> </ul>
<b>7. SIDs</b>	<ul style="list-style-type: none"> <li>• Electrical SID</li> <li>• Fluid SID</li> <li>• Additional devices SID</li> </ul>
<b>8. Safety</b>	<ul style="list-style-type: none"> <li>• electrical and mechanical safety precautions</li> </ul>
<b>9. R&amp;D plan</b>	<ul style="list-style-type: none"> <li>• The plans that the team is seeking to do.</li> </ul>
<b>10. Project timeline</b>	<ul style="list-style-type: none"> <li>• The timeline that the team went through during the season</li> </ul>
<b>11. Cost Analysis</b>	<ul style="list-style-type: none"> <li>• Clarifying the team's total budget for all items during the season in terms of the project budget itself or the team's general expenses that serve on the project.</li> </ul>
<b>12. Team members hierarchy</b>	<ul style="list-style-type: none"> <li>• Clarifying the responsibilities of each individual within the team and distributing tasks</li> </ul>
<b>13. Acknowledgments</b>	<ul style="list-style-type: none"> <li>• Acknowledgments for the team supporters.</li> </ul>
<b>14. References</b>	<ul style="list-style-type: none"> <li>• Show the references of presented info.</li> </ul>

### Appendix (C): Presentation

- The team can use any required visuals to support your report

Presentation Content (Maximum Points: 50)	
<b>1. Introduction</b>	<ul style="list-style-type: none"> <li>• Clarity in introducing the team and their project.</li> <li>• Clear explanation of the problem statement and objectives.</li> <li>• Explanation of the core value of the product</li> </ul>
<b>2. Project Overview</b>	<ul style="list-style-type: none"> <li>• Comprehensive overview of the RUV design, features, and capabilities.</li> <li>• Explanation of how the RUV was constructed or modified to meet the competition tasks.</li> </ul>
<b>3. Strategy and Approach</b>	<ul style="list-style-type: none"> <li>• Clear articulation of the team's strategy for tackling the competition tasks.</li> <li>• Explanation of the decision-making process behind task prioritization and execution.</li> </ul>
<b>4. Results and Achievements</b>	<ul style="list-style-type: none"> <li>• Presentation of quantitative and qualitative results achieved during task execution.</li> <li>• Discussion of challenges faced and innovative solutions implemented.</li> </ul>
<b>5. Depth of Knowledge</b>	<ul style="list-style-type: none"> <li>• Demonstrated understanding of technical concepts related to RUV design and operation.</li> <li>• Ability to address detailed questions about the project from judges and audience members.</li> </ul>
<b>6. Carrying out tasks</b>	<ul style="list-style-type: none"> <li>• clearly explaining how to perform the required tasks</li> </ul>
<b>7. Time Management</b>	<ul style="list-style-type: none"> <li>• Adherence to the allotted presentation time.</li> <li>• Ability to convey key points succinctly without rushing or exceeding time limits.</li> </ul>
<b>8. Clarity and Organization</b>	<ul style="list-style-type: none"> <li>• Clear and logical flow of information throughout the presentation.</li> <li>• Effective use of visual aids, such as slides or demonstrations, to enhance understanding.</li> </ul>
<b>9. (R&amp;D) plan</b>	<ul style="list-style-type: none"> <li>• Overview of the research and development Plan</li> </ul>

### Appendix (D): Presentation Penalties

These penalties ensure that teams adhere to the rules and maintain professionalism throughout their presentations.

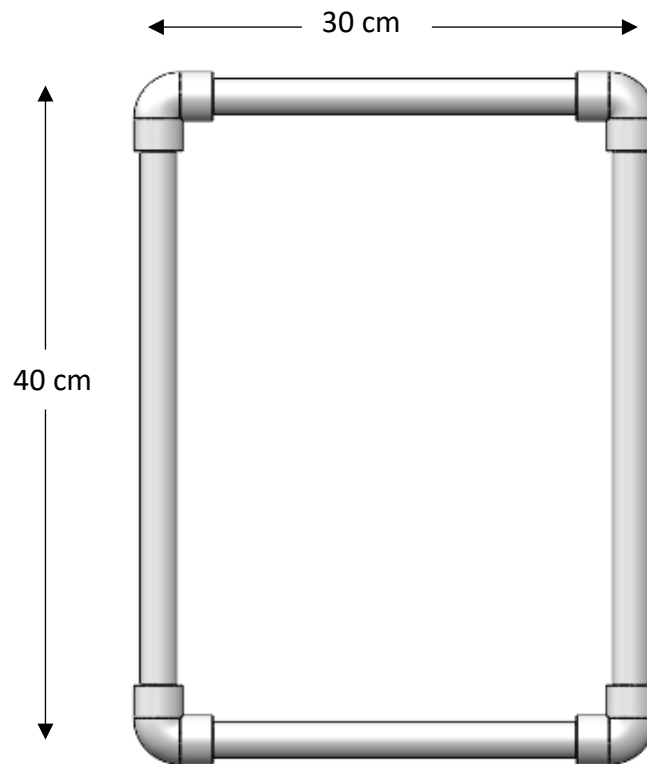
<b>Late Start</b>	Deduct 3 points if the team begins the presentation after the allotted start time.
<b>Exceeding Time Limit</b>	Deduct 3 points if the presentation exceeds the allotted time limit by more than 1 minute.
<b>Unprofessional Behavior</b>	Deduct 5 points for behavior deemed disrespectful, inappropriate, or unprofessional during the presentation or Q&A session



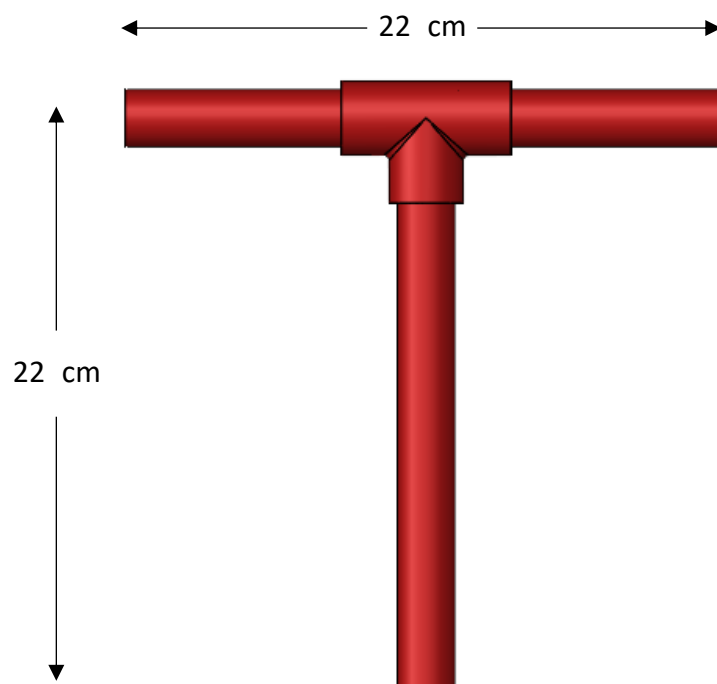
**Appendix (E): Underwater tasks**

**Task (1)**

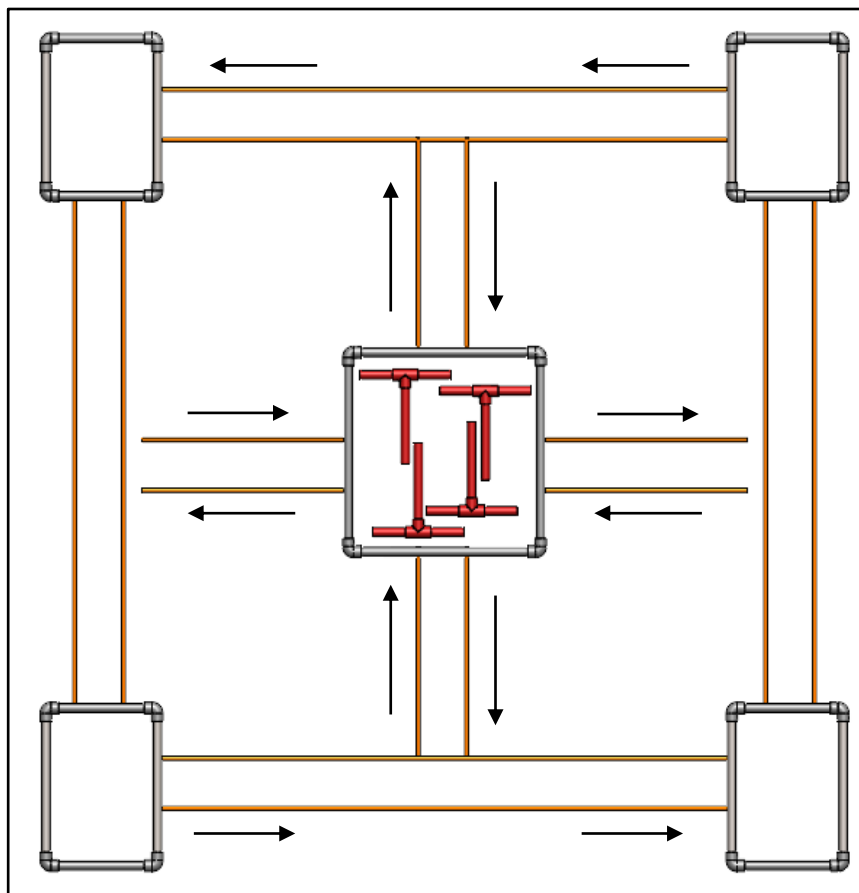
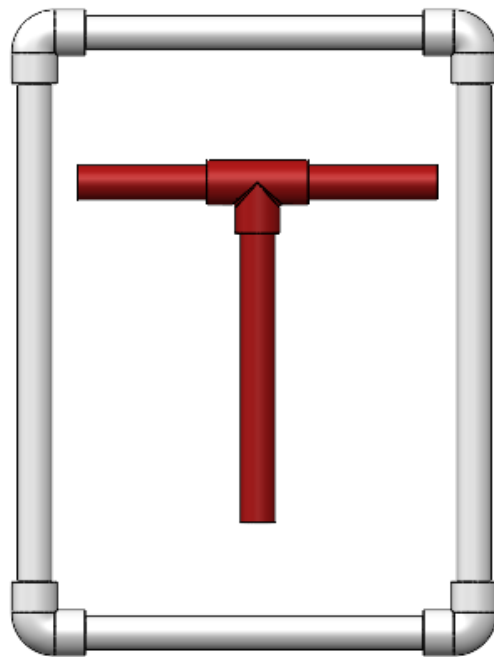
½" PVC pipe for the frame



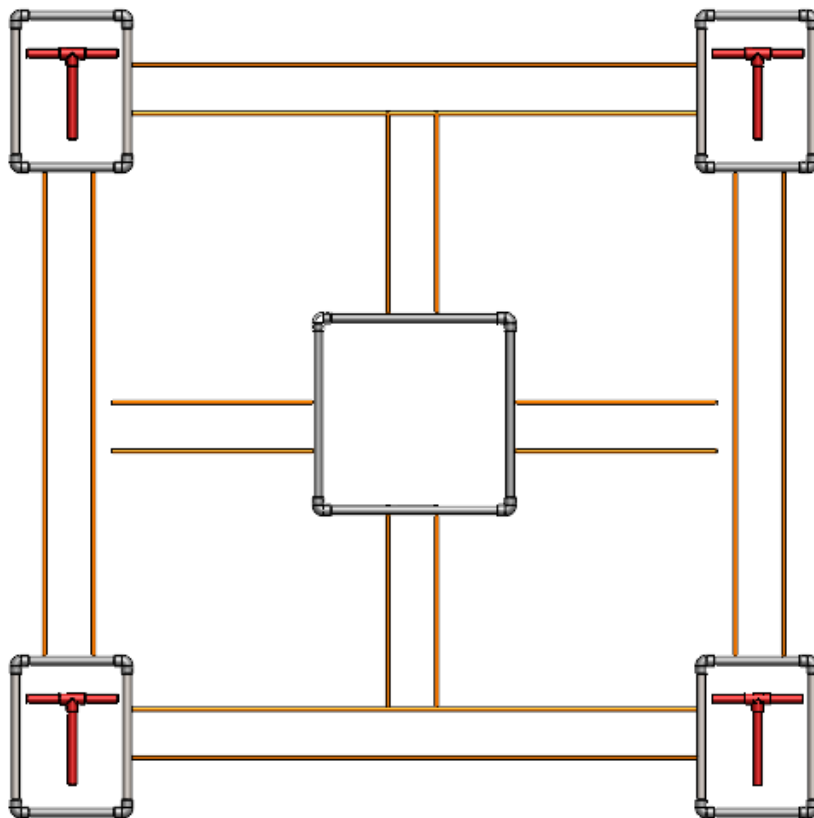
¾" for the markers



The marker inside the designed frame



The desired end results



The shape of the ground in the pool

