Voyager Class – HK IEEE ROV Regional Qualification.

What is Marine Archaeology?

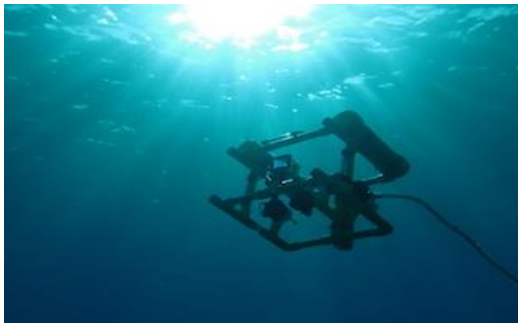
Marine Archaeology is a branch of Archaeology that deals that studies historical human interactions with the ocean. Marine Archaeologists study and investigate shipwrecks, artefacts, submerged landscapes and even human remains. They aim not only to discover these submerged historical sites, but to be able to uncover the background to them – where the artefacts came from and deducing the events leading up to how they ended up in the position they were found in.

Marine archaeology is a relatively new field of study for historians, as it was only during the last century that mankind developed the equipment needed to explore the oceanic depths. Archaeology itself was only popularised in the 1960s. With over 70% of the Earth's surface covered in water, the novelty of this discipline means that it is an area still largely undeveloped, and requires the minds and talents of the new generation of divers to delve into uncovering the past. The trove of sunken ships and settlements is only set to grow in size, as the rising sea level takes more hidden along the shoreline. Given the far more constant conditions the sea depth, these sunken ships and cities remain largely undisturbed, as well as undiscovered.

This is, however, a race against time – these submerged settlements often span thousands of years of detritus and debris. Layers of oceanic organisms, sediment, and even artefacts dropped from more recent eras obscuring the desired site from view. It takes the knowledge and skill of a diver-archaeologist to carefully unravel the layers that have accumulated over time, and deduce what happened.

These scenarios often present themselves when investigating larger settlements. Sunken shipwrecks however, has the advantage of being an encapsulated unit, becoming an unintended reliquary and tomb for the goods and possessions of the sailors within. The hull of the ships keeps the artefacts inside separated, cocooning a literal boatload of artefacts, that can all be traced to the same bygone era.

These wrecks, however, can often lie hundreds of meters deep, much further than even the most seasoned free-divers can.

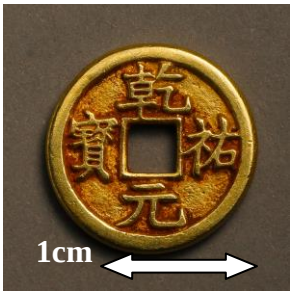


NEED

ROVs can withstand conditions that seasoned human divers cannot, and are able to navigate the undersea depths without the need for an insulated suit or an air supply. This makes them ideal for scouring deep water for prolonged periods of time. The ROV should however be equipped with an intense light source, so as to allow the controller to maintain orientation. Given its collection function, the ROV should also utilise a submersible arm of sorts, which can be customised to fit the needs of the artefact type (e.g. magnet for magnetic objects and hooks and grabs for other items)

1. Artefact Collection

The ROV needs to collect items from the wreck that can be examined for information about the wreck. These items include buttons, clips, coins and other small objects sighted. These need to be recovered to the surface, washed and then examined for identification. The types of items to be collected are shown below:



The coins will be similar to these and you will need to get onto the internet to figure out which ones you have and the origin of the coins. There will be some other artefacts that you may collect or simply identify in the water to determine what they are. Other artifacts will be nails and screws some magnetic and some not magnetic.

2. Data sample collection

The ROV will need to be configured to be able to collect "wood" fragments from the hull of the ship, and needs to be able not only to sample piece off the ship, but also stabilise itself in the water to make for efficient collection. These fragments will be of assorted sizes and you only need to collect one.

3. Ghosted Fishing net

One of the most annoying aspects of working with ROV on shipwrecks is the issue of ghosted fishing nets. The ROV needs to remove a ghosted net to gain access to certain parts of the area of the wreck. The net will need to be pulled off by the ROV and either discarded at the side of the wreck or returned to the surface. There will be several pieces of net and two needs to be dealt with.

DESIGN BRIEF

Below is a summary of the product demonstrations organized by competition class. Unlike 2015, the product demonstrations will not be separated into different runs; all five product demonstrations will be accomplished in one product demonstration run.

Marine Artefacts(Collect and return to the surface)

- 1-3 brass buttons of Naval Officers in and around the wreck
- 1-3 coins from the wreck
- Two nails/nuts/bolts from the seabed

Scientific Data Collection

- A sample piece of the wreck to collected and returned to the surface

Net Clearing

- Two pieces of net need to be cleared and either deposited nearby to the wreck or removed to the surface. In the final location the removed net should not be in contact with the wreck structure.

SPECS

- 12 volts, 25 amps DC. Conversion to lower voltages is permitted topside and on the ROV. Onboard electrical power is not permitted.
- There must be a **25amp fuse in the input power cable** of every ROV.
- A **15m** long umbilical cable is required.
- PWM motor speed control is allowed.
- Manually-powered hydraulics and pneumatics are permitted.
- Pneumatic systems cannot exceed ambient pool pressure.
- Lasers are NOT permitted.
- At least one Camera is required.
- Underwater light is required.
- Maximum size limit: None.
- One person must be able to deploy and retrieve the ROV from the water.
- Arm is allowed.

RESOURCES
Teams are permitted to use the materials of their choice provided that they are safe, will not damage or otherwise mar the competition environment, and are within the defined design and building specifications.

Teams are encouraged to focus on engineering a vehicle to complete the product demonstration tasks; when considering design choices, teams should ask themselves which one most efficiently and effectively allows them to solve the problem. Re-using components built by previous team members is permitted provided that the current team members evaluate, understand, and can explain their engineering and operational principles. Using or re-using commercial components is also permitted, provided that team members evaluate, understand, and can explain their engineering and operational principles. Teams will be questioned extensively on their overall design and component selections during their technical sales presentations.

Teams will also be provided with a reference booklet, containing information and sources for their further research to deduce how old the boat is.

TIME
The time given for the mission run is 10 minutes, with an additional 10 to use the information gathered to deduce the ship's age.

Voyager Missions

1. Collection of Artefacts

Teams will direct their ROVs towards the simulated wreck. Using a tool/arm the ROVs will collect various artifacts around and inside the wreck (e.g. buttons, coins, etc.) . The ROV can return to the surface for the team to collect the retrieved artefacts. Students are then responsible for utilising the booklet provided to determine the time period of the given artefact and its relevance to the wreck (deducing the time period of the wreck itself).The retrieving person must only touch the ROV to retrieve the artefact(s). Points will be deducted if the team attempts to control the ROV by pulling on the tether. The teams will be able to retrieve 1 button per person, and one coin per group.

2. Collection of Samples

Teams will direct their ROVs towards the simulated wreck. Using a tool/arm, the ROVs will collect a piece of wood from the wreck to be brought to the surface for “analysis” The retrieving person must only touch the ROV to retrieve the sample. Each team will be tasked with collecting 1 sample. The retrieving person must only touch the ROV to collect the sample, and only after it has made contact with the poolside in front of the station. Points will be deducted based on duration and any unnecessary damage to either the ROV, or lack of control of the cutting appendage and sample once collected.

3. Ghost nets

Two sections of ghost nets will need to be removed. One will obstruct the collection of the artefacts the other will be a random piece of net. Both must be removed to a location so as to be no longer in connection with the wreck structure. The nets may be removed to the surface.

The Surface Work

There will be marks awarded for the surface work. The breakdown will be issued in an up-date of this document.

1/ Discussion

Each Adventurer Class team needs to make a10min presentation about their ROV to the judges. During this time the judges may ask questions. This presentation may be in the English or Chinese languages or a mixture of both. No PowerPoint or multi-media tools allowed, just a discussion based around the poster. Details of this presentation are below:

- Introduce yourself and the team
- Explain who made what parts of the ROV
- Refer to the poster as the presentation material (no PowerPoint or other multi-media).
- Explain the cool parts in detail.
- Explain the challenges that the team had building the ROV.
- Anything else you want to add.

2/ Poster

Each Adventurer team needs to make a poster about their ROV. The theme of this shall be a reflection on the building of their ROV. This poster shall be in the Chinese or English language or a mixture of the two. The details of what this poster should contain are below:

- Should be A1 size.
- May be made up of sections of smaller sized sheets of paper.
- Title in large letters at the top.
- Name of the ROV & Team clearly shown.
- Photos **with captions!!**
- Illustrations and drawings
- A written description of the ROV

3/ Reflection

Each member of the team should write one or two paragraphs about the experience of building the ROV and working with their team members. This document can be in either Chinese or English language. It may be neatly written or typed. Each reflection piece should have the name, age and school grade / class level on the first line. Several reflection paragraphs can go onto the same page provided they fit. It should have a title page with the team name on it and be bound or stapled down one edge to resemble a book. Students may include drawings or other artwork to highlight the experience. The limit for each student's reflection is one A4 page.

Scoring

Tasks			Max
a)	**35 points** - Collection of buttons (2 max)		70
b)	**35 points** - Collection of small coins (2 max)		70
c)	**30 points** – Collection of ghosted fishing nets (2)		60
d)	**25 points** - Moving the ghosted fishing nets		50
Penalty Points			
Tether Pulling - Infractions * -5			
Diver Assistance - Infractions * -5			
Leaving Debris in Pool - Infractions * -5			
Total			250