

Pool Performance Round 2 Underwater Mission

Operation: Mine Hunter

BELOW IS A FICTIONAL SCENARIO FOR THE SEAPERCH UNDERWATER ROBOT OUTREACH COMPETITION

Mine Hunter

Unmanned Underwater Vehicles (UUV), sometimes known as **underwater drones**, are any vehicles that are able to operate underwater without a human occupant. These vehicles may be divided into two categories, remotely operated underwater vehicles (ROVs), which are controlled by a remote human operator, and autonomous underwater vehicles (AUVs), which operate independently of direct human input.

The US Navy uses UUVs to detect underwater mines as part of their mine countermeasures efforts to identify threats to Naval vessels. UUVs can identify the types and locations of the mines so that measures can be taken to neutralize them. The U.S. Navy has received intelligence that a number of enemy mines have been buried under the sea floor within U.S. territory and has been tasked to detect and neutralize these mines.

As the Navy's most advanced underwater Remote Operated Vehicle (ROV), a SeaPerch equipped with advanced detection technology, is being dispatched to the scene. Its mission is to find the three mines and neutralize them. This mission must be carried out quickly and efficiently before enemy reinforcements arrive and detonate the mines. Completion of this mission is imperative and a matter of national safety.

The Navy is searching for the best company to complete the mission this is known as Source Selection. The Navy has developed a program to evaluate each company's SeaPerch (ROV) based on performance in a simulated mission. The company that performs best will secure a navy contract. Good Luck!

For SeaPerch Operators: You have been selected to lead this mission due to your skills in navigating and manipulating the SeaPerch ROV. Your SeaPerch will be equipped with a mission package, such as probes or manipulators as you determine necessary.

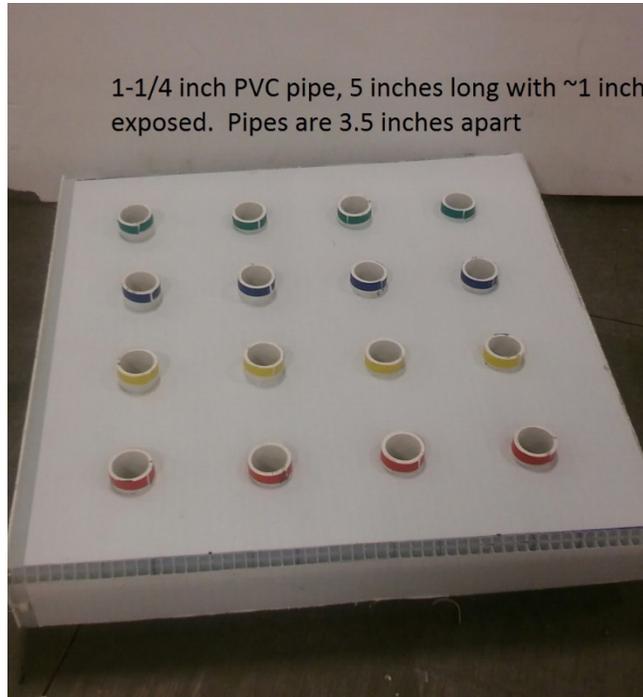
Mission Components:

1. One 4 X 4 grid with 16 holes
2. A 1 ¼ inch PVC pipe, 5-inches long inserted in each hole, with about one inch above a flat surface
3. One photo cell in each one of the 16 holes
4. Three 2-inch PVC caps connected to a 2-inch rope ring
5. One prop mine with a 3-inch diameter with a plunger (plate)
6. Model aircraft carrier equipped with three LED lights
7. Electrical Grid (not part of completing the mission)
8. Internationals 2019 SeaPerch Challenge mission components:
 - a. Detailed build guides can be found here: <https://www.seaperch.org/course>
 - b. 2019 Greater Philadelphia SeaPerch Challenge modifications are detailed below

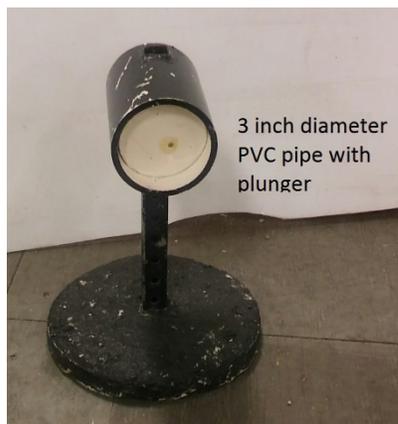
A view of the mission components can be viewed on Attachments A, B and C in this document.

Mission Overview

1. The first task is to pick up the PVC pipe caps with the rope ring attached directing to the cap. There will be three of these. The objective is to place the cap completely over the 1-1/4 inch PVC pipes on the board. The teams have to locate which of the 1-1/4 inch pipes have a photosensor in it. The robot will maneuver over the 4 x 4 pipe grid until they locate a pipe with a photosensor in it. When a pipe is located, a light will illuminate on the model aircraft carrier. All three pipe caps must be on the three photosensor pipes with the three lights lit on the aircraft carrier before moving on to the next challenge. The pipes with the photosensors will be in a row, either horizontal, vertical or diagonal.



2. The next challenge will be to release the torpedo. There will be a black colored prop on the bottom of the pool. The diameter of the pipe is 3 inches. The robot will have to push a plunger into the pipe to release the torpedo. Note: this is the same prop used in past competitions. Releasing the torpedo will cause some special effects and sink the ship.

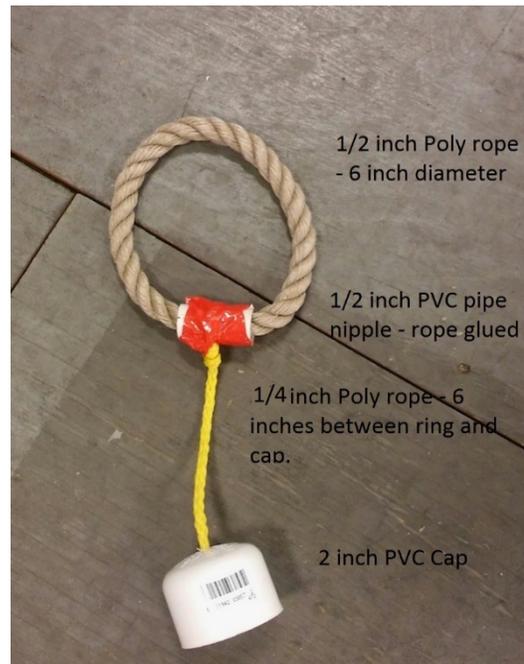


3. Teams can decide which of the two International challenges to attempt first. One challenge is identical to the International's beacon challenge, except the foundation will be different. The height of the beacon off of the pool floor will be the same as with the International competition. The beacon is lit when a magnet is in close proximity to the sensor. The North pole of the magnet will activate the light within 1.5 inches from the red tape. The South pole of the magnet will not work on this side. The South pole of the magnet can activate the light on the opposite side of the vertical pipe, except the magnet essentially has to be against the pipe. The robot can activate the light momentarily by coming near the beacon with the magnet or the robot can place a magnet on the beacon and continuously light the beacon. Teams are allowed to come to the pool deck and add a magnet appendage onto their robot for this event.



4. The other challenge is also from the International's challenge but modified using past props from a past competition. The gate prop will be identical as in the International challenge. It will just be placed on top of a cage. The objectives will still be the same: 1) open the gate; 2) retrieve an object from within; and 3) place the object in a set location. Opening the gate is identical to International's competition. The height of the gate is 26 inches above the pool floor. The objects to retrieve will be different, but the principle will be the same. Two objects will be in the cage. They will be a PVC pipe cap tied to a rope, which is connected to a rope ring. Design of the robot and the placement of the probe in regard to the robot's center of gravity will be essential to the successful retrieval of the objects. Once retrieved the one rope ring cap is to be placed on the same 4 x 4 pipe grid as the first challenge. Placing the pipe cap completely on the pipe will earn the higher point value. The cap can be placed on any open pipe on the board.

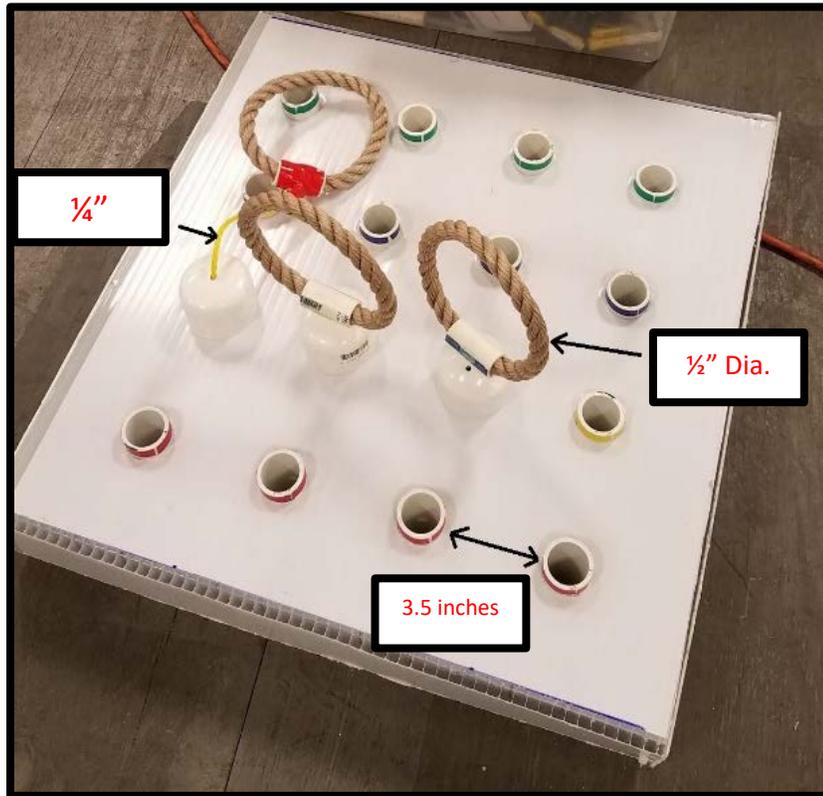
- The other rope ring cap that has a rope extension is placed inside of a 4-inch pipe triggering an air valve.



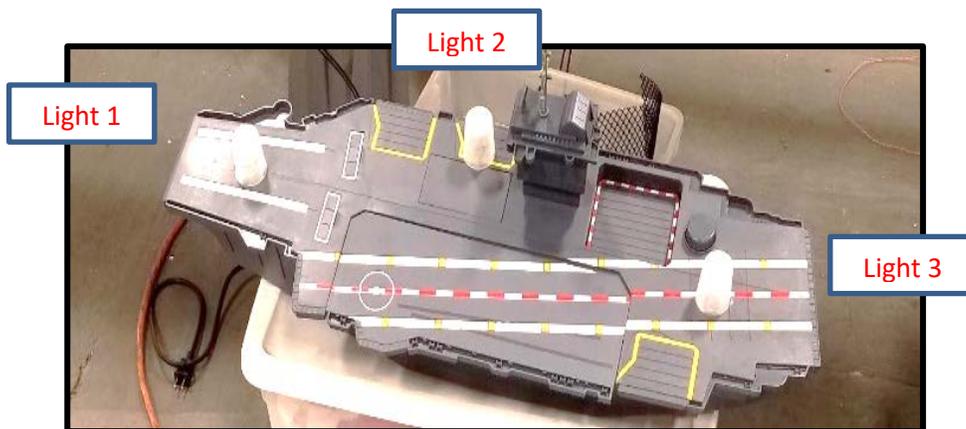
- The competition is completed when the robot hits an air valve and the final time is recorded. The air valve is similar to the float valve used in aquariums to maintain the water level. The prop for this task is still under development and will be posted later.

The individual tasks were designed to be simple and repetitive. Tasks require either a simple lift or push.

Mine Hunter



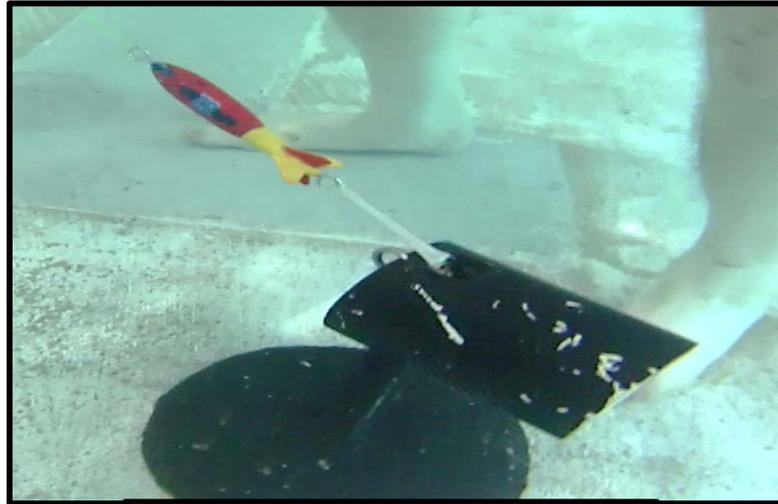
4 X 4 Grid



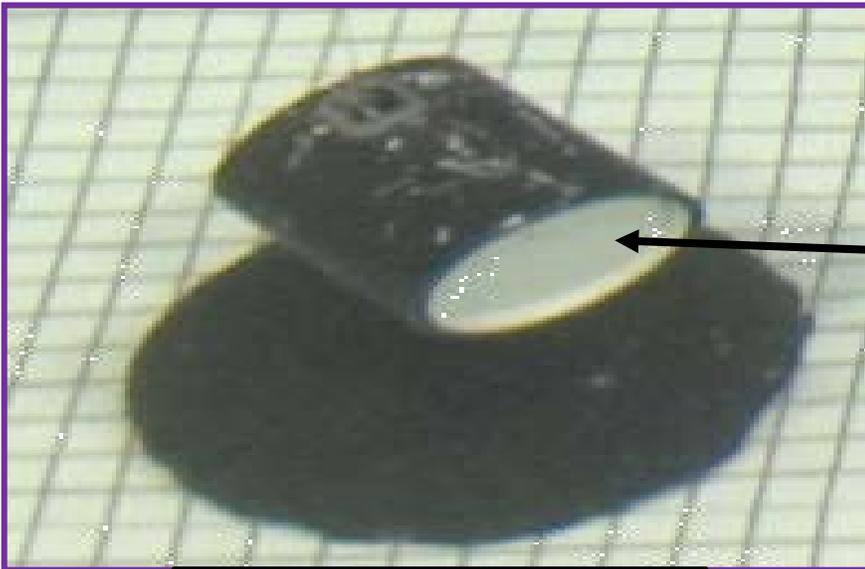
Model Air Craft Carrier

Attachment A

Torpedo Launch



Torpedo Launch



Mine Prop

Plate inside a
3" diameter PCV pipe

Electrical Grid

