

Greater Philadelphia SeaPerch Challenge

(An International Qualifying Regional Competition)

2018 Competition General Rules

Last Updated November 03, 2017

Vehicle Compliance

Each SeaPerch ROV must complete a safety and maneuverability compliance check during check-in, and be approved prior to the team competing in the pool performance events. Only two team members are permitted at Compliance stations 1 and 2.

Compliance Station 1: Safety and Sturdy Rule Compliance Check

1. Sturdy Construction

- a. No loose parts that will potentially fall off during competition or handling
- b. Glue, tape or screws used to secure components
- c. Ballast attachment is secure or described method for ballast attachment is secure
- d. Propeller is properly and securely fastened to motor shaft

2. Safety

- a. No Exposed wires on controller
- b. No sharp edges
- c. Alligator Clip covers (supplied with the kit) are installed on electrical contacts as appropriate

3. Operations

- a. Team connects battery to demonstrate forward and reverse operation of each propeller to ensure they are in proper working order

4. Design Compliance

- a. No more than 3 propellers are installed
 - b. Propeller motors are standard issue and have not been upgraded
 - c. If design modifications appear to exceed the \$20 allowable limit, team identifies that they have valid receipts to support the design modifications in their notebook.
- A serialized Compliance 1 sticker will be issued after successfully completing compliance station #1. Teams should then proceed to Compliance Station 2.

Compliance Station 2: Maneuverability Water Check

- Evaluate ROV's ability to move forward, backward and steer.
- Evaluate ROV's ability to submerge and resurface.
- ROVs that fail the maneuverability check should be taken to Triage for repair or modification. After modification the team can return to Compliance 2 for re-evaluation.

- A serialized Compliance #2 sticker will be issued after successfully completing maneuverability check.
- Teams ROVs are now authorized to compete in pool performance events.

Triage

The vehicle may be worked on by the teams during the competition at the triage station.

- The triage station is equipped with select spare parts and hand tools.
- Triage engineers are not there to build your ROV's replacement parts.
- Triage is to be utilized for repairs and not for building the ROV.
- Triage engineers are there to ensure the safety of the students and assist with minor repairs.

Pool Access & Vehicle Rules

To manage the amount of activity on the pool deck and maximize safety the following rules are in place.

- Limit of two team members allowed on the pool deck in the competition area during an event. This would include a driver and handler.
- Advisors are NOT permitted on the pool deck during competition events.
- One driver and a second person on deck able to control the tether.
- All team members must wear shoes with rubber soles on the pool deck.
- Absolutely NO glass, chemicals, CO2 cartridges or loose materials are permitted in the pool or on the pool deck.

The following rules apply to both pool performance events.

- Bring a fully charged battery to the pool.
- The vehicles MAY NOT be dragged via the tether.
- The vehicle may be reset by the teams during the competition.
- ROVs that are not working may not be worked on during the performance event on the pool deck.
- ROVs requiring work should be taken to triage for troubleshooting and repair.

Vehicle Design Rules

Teams are encouraged to think outside the box and change the shape and configuration of their SeaPerch ROV.

(High School and Middle School)

- Teams may utilize materials (quantity and components) equivalent to one SeaPerch kit.

- Teams have a budget of \$20.00 in addition to the standard kit.
- It is the actual value of the modifications that must be \$20 or less.
- Donated material will be assessed at what the cost would be to procure the material.
- The \$20 limit is for cost of the materials utilized on the final competition vehicle.
- Reasonable spare parts or recycled parts (one set of thrusters (3) and one controller) are not included in this budget.
- Proof of budget compliance should be made available to the judges upon request.
- All motors must be waterproofed.
- Additional NON-stock motors may be utilized for actuation or other non-propulsion uses.
- Teams may only utilize stock SeaPerch motors for propulsion (Jameco Electronics P/N 232022).
- Teams may only utilize three (3) thrusters.
- A thruster is defined as a means of propulsion for the SeaPerch, normally but not limited to a motor and propeller assembly.
- Teams will design for and utilize a 12-volt power source.
- Over charging or stacking batteries is not allowed.
- Power source other than the included kit battery or venue supplied power is not permitted.
- ROV thruster controls shall use simple switches only, no power conditioning or pulse-width modulation (PWM) controls are allowed. Use of a fixed or variable resistor to reduce voltage is acceptable.
- No dimension shall be larger than 22" (minimum obstacle diameter).
- Hooks and attachments may be added/removed depending on the competition round and have cleared safety compliance.

3-D Printing

Permissible as long as it is used to contact with the mission object and:

- Shall provide technical advantage or innovation.
- Rationale documented in design notebook and presentation.
- Value of 3D part is based upon the value of part it replaces.
- Value of 3D printed parts shall not exceed \$10.
- Included in \$20 design improvement budget limit.
- Additional questions on 3-D printing may be submitted through the phillynavalstem.com web site.

Redress, Challenges and Disputes

Sportsmanship is expected at all times. Should a protest or dispute occur during the competition it is the intent to resolve the grievance at the time it occurs, and the ruling by the lead Judge is final.

A team that wishes to have an issue considered shall send the student team captain and one additional student member (2) to the lead judge for discipline in question, with the inquiry or question. The lead judge will render a decision on the issue, and this decision is final. The same issue may not be brought to the judge a second time by any member of the team. Adults may not approach the lead judge on the pool deck regarding any perceived issues.

In the event that a vehicle is inadvertently interfered with during a competition, or a malfunction of a vehicle's parts (i.e., the motor) occurs that is beyond the design and construction, the lead pool judge will have the sole authority to provide the team with time to fix their vehicle and to allow them to compete later in the round. Malfunctions will be evaluated on a case-by-case basis.

Teams may not question the legality of other competing vehicles; it is the SeaPerch Technical Director's role to determine if vehicles meet the entry and compliance requirements.

Unsportsmanlike conduct is grounds for the disqualification of a team. Team members and advisors are responsible for the conduct of all members and adults accompanying the team.

Overall Scoring

Individual Events

Each event will be scored in accordance with its published rubric. Teams will then be ranked, by their score.

Combined Scores

Overall Challenge Winners - Each team will receive a score for each of the four competition categories. Scores from all categories except Team Spirit & Sportsmanship will be combined to determine the overall GPSPC Champion. There will be one overall Middle School Champion and one High School Champion.

Trophies are awarded for first, second and third place for Engineering Design Notebook, Oral Presentation, Vehicle Performance, and Team Spirit and Sportsmanship. Vehicle Performance awards are a combined score of both pool rounds.

First and second place pool performance winners receive an invitation to represent the Greater Philadelphia SeaPerch Region at the International Competition.

Breaking Ties

Scoring ties will only be broken where it is required to determine trophy places. (i.e., ties will not be broken when ties do not affect the top three results in any event or class overall) Pool Performance ties to the 100th of a second will be broken by the faster time.

Competition Events

Pool Performance: Obstacle Course

An underwater remotely operated vehicle (ROV) must be able to maneuver successfully under its own power. If a vehicle cannot maneuver to the appropriate location to perform its task, the vehicle is of no use. In this round teams must navigate their ROV through a submerged obstacle course and trigger two light sensors.

1. The SeaPerch must navigate through the obstacle course and trigger a light sensor after clearing the furthest ring before starting its return.
2. The ROV must return through the course in reverse order and trigger a second light sensor when it reaches the end of the course.
3. A time penalty will be enforced if the light sensor is skipped.
4. The clock stops once the second light sensor is triggered at the end of the course.
5. If your team is not able to make it through a hoop, you may skip it.
6. You will be given a total of no more than 10 minutes to complete the round.
7. The vehicle cannot be dragged through the obstacle course via the tether.
8. The submerged obstacle course involves five large rings (22"–24" minimum diameter), oriented in various directions, For every hoop your team makes it through you will receive points. Scores for this round will be based on the fastest time for successfully navigating the obstacle course and triggering the sensors.
9. Consideration of optimal maneuverability, control, and speed should be given when constructing your Sea Perch (thruster placement and orientation, tether attachment, buoyancy and ballast, etc.) and control box.

For a complete set of rules and description follow the [Obstacle Course link of this website.](#)

Pool Performance: Mission Course

Nuclear Torpedo Recovery

Scenario: The U.S. has received intelligence that a next generation nuclear torpedo has been lost by an adversary. The U.S. Navy has been tasked to recover the torpedo buried in the sea floor. 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.

An underwater glider was used to determine the approximate location of the torpedo. Now that the approximate location has been identified, an ROV will be deployed to assist in the recover the torpedo. The exact location must be determined and the torpedo tagged with a location beacon. Once this is complete, an Underwater Recover System (URS) will be deployed to free the torpedo from the seabed and lift it to the surface. In a series of unfortunate and real world events, the URS was damaged and requires repair. The ROV will be utilized to complete the repairs to the URS. Once the URS is repaired the ROV will activate the lift system of the URS. Scientists speculate that the torpedo's integrity has degraded allowing seawater intrusion. As a result, an internal reaction is producing a continuous thermal event. The nuclear material must be removed to render the torpedo safe.

Teams are required to complete these tasks:

- Tag Torpedo with locator beacon
- Repair three (3) components of the Underwater Recover System (URS)
- Activate URS lifting system to raise torpedo
- Remove nose cone to gain access to nuclear material
- Remove nuclear material and place in a containment box.
- Perform final task to destroy the URS, related to SeaPerch International

For a complete set of rules and description follow the mission link of this website.

Team Presentations

Each team will make a maximum 10-minute presentation using PowerPoint or Google Slides to a panel of judges. The team should present as though they are the sales team of the company that designed and built their Sea Perch. The client (panel of judges) has a mission to retrieve a nuclear torpedo from the sea floor and they are screening possible companies to determine which model would be right for them. It is the sales teams' responsibility to prove to the clients that their product is the best. Teams that modified the original Sea Perch design should discuss their modifications, the experiments they conducted and what modifications came from them. Craft **must** be present at the presentation. At the conclusion judges should have a clear understanding of how students implemented their basic knowledge of fluids and propulsion.

Teams are judged in these areas:

- Presentation of the company
- Knowledge of design and manufacturing process/engineering processes
- Highlight innovation and creative thinking
- Focus on naval engineering
- Time management
- Innovative design interview Q&A (5 minutes)

For a complete set of rules and description follow the presentation link of this website.

Engineering Design Notebook

The Engineering Design Notebook category measures a team's ability to document the scientific process in a meaningful and organized manner. The Engineering Design Notebook must document how teams implemented the engineering process. The Design Notebooks shall include the following sections:

Teams are judged in these areas:

- Front Matter
- Naval Engineering Research

- Design, Engineering, and Manufacturing Process
- Naval Scenario for SeaPerch
- Teamwork
- Bill of Material
- Supporting Documentation

For a complete guide and description follow the notebook link of this website.

Policy on Entering Multiple Teams

- Due to capacity limitations, schools may only enter one team for each level of the competition. In cases where multiple teams from a particular school design and build multiple Sea Perch ROV's, a runoff competition is recommended to identify which Sea Perch will be entered into competition.
- In cases where a non-school organization sponsors multiple unrelated teams from various geographic locations, a written request can be made for more than one team to compete in the GPSPC. Based upon space availability and other factors, more than one unrelated team sponsored by a single organization may be granted permission to compete.
- Teams that are not registered/qualified to participate in GPSPC may be permitted to complete the obstacle course and/or mission after the official competition is over if time allows as determined by the lead pool judge. Requests shall be made at intermission and a determination of availability will be made by the lead pool judge at the end of competition.
- Teams competing in SeaPerch and SeaGlide must have separate team members and coaches on Competition Day to avoid scheduling conflicts. No accommodations for schedule will be made.