



MATE Center/MTS ROV Committee ROV Competition for High School & College Students

www.marinetech.org/rov_competition/index.html

Being held in conjunction with the
NOAA/NASA Link Project Exploration 2002 Symposium
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Kennedy Space Center, Cape Canaveral, Florida



Design & Building Specifications and Competition Categories

ROV Design & Building Specifications:

- **Depth rating**
The vehicle must be able to operate at a water depth of up to 13 feet (3.9 meters). The vehicle will be expected to travel to and within a 15ft x 15ft (4.5m x 4.5m) area that will be marked off on the bottom of the pool. This area will be at least 10 feet (3.0m) from the poolside launching area. The farthest point of this area will be no more than 25 feet (7.6 meters) from the poolside launching area.
- **Operation**
The vehicle must be able to function in fresh but chlorinated water. The vehicles will be operating in the swimming pool located at the Brevard Community College (BCC) Cocoa campus (see <http://web2010.brevard.cc.fl.us/campuses/cocoa/> for information about BCC's Cocoa campus).
- **Construction materials**
The vehicle can be constructed out of materials of the team's choice, as long as they meet the other requirements and safety concerns listed below. (See the *Resources* section of ROV competition web site for information on building materials.)
- **Size constraints**
The vehicle and all of its accessories (cameras, thrusters, retrieval devices, etc.), EXCEPT for the tether, must fit within a 2.75ft x 2ft x 2ft (84cm x 61cm x 61cm) box. The vehicle and all associated equipment, including the tether, must be hand-carried to the competition site.
- **Power supply**
The source of electrical power for the vehicle is one 12-volt battery (e.g., car or golf cart battery) – approximately 600 CCA (cold cranking amps). This is the **only** electrical power supply; no additional batteries or electrical power supplies are permitted during the competition.

Other sources of “stored” power (e.g., hydraulic, pneumatic, or compressed air) are permitted as long as the vehicle and any and all associated equipment can be hand-carried to the site and operated off of the one 12-volt battery provided. All electrical devices must operate at no more than 25 amps. **When submerged, the vehicle must operate at 12 volts, drawing a maximum of 25 amps.** A 25-amp fuse will be placed in-line between the positive battery terminal and the vehicle to ensure that the ROV operates within these limits.

12-volt batteries (fully-charged) will be provided at the event. No other electrical power (e.g., 110/120 VAC) will be provided.

- ***Retrieval capabilities***

The vehicle will be tasked with retrieving objects as part of the mission scenario.

These objects will be placed within a 15ft x 15ft (4.5m x 4.5m) area marked off on the bottom of the pool that will be located at least 10ft from the poolside launching area.

Objects – general information:

- Number
5 different types of objects, 2-3 of each object located within the recovery area.
- Weight
Heaviest object(s) weigh no more than 2 lbs. wet (in the water weight).
- Shape
Varies. Objects are in the shape of cylinders, squares/rectangles, cups (with handles), bottles, and chains (such as strands of beads or metal links).
- Material
Varies. Includes lead, plastic, ceramic, glass, and/or aluminum.
- Size
All objects fit within 6in x 6in x 12in (15.25cm x 15.25cm x 30.5cm) box.
- Point value
Each object will have an assigned point value. Points will be awarded to teams once they have recovered the object.

Objects – specific information:

Information that accompanies each:

- Name
- Weight
- Point value
- # at each station
- Notes

“Porcelain” teacups

< 1/2 lbs.

5 points

2 @ each station

The daintily crafted and hand-painted teacups were made by the famous Corelle family, talented craftspeople originally from Spain. The family eventually came to settle in Corning, New York, where their descendants can still be found making table and cookware today.

Necklaces of “precious” jewels

< 1 lbs.

10 points

3 @ each station

The buccaneers put their own signature – the Jolly Roger carved in black onyx – on these strands of precious gold, pearls, and rare black rubies.

Wine bottles

≤ 2 lbs.

15 points

2 @ each station

Yo! Ho! Ho! and bottles of wine, not rum, for these feisty pirates – a California Chardonnay to be exact.

Stacks of gold coins

< 1lbs.

20 points

1 @ each station

Over time the gold coins, carefully stacked and stored below deck, became fused together by the siliceous clay that filled the ship's haul when it came rest on the ocean floor.

Gold bars

2 lbs.

25 points

1 @ each station

The most valuable of all treasures on board, the gold bars had been tied together by ropes to make them easier to handle and transport. Unfortunately, as the ship sunk many of the bars came lose from their bonds and were scattered about and lost on the sea floor. Only the bottom bar – with the rope amazingly intact – remains.

- ***Safety issues***

Hazardous and/or non-biodegradable materials (e.g., hydraulic oil) may not be intentionally released into the competition waters. During the safety check (see below), competition officials may disqualify any vehicle that they feel poses an unreasonable safety hazard (such as from leaking fluids or exposed electronics).

Make sure all seals and housings are tight and secure before the vehicle enters the water.

Officials may also stop the competition at any time that they feel there is a realistic safety concern.

Safety check:

Competition organizers will conduct a physical inspection and safety check of the vehicle to ensure that it meets the design and building specifications and does not pose a risk to the integrity of the competition venue.

The competition organizers (MATE and MTS's ROV Committee) and venues (Kennedy Space Center and Brevard Community College-Cocoa) are not liable for any injury or damage caused by any vehicle participating in the event.

Competition Categories:

Design & Innovation (Static Display of ROVs)

Competition judges (who may be members of the Technical Advisory Committee; see the ROV competition web site for a list of members) will evaluate the vehicles based on a pre-established set of criteria. The criteria may include: innovation of design and creative use of materials; technical merit; craftsmanship; and safety.

The criteria will be posted to the ROV competition web site at least one month prior to the event.

Mission: Object Retrieval

The “wet” component of the competition involves locating, retrieving, and returning to the surface starting point with objects (as described above) during a specified time frame.

The goal is to retrieve as many objects as possible during the specified time period.

Points are awarded according to each object’s assigned point value. Competition judges and/or organizers will monitor the competition runs and award points based on each team’s performance.

Mission scenario:

See *Rime of the Ancient Buccaneer*, posted within the **Design Specs & Mission** section of the ROV competition web site.

Competition arena:

- There will be 2 competition launch stations set up along the edge of the BCC pool. Team station assignments will be announced at the event.
- At each station –
 - Objects will be located within a 15ft x 15ft area marked off on the bottom of the pool. This area will begin 10ft from the poolside launching station.
 - There will be 5 different types of objects to recover and 2-3 of each object located within the recovery area.
 - The farthest point of each 15ft x 15ft area will be no more than 25ft from the poolside launching station.

Competition runs:

The amount of time allotted to each team during a competition run includes:

- 5-minute preparation time
Includes getting organized at the launching area and deploying the vehicle into the water.
- 20-minute performance period
Begins once the vehicle is released into the water by a designated team member. Includes locating, retrieving, and traveling back to the surface starting point with the recovered objects. Also includes the time it takes for the designated team member to remove the object from the ROV.
- 5-minute wrap-up
Begins once the performance period end. Includes recovering the vehicle from the water and leaving the launching area.

Scoring:

An object is considered retrieved if the vehicle has possession of it (i.e., the object is attached to, held on to, or otherwise contained by the vehicle) when the vehicle returns to the surface starting point and is removed from the ROV by the designated team member's hand. Points are awarded according to each object's assigned point value and only if the object is intact (i.e., not damaged).

Recovering multiple numbers of the same object is permitted, considering that some objects will have a higher assigned point value than others.

Judges will use their discretion when awarding points, i.e., use their best judgment to determine if total points are awarded for an object that was retrieved but damaged during the retrieval process.

Venue:

Pool parameters –

- Depth
13 feet.
- Distance from shore
Each 15ft x 15ft recovery area will begin 10-ft from the poolside launching station.
- Salinity
0 ppt (freshwater).
- Bottom conditions
 - Substrate/Sediment
Concrete.
 - Topography
Flat.
 - Submerged vegetation
None.
 - Wildlife
None.
- Visibility
Unlimited. However, the pool's floating cover will remain in place during the competition, which means that team members will not be able to see their vehicles from the surface once the vehicles enter the pool. The cover will also reduce the amount of available natural light. Therefore, team members will have to rely on cameras or other forms of navigation.

Practice Sessions:

Each team will also be given practice time – the opportunity to submerge and operate its vehicle to make certain that the vehicle is functioning properly and, if not, to make repairs and/or minor modifications before the actual competition. A practice session is tentatively scheduled for Tuesday, May 21st, from 9am-1pm at the BCC pool.