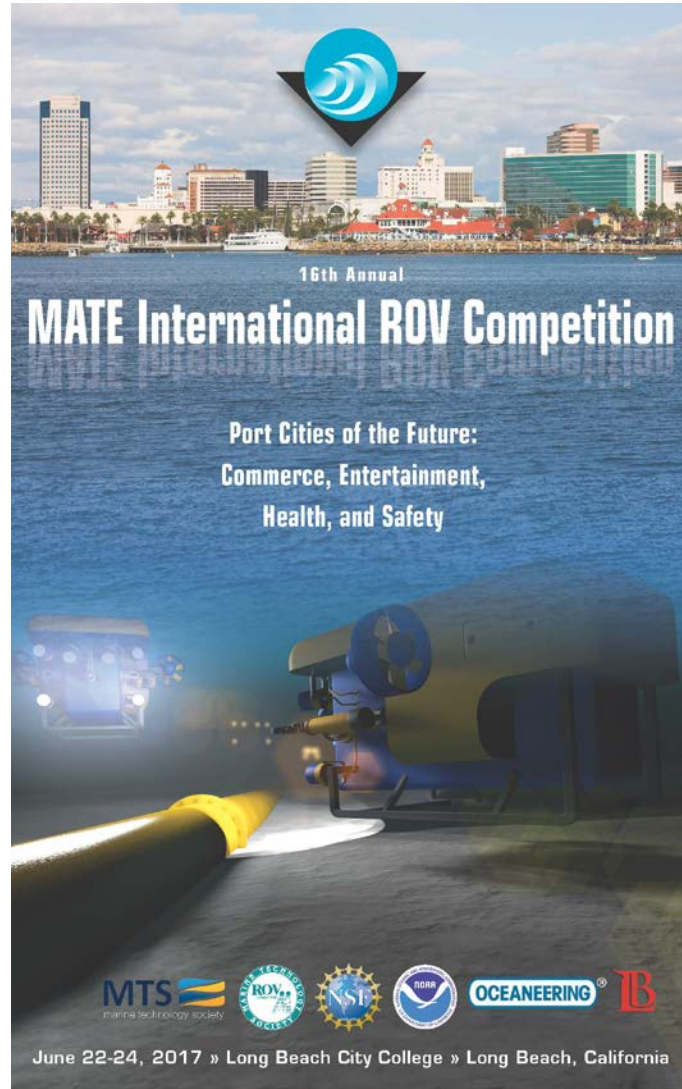


## 2017 MATE ROV COMPETITION: SCOUT CLASS PREVIEW MISSION



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## ***SCOUT Class Preview Product Demonstration***

### ***Port Cities of the Future: Entertainment***

With its kaleidoscope of colors, fanciful music, and more than 1,000 fountains shooting water 100 feet into the air, the port's water and light show, *a-MATE-zing*, is a spectacular blend of art and technology. It is also a hugely popular nighttime attraction, which makes maintaining it to ensure uninterrupted operation a priority.

The show is due for routine maintenance. Specifically, one of the water fountains needs to be removed and replaced. The fountain is located in the center of the show's primary platform.

You are tasked with piloting your ROV to the platform to turn a valve to stop the flow of water. Then you must remove the old fountain and install a new fountain. After installing a new fountain, you must turn the valve to restore the flow of water. You must also return the old fountain to the surface.

#### **References**

<https://disneyland.disney.go.com/entertainment/disney-california-adventure/world-of-color/>

**This task involves the following steps:**

- **Turning the valve to stop the flow of water to the platform – 10 points**
- **Removing the old fountain – 10 points**
- **Installing the new fountain – 10 points**
- **Turning the valve to restore the flow of water to the platform – 10 points**
- **Returning the old fountain to the surface, side of the pool – 10 points**

**TOTAL POINTS = 50**

#### **Product Demonstration Notes:**

Companies must do the first four steps of this task in order. Step 5, returning the old fountain to the surface, side of the pool, can be done at any time after removing it from the platform.

The valve will be constructed of a ½-inch gate valve and will be built into a ½-PVC framework. Four 40 cm lengths of PVC pipe will be inserted into the handle of the valve to assist in opening and closing the valve. The valve will be positioned horizontally (parallel to the bottom of the pool). Companies will receive 10 points when they turn the valve clockwise 360°, 1 time around, to turn off the flow of water. One of the 40 cm lengths of pipe will be painted red to verify the rotation of the valve. No actual water will be running through the valve or pipes.

Companies must then remove the old fountain and install the new fountain. At the start of the product demonstration, the old fountain will be located on the top of the platform, sitting on a 32 cm x 32 cm corrugated plastic sheet. The new fountain will be located at the surface, side of the pool and can be

attached to the vehicle during the set up period, or attached at a later time. Both fountains will be constructed from a 3-inch to 2-inch ABS reducer bushing with two 1/2-inch end caps attached to the top. A length of rope will serve as a grab point for the fountains. The old fountain will be positioned inside a 20 cm circle drawn on the corrugated plastic. Companies will receive 10 points for removing the old fountain. Removing the old fountain is defined as the old fountain no longer in contact with the corrugated plastic. Companies will receive 10 points when they install the new fountain. Installing the new fountain is defined as the entire fountain inside the 20 cm circle drawn on the corrugated plastic and no longer in contact with the ROV. The new fountain must be transported by the ROV.

Once the new fountain is installed, companies must turn the valve to restore the flow of water to the platform. The valve must be turned counter-clockwise 360°, approximately 1 time around, to restore the flow of water to the platform. Companies will receive 10 points when they successfully turn the valve handle 1 turn counter-clockwise. One 40 cm length of PVC pipe attached to the valve will be painted red to verify the rotation of the valve.

Companies must return the old fountain to the surface, side of the pool. This step may be done at any time after the old fountain is removed from the platform. Companies will receive 10 points when the old fountain is returned to the surface, side of the pool. If returning the old fountain to the surface is the final task of the product demonstration period, time will stop when a member of the company grabs the vehicle at the surface, side of the pool. The old fountain may be removed from the vehicle and placed on the surface, side of the pool after the clock has stopped. If the old fountain is accidentally dropped after the clock has stopped, time will not restart, and the company will not receive a time bonus since all tasks were not successfully completed.

## **PROP BUILDING INSTRUCTIONS & PHOTOS**

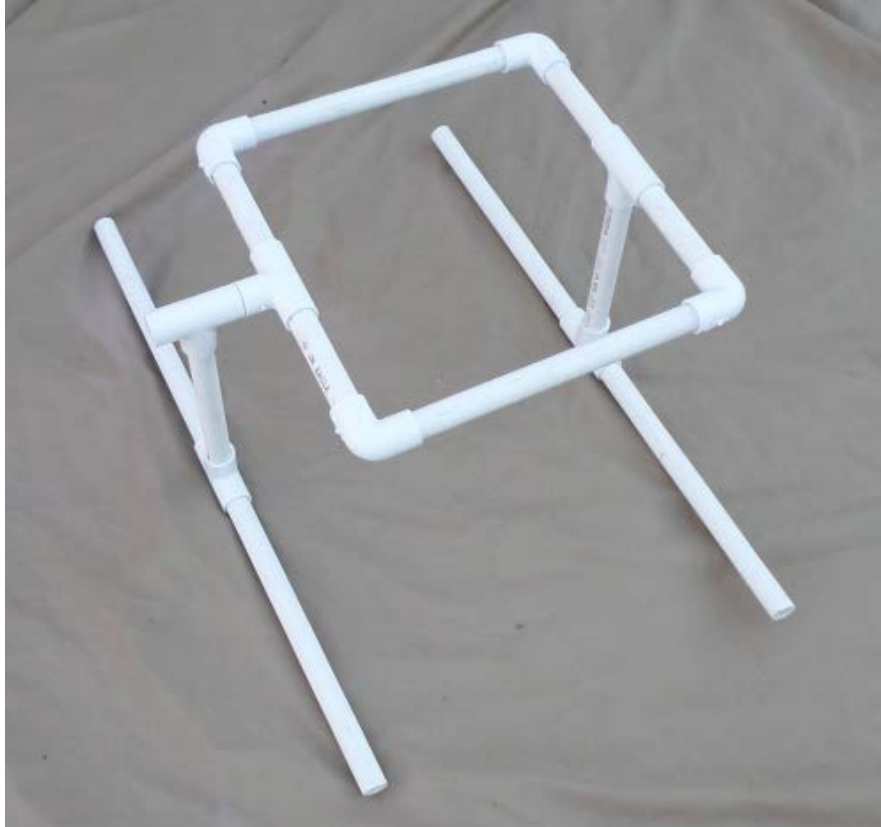
### **Platform**

The platform framework will be constructed of 1/2-inch PVC pipe. A corrugated plastic sheet will cover a small section of the framework. To construct the platform framework:

1. Cut four 30 cm lengths, two 26 cm lengths, two 20 cm lengths, four 12 cm lengths, and one 3.5 cm length of 1/2-inch PVC pipe.
2. Insert two 12 cm lengths of PVC pipe into the side openings of a PVC tee. Attach a 90° elbow to the other ends of each 12 cm length of pipe. Insert a 26 cm length of pipe into each opening of the two elbows. Attach another two 90° elbows to the other end of each 26 cm length of pipe. Insert the remaining two 12 cm lengths of pipe into the open ends of these two elbows. Bring the ends of the 12 cm pipes together and insert them into the side openings of a PVC tee.
3. At this point you should have a rectangle with two edges of 26 cm pipe, and two edges of 12 cm/tee/12 cm lengths of pipe. The middle openings of both tees should be open.
4. Insert the 3.5 cm length of pipe into the middle opening of one of the tees. Attach the side opening of another PVC tee to the other end of the 3.5 cm length of pipe. Insert two 30 cm

lengths of pipe into the two side openings of a tee. Insert a 20 cm length of pipe into the middle opening of this tee. This will create a base for the framework.

5. Repeat step 5 to create a second base stand.
6. Two tees have a middle opening without PVC pipe, one at each end of the framework. Rotate both middle openings so they face down (perpendicular to the rectangle). Insert the 20 cm length of pipe from the two base stands into the two middle openings of these rotated tees.



**SCOUT product demonstration build photo #1: Platform framework.**

7. Cut a 32 cm by 32 cm square of corrugated plastic sheeting. Use screws to attach it onto the topside of the rectangular portion of the framework.
8. Measuring from the center of the corrugated plastic sheet, draw a 20 cm circle around the center-point. This circle should be visible from the surface, side of the pool.



**SCOUT product demonstration build photo #2: Corrugated plastic on framework.**

### **Valve**

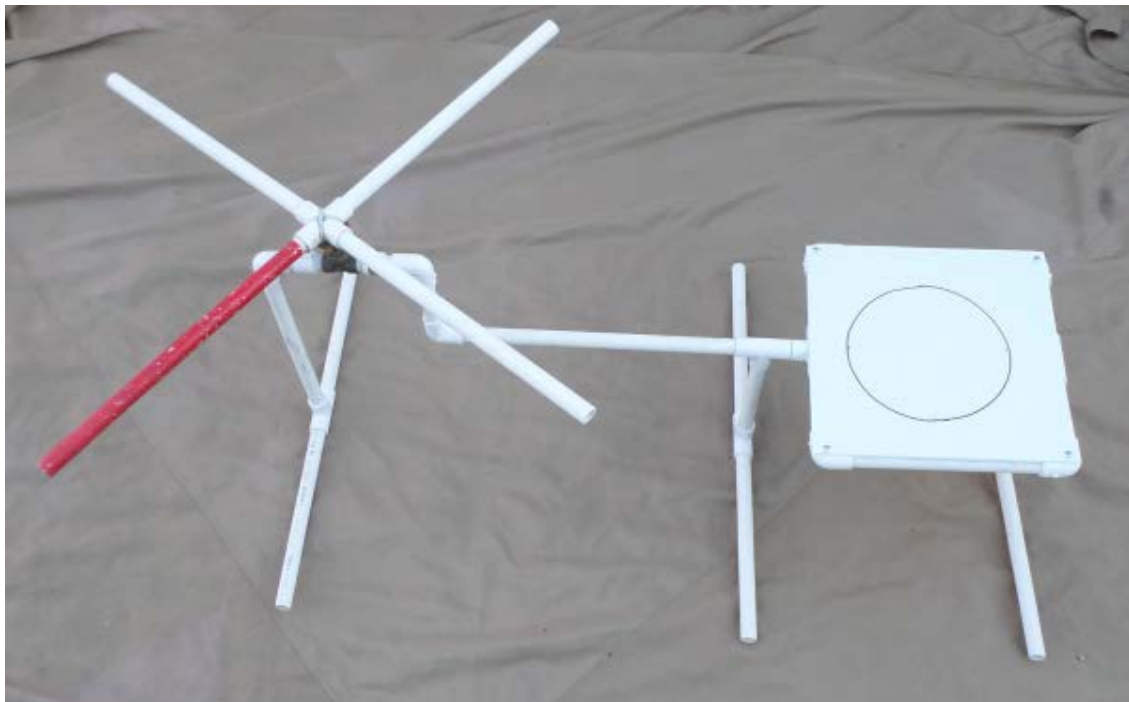
The valve will be constructed from a ½-inch gate valve. A ½-inch cross with 40 cm lengths of pipe serve as a handle to turn the valve. To construct the valve:

1. Cut five 40 cm lengths, one 32 cm length, two 30 cm lengths, one 10 cm length, and two 5 cm lengths of ½-inch PVC pipe.
2. Insert one of the 40 cm lengths of pipe into the side opening of the tee at the end of the platform framework (see above). Attach a 90° elbow to the other end of this 40 cm length of pipe. Rotate the elbow so the opening faces up and insert the 10 cm length of pipe. Attach a 90° elbow to the other end of this 10 cm length of pipe. Insert a 5 cm length of pipe into the other opening of this elbow.
3. Twist a ½-inch male adapter into both ends of a ½-inch brass gate valve (Home Depot Model# 170-2-12-EB, Internet# 205816192, Store SKU# 867855). Use zip ties to secure a ½-inch PVC cross onto the valve handle; use 2 or 3 zip ties to secure the cross tightly.
4. Attach one of the male adapters in the gate valve to the other end of the 5 cm length of PVC pipe. Insert the other 5 cm length of PVC pipe into the other male adapter screwed into the gate valve. Attach a ½-inch 90° elbow to the other end of this 5 cm length of pipe. Rotate the elbow so the open end face downwards.

5. Insert the 32 cm length of pipe into the other end of this 90° elbow. Attach the middle opening of a PVC tee to the other end of this 32 cm length of pipe. Insert the two 30 cm lengths of pipe into the two side openings of this tee.
6. Insert the four remaining 40 cm lengths of PVC pipe into the four openings on the cross attached to the gate valve. Paint one of the 40 cm lengths of pipe red, or other bright color. This will help in determining whether the valve has been turned 360° (1 time around).



**SCOUT product demonstration build photo #3: The valve.**



**SCOUT product demonstration build photo #4: The valve attached to the framework.**

## Fountain

The fountain (old and new) will be constructed from an ABS 3-inch to 2-inch reducer bushing (Home Depot model #C58012FHD32, Internet #100343802, store SKU # 188301). It will have two ½-inch PVC end caps screwed into the top side. To construct the fountain:

1. Cut a 2 cm length of 2-inch PVC pipe. Insert the 2 cm length of pipe into the 2 cm opening on the reducer bushing.
2. Insert a 2-inch knockout cap (Home Depot model #39101, Internet #100137732, Store SKU #508257) into the 2-inch pipe.
3. Use a screw to secure a ½-inch PVC end cap to the outside of the top edge of the 3-inch to 2-inch ABS reducer bushing. The screw should go straight down into the side wall of the bushing. Repeat this one more time (two end caps total) at opposite sides of the bushing.
4. Cut a 50 cm length of 1/8-inch polypropylene rope (Home Depot part #72402, internet #205804755, Store SKU #402816). Drill two 3/16-inch holes through the top side wall of the wellhead cap on opposite sides. Push the 50 cm length of rope through both 3/16-inch holes. Tie an overhand knot on the ends of each rope to secure the rope to the wellhead cap.

Design note: The fountain for the 2017 task is almost identical to the wellhead cap from the 2016 RANGER / NAVIGATOR product demonstration tasks. The 2017 fountains do not require the Velcro additions required for the wellhead cap. However, the Velcro does not affect the task in any way and may be included. If you wish to add the Velcro:

1. Cut two 1.8 cm x 1.8 cm squares of Velcro hooks. Adhere the sticky side of the Velcro to the inside bottom surface of the two end caps, over the screw heads holding them in place.
2. Cut four 5 cm x 3 cm lengths of Velcro loops. Attach them around the bottom, angled end of the 3-inch to 2-inch reducer bushing.



**SCOUT product demonstration build photo #5: The fountain with Velcro.**

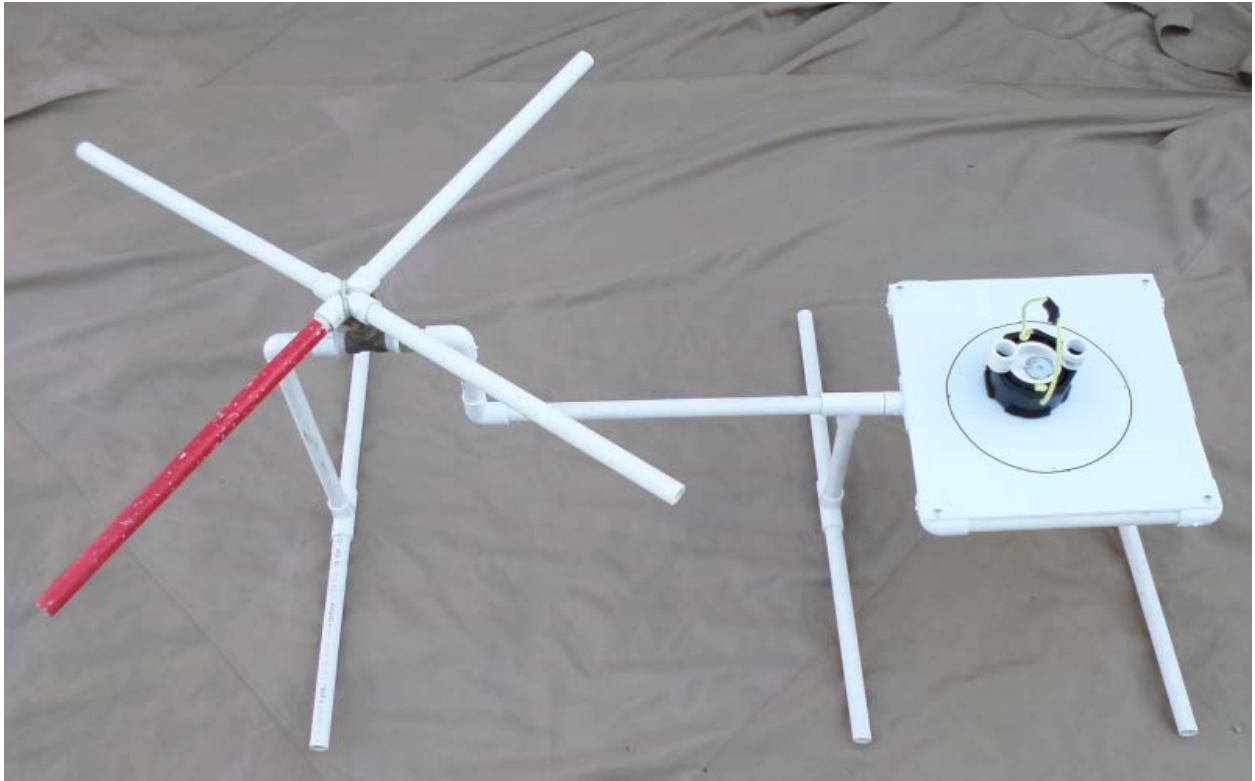
A small piece of flotation can be added to the top of the rope to keep it upright in the water.



**SCOUT product demonstration build photo #6: The fountain on the platform.**



## PRODUCT DEMONSTRATION PHOTOS



**SCOUT product demonstration photo #1: The platform, valve and fountain.**