2023 Product Demonstration Company Briefing

This briefing will go over some of the information your company may need to know regarding your product demonstration runs. More information on the tasks is available in the competition manuals and Official Rulings document.

Be on time. Everyone has a schedule. Be at your engineering presentation room 10 or 15 minutes prior to your presentation. Be ready to go 20 or 30 minutes prior to your product demonstration run. Weight measurements happen prior to your product demonstration time. The pool deck coordinator will not wait if you are still trying to get your weight done when your product demo time is scheduled. Your set up time and product demonstration time will start, even if you are back getting your vehicle weighed. Six companies need to be weighed, and it will be done in the order they show up. Don't show up late.

Missing your run: If your vehicle is not functioning and you cannot make your product demonstration run, send a company member to inform the pool deck coordinator that you are not showing up. Please let us know.

Communicate with the station judges. Let the judges know what task you are working on. If you have multiple video monitors, let the judges know what monitor is doing the active mission. The more information you give your judges, the easier it will be for them to score you properly. If you think you have completed a mission, ask the station judge.

This is especially important if more than one thing is going on at once. If a company member is identifying fish via eDNA, or creating a 3D model of the coral head, let the judges know – especially since it is probably not the pilot doing this task.

The better you communicate with the judge, the more smoothly everything will go.

No tasks can be done after the 15-minute time period. All the tasks must be done within the 15-minute mission time. That includes creating the 3D model, eDNA analysis, and more. If the judges do not see the finished product by the end of the 15-minute mission time, you will not receive points for it.

This goes back to communicating with the judges. If you do not communicate the fact that you finished a task, you may not be scored for it.

Companies must have passed safety inspection. All companies MUST have their blue, passed safety check card. You will get these from the safety inspectors when you pass safety inspection. If you do not

have this, you do not get into the water. No exceptions. If you do not have it, you need to retrieve it. Time will not stop while you are retrieving your card.

5-minute setup time. Companies have 5 minutes to set up. Companies may put their vehicles into the water and test power/motors/etc. ROVs cannot descend and check out the missions during set up; they should go no deeper than 0.5 meters. Companies must start at the surface, side of the pool. If a company does not finish setting up within 5 minutes, their mission time starts. They can continue setting up and/or repairing their vehicle during mission time. If a company finishes setting up early, they do not get additional mission time. They can choose to start early, or they can wait until their 5 minutes is up.

15-minute product demonstration time. Companies have 15 minutes to complete all the mission tasks. The judges will award points as you accomplish tasks. When the mission time ends, you receive points for the tasks that you have accomplished but cannot receive any additional points.

Likewise, you can no longer receive penalty points after the mission time ends. If your ROV breaks down, and you want to avoid penalty points for diver assistance or pulling on the tether, ask the judge to end your mission run.

5-minute demobilization time: After the mission run, Companies have 5 minutes to pack up and exit the station. The judges may need the CEO to remain a bit longer to confirm points, but the rest of the company and their equipment should be moved out of the area.

Time bonus: To receive a time bonus, companies must have completed all the tasks perfectly and have received no penalty points.

PRODUCT DEMONSTRATIONS

Order of tasks. Companies can start with any part of any of the three tasks. Companies can go back and forth between the tasks as desired.

A few tasks logically have to be done in order: You need to retrieve the water sample before you can identify the fish using eDNA. Certain tasks are required to be done in order. This doesn't mean once you start that task you have to finish it, it just means you cannot skip ahead. For example, all three mooring connectors from the solar panel array MUST be connected before you can remove the cover and plug in the power connector. But you can start this task then move on to other tasks, then come back to it. For example, you can move the floating solar panel array into the proper area, then leave it there while the ROV does other tasks.

Weight:
Your will be weighed prior to each product demonstration run. Since you have two attempts at the product demonstration, you will be weighed twice, once for each product demonstration run. You cannot use your first weight measurement on your second run, or vice versa.

Once your ROV is weighed, company members cannot retrieve additional items for the vehicle or mission run. If you do, your ROV must be weighed again.

Launching Through the Hole

Companies must launch their vehicle through the 1-meter x 1-meter hole. When your ROV is in the water, the tether must be through the hole for the entire product demonstration run. Items can be returned to the surface anywhere, but the tether must go through the hole when the ROV is in the water.

TASK 1: Marine Renewable Energies

Task 1.1 Installing a floating solar panel array

This task must be completed in order. You cannot complete a later step of this task without completing the previous steps first. That DOES NOT mean you cannot stop partway through and move on to something else, but you cannot continue the steps of this task if you cannot complete one of the steps of the task.

POSITION A SOLAR PANEL ARRAY AMONGST FLOATING WIND TURBINES

The floating solar panel array will either be on the surface, side of the pool or on the pool deck at the start of mission time.

All four connectors should be attached to the bottom when the mission starts. If they are not, let the judges know. If they come loose later, while your company is moving it, it is up to you to work with it as is.

Companies are allowed to remove one or all of the mooring and power connectors and drag the solar panel array out by those connectors. How a company moves the solar panel array is up to them.

MOOR THE PANEL ARRAY TO THREE ANCHOR POINTS

You must connect all three anchor points before moving on to connect the power.

Any mooring connector can go on any anchor point, but only one mooring connector per anchor point.

REMOVE THE POWER PORT COVER

INSTALL THE POWER LINE CONNECTOR INTO THE POWER PORT

The power connector goes over the power port. When you make this connection, the LED should come on. Show the illuminated LED to the judge.

You MUST have all three moorings connected in order to remove the power port cover!

Beware of all the ropes!

If you complete task 1.1, there will be seven ropes/cables going from the surface to the bottom. Know your ROVs surroundings and don't get entangled.

Notes for RANGER: Since RANGER class is happening in shallow water (4 ft to 5.5 ft), the wind turbines will be held up by PVC pipe, not with floats at the top end of ropes. For task 2, the biofouling will be on PVC pipe, not ropes.

Task 1.2 Remove biofouling from the floating wind turbines

Biofouling is not considered debris and can be left on the bottom of the pool without penalty. Alternatively, companies may bring it to the surface, side of the pool.

Task 1.3 Piloting into "resident ROV" docking station.

This should be the final task. After the company successfully docks, the mission is over and no more points can be earned (or lost).

Successfully docking is defined as pushing the red button at the back of the docking station all the way in. A judge must see the red button pushed in. If need be, you might need to push the button and then back off (reverse) to show the judge you are successful.

TASK 2: HEALTHY ENVIRONMENTS FROM THE MOUNTAIN TO THE SEA

Task 2.1 Create a 3D Model of a coral head

The bowl will have three diseased areas. These diseased areas will be 6 cm x 6 cm, 4 cm x 4 cm or 2 cm x 2 cm. There will be a mix of sizes.

Companies must create a 3D model of the coral head.
Companies can use any CAD program they wish. CAD is defined as any program that can display the image and rotate it around to any angle. This can be a CAD program like Solidworks, Eagle CAD or can be some other program. The desire (what the judge will score on) is to have the proper image displayed on the screen and that image is able to be rotated. How a company achieves that is up to them.

Companies do not need to show / display the PVC framework below the coral head (if there is any) or any holes drilled into the bowl/coral head. They can show these if desired, but they are not required. Companies should include the framework for calculating the height of the coral head. The height of the coral head is from the bottom of the pool to the top of the coral.

When creating the model, the diseased areas (white squares) shown on the CAD should be as close to how they are positioned on the coral head as possible. The diseased areas will be distributed within certain parameters to make it easier for a judge to evaluate.

Important rulings on autonomous creation:

For autonomously creating the 3D image of the coral head, the following is/is not allowed:

- Companies are allowed to manually take the measurements
- Companies are allowed to manually enter the photos/videos they have taken into their program
- The 3D image MUST appear autonomously from the pictures/videos input into their program
- The company MUST scale the image properly. Any dimension may be used to properly scale the image. This scaling may be done manually (i.e. company member at the station clicks on two points and adds in the scaling number to get those points set at the proper distance). The company should show the judge the properly scaled dimension.
- The diameter, height and diseased tissue area may be an overlay

For autonomous creation of the 3D image, only the 3D image must be completed autonomously. Measurements and scaling may be done manually.

Task 2.2 Identify reef organisms using eDNA

COLLECT A WATER SAMPLE FROM ABOVE THE CORAL HEAD

Companies must penetrate through the plastic wrap and collect water from inside the soft water bottle.

Companies should attempt to penetrate down into the water bottle to take their water sample. If taken too close to the surface, some mixing with pool water may occur. Although some mixing with pool water is acceptable, companies should strive to get as pure a sample as possible. The water inside the soft water bottle will be salted. Judges will use salinity to insure a good sample. Some dilution will be allowed, but companies should attempt to get the most pure sample by reaching their sampling device deeper into the water bottle (saltier water being heavier, the deeper the sampling device reaches, the less likely there is to be mixing.

If a company has a device to collect the water sample, they cannot pull the device to the surface by hand if it has the water sample on board. If the water sample is not onboard, and the device is independent of the ROV, they may pull it to the surface by hand.

The unknown eDNA samples will be on the product demonstration table. Companies may turn these over to see the unknown samples after they have successfully collected the water sample.

Task 2.3 Administer Rx to diseased corals

POSITION THE SIMULATED UV LIGHT SOURCE OVER THE DISEASED AREA OF CORAL
IRRADIATE THE DISEASED AREA OF CORAL WITH SIMULATED UV LIGHT

The light simulating UV light would qualify as an independent sensor and could be treated as such. But no onboard batteries would be allowed (you could not carry down a dive light powered by batteries).

MATE will have a multimeter connected to the coral head's photoresistor.
Judges will be looking for the resistance to increase when the pipe is covered and it is dark.
Judges will then look for the resistance to decrease when the light illuminates the diseased area.
Communicate with the judge to tell them when you are covering the PVC pipe as well as when you are illuminating the coral head so they can check the multimeter.

PLACE A TENT OVER THE DISEASED AREA OF CORAL
The tent goes over the coral for Task 2.1, the coral with the white squares on it. Note, therefore, that this tasks should be completed AFTER you have done what you need to do to complete task 2.1.

The tent must be completely over the coral head and its base flat/flush on the pool bottom.

INSERT A SYRINGE FILLED WITH "PROBIOTIC" INTO A PORT
INJECT A "PROBIOTIC" FLUID INTO THE TENT
The syringe must be inserted into the port on top of the tent after it is carried down. You cannot put the syringe into the tent's port on the surface and carry it down.

Companies must use the syringe provided by the MATE ROV Competition. Companies cannot design and bring their own syringe for this task. Companies could add an additional mechanism to the syringe (handle to carry it) provided it can be quickly and easily removed from the syringe when you are done. I.e. you can add rope to it, but you could not drill holes in it to tie the rope off to.

Task 2.4 Monitor and protect seagrass habitat

COMPARE IMAGES TO DETERMINE THE RECOVERY OF A SEAGRASS BED FROM AN ANCHOR SCAR
The prior image will be on the table.
The current image is what is in the pool.
Multiple square will have turned from green to white OR Multiple squares will have turned from white to green. It will not be a mix – some turned green, some turned white.

Make sure to get your "polarity" right … what changed from the prior image (on surface) to the current image (in water).

INSTALL AN ECO-MOORING SYSTEM TO PROTECT SEAGRASS AND SEAHORSE HABITAT
Install the mooring and rotate it 720 degrees (2 times around).
The Eco-Mooring must stay in the holder for the entire turning duration.

Task 2.5 Reintroduce endangered native Northern Redbelly Dace fry
Fish fry will be on the pool deck or table.

SEARCH TWO POTENTIAL SITES FOR INVASIVE PREDATORY FISH SPECIES TO DETERMINE WHICH ONE IS SAFE FOR RELEASE

You must examine and show the station judge both sides. You cannot see one and assume the other is the opposite type.

TRANSPORT THE FRY TO SAFE RELEASE AREA AND ALLOW THE FRY TO ACCLIMATE TO LOCAL CONDITIONS

The container to hold the fish fry does not need to be watertight. When on the surface, side of the pool, the container does not need to be full of water. You can place the fish fry into a dry container.

The container does not need a top and all sides. For example, you may place the fish fry in a container with a bottom and four side walls, but no top (or a container with bottom, top, 3 walls, with one wall missing). In the real world, of course, the fish would swim out. But for task 2.5, that would still count as a container. Provided the fish are still in the "container" after transporting them down and acclimating them to local conditions, it will count.
If a fish falls out of the company-built container during transport, companies would not receive points.

The ROV must release the fry. You are not allowed to pull on a rope/line from the surface to dump the fry out of the container. If you are using an independent container, only after the fry are out of the container may you pull it to the surface by hand to remove it from the water. This process cannot remove the fry from the container.

Communicate with the judges to know when the required 20 seconds has passed.

RELEASE THE FRY

Drop the fry in the proper green square. All three fry MUST be within the square. If one lands outside, no points, cannot go get it.

Task 2.6 Ensure the health and safety of Dillon Reservoir

INSPECT THE BUOY ROPES FOR DAMAGE

Show the judge all ten letters. No partial points.

RANGER companies in shallow water will have their rope at an angle – stretched out top to bottom but also side to side.

RECOVER A CONTAINER FROM THE BOTTOM OF THE RESERVOIR

DETERMINE THE LIFT CAPABILITY OF YOUR ROV

Give the mission station judges a quick summary telling them your lift capability and how you tested/calculated it. Keep this short.
You can also give them a handout of how you calculated / measured your lift capability.
This must be done during mission time – not during the 5 minute set up.

YOU DO NOT NEED TO BE ABLE TO LIFT THE CONTAINER WITH JUST YOUR ROV THRUST. IF YOUR LIFT CAPABILITY IS 36 NEWTONS, BUT THE CONTAINER IS 55 NEWTONS, THAT IS OKAY. YOU STILL GET POINTS. You will just need something else to help lift the container.

LIFT THE CONTAINER AND RETURN THE CONTAINER TO THE SURFACE, SIDE OF THE POOL
You can do this with ROV thrust, with a lift bag, or some other means.
YOU CANNOT ATTACH A ROPE TO THE UBOLT AND LIFT IT BY HAND.
NO MOTORIZED DEVICE ON THE DECK TO PULL IT IN
The ROV must do the work – either lift it or fill a lift bag

The lift bag may be independent of the ROV.
Any air line / tubing used to fill a lift bag may also be independent of the ROV tether. It does not need to be included in the tether.
You may not pull on the airline tubing to assist lifting the heavy container in any way, nor may you pull on the airline tubing to bring the lift bag and container to the side of the pool once it is on the surface.

Task 2.7 Monitor endangered Lake Titicaca giant frogs

COUNT THE NUMBER OF FROGS IN A TRANSECT
FLY THE TRANSECT
If you have multiple cameras with multiple views, let the station judge know which camera is doing the transect – which camera will see only the blue pipes, not the red pipes.

COUNT THE FROGS
Count the number of frogs. There may be some extra elbows without frogs in the area.

TASK 3: MATE Floats!

PRIOR TO THE COMPETITION, DESIGN AND CONSTRUCT AN OPERATIONAL VERTICAL PROFILING FLOAT
For companies that turned in float documentation, there will be an indication on your blue PASSED safety card. Show that blue safety card, as well as a printed version of your float design document (no need to show the SID) to your station judges.

Let them know if you designed a buoyancy engine or are using thrusters (RANGER and PIONEER only).

Deploy the float: For EXPLORER and PIONEER class, the float should be deployed into the red square.

For all classes, the float must be floating on the surface, no longer in contact with the ROV to start this mission task.
THE FLOAT SHOULD NOT BE DESIGNED TO SINK UPON RELEASE.

For RANGER companies: Up to two RANGER company members will deploy their float in the deep end of the pool. RANGER companies can have two extra members deploy their float (above and beyond the six members allowed at the mission station). Note that the number of company members at the mission station is limited to six. If the two who deploy the float are part of that six, they can return to the mission station to help. If they are company members #7 and #8, they cannot return to the station until mission time is over.

FLOAT COMMUNICATES WITH THE MISSION STATION PRIOR TO DESCENDING
The float should be floating on the surface at the start. It should communicate the necessary information back to the mission station receiver.
Let the judge know what screen/device the transmitted data is being displayed on. The judge must see this information before the float descends.

FLOAT COMPLETES UP TO TWO VERTICAL PROFILES
Vertical profiles are scored separately from communications. If your float does not communicate properly, you still get points for doing vertical profiles.
RANGER companies: Your floats will not be deployed at your product demonstration station. MATE may have a judge dedicated to watching the floats complete vertical profiles, and letting the station judges know when they are completed. But you may want to have one of your additional company members who launched the float inform the station judge when the float is ascending to the surface. Again, communicate with the judges to let them know what is happening.

FLOAT COMMUNICATES TIME TO MISSION STATION
When your float returns to the surface, that float should communicate to the receiver at the station. Let your station judge know when that transmission data is received. Again, if the judge does not see it, or is not informed that data was transmitted, they CANNOT score you for this.
When the data is received by the receiver, immediately let your station judge know so they can see the transmitted data.

GENERAL INFORMATION

EVERYTHING MUST BE DONE IN THE 15-MINUTE TIME PERIOD. COMPANIES CANNOT TURN IN ANY RESULTS AFTER THE 15 MINUTE TIME IS OVER.

Communicate with your judges – let them know what you are doing – and how you are doing it, including taking diameter/height measurements of the coral, creating the 3D image of the coral head, etc.

REFERENCES

- See the Prop Building Instructions for images and measurements of the missions.
- See the Fly-Through for a video representation.
- Check the competition manual for more details.
- See the score sheets that are posted for the product demonstration.