RANGER and EXPLORER Product Demonstration team briefing

After the opening ceremonies, I (Competition Technical Manager Matthew Gardner) will go over a few things and answer questions teams may have. But I do not have time to go over everything in detail. This document has information about the product demonstrations. Please read it through thoroughly. Note: Some sections are marked EXPLORER or RANGER, and apply only to that class.

Good luck all. See you on Thursday for the Opening Ceremony, if not before.

Communicate with the judges. Let them know what task you are trying to accomplish, it will be easier for them to score you properly.
If you are doing stuff on the surface (math) and underwater simultaneously, let the judge(s) know.

Be prepared. Know where you are going. Bring all your equipment. Have your score sheet ready to go. Have your blue safety card ready to show.

Size and weight happens before your mission time. Be at the size and weight station / on deck circle well in advance of your run – 15 or 20 minutes. It is your responsibility to be ready to go, get your vehicle to the size and weight station well before your mission time.

Teams must have passed safety inspection. All teams MUST have their blue safety card to get in the water.

Equipment. Once at the station, companies cannot leave to get additional ROV equipment. No one can bring them additional ROV equipment. You can leave to bring back paperwork, etc. but nothing that goes in the water / on the ROV.

5-minute setup time. Teams have 5 minutes to set up. Teams may put their vehicles into the water and test power/motors/etc. Teams cannot go down and check out the missions during set up, you should go no deeper than 0.5 meters. If a team does not finish setting up within 5 minutes, their mission time starts. You can continue setting up and/or repairing the vehicle during mission time. If a team finishes setting up early, they do not get additional mission time. They can choose to start early, or relax and chill out until their 5 minutes is up.

15 minute product demonstration time. Teams have 15 minutes to complete all the mission tasks. Judges will give you a countdown, but if you want to know how much time is left … ask.

5 minute demobilization time: After their 15 minute demo time, teams have 5 minutes to pack up and leave the station. The judges may need to keep the CEO around a little longer to confirm points, but the rest of the team and their equipment should be out of the area.

Time bonus: To get a time bonus, teams must have completed all the tasks perfectly and have no penalties. You must have the maximum points in every task to get a time bonus. The clock stops when you touch their vehicle at the surface, side of the pool. If a team is coming up with their final items that need to be collected, time still stops when they touch their vehicle. You may put those items on the deck (surface, side of the pool) afterwards. If the item drops back into the water as you try to grab it (after time has stopped), they cannot restart time to go get it, and they cannot get a time bonus.

In Team Folders:
Other than score sheets, teams will also have a dam wall grid map (task 1) and a data sheet (task 2) in their folder. They will have 2 of each of these, one for each run. IT IS YOUR RESPONSIBILITY TO BRING THESE WITH YOU TO EACH MISSION RUN.

PRODUCT DEMONSTRATIONS

Order of tasks. Can start with any of the three tasks. Teams can go back and forth between the tasks as desired. Task 3: Preserving History (the cannon) has some exceptions:

Cannon:
Teams must measure the dimensions of the cannon before they can turn over the printed measurements for calculations. Teams can skip this step (skip the measurements), but if they skip it, cannot go back later to measure dimensions. Also, the measurements do not have to be correct (full points) to turn over the cannon dimensions for volume – only need to be measured (or skipped).

Teams must calculate the force needed to lift the cannon before they can turn over the actual weight of the cannon in water. Teams can skip this step (volume calculation / wet weight calculation), but if they skip it, cannot go back later and do the calculations. Also, the calculations do not have to be correct, they just have to try it (or skip it).

Once they start to lift the cannon (attach a lift bag or grab onto the cannon), they cannot do any more measurements, calculations or cannon math.

Additional note on the cannon:
Teams take the measurements of the PVC / ABS cannon in the pool.
Teams are calculating the volume using different dimensions (of a theoretical cannon) using the dimensions written on the card attached to the station table.

Size and Weight: Before coming to the station, make sure your team has undergone size and weight. Teams cannot go back afterwards for their size and weight measurements because they were running late.

SIZE AND WEIGHT IS TIED IN WITH EACH MISSION RUN. YOU WILL DO YOUR SIZE AND WEIGHT TWICE, ONCE FOR EACH RUN.

Task 1: ENSURING PUBLIC SAFETY – DAM INSPECTION

Companies can do the steps of this task in any order.

Inspecting the foundation of the dam

RANGER:

Following a transect line

Teams should be close enough to the red line that they are moving back and forth / up and down. Teams are not allowed to sit back with a wide angle lens and see the whole sheet at once.

Teams get points when they go from start to finish.

Identifying and counting the number of cracks (5 points)

Tell / show the judge how many cracks you saw (no guessing)

Determine the length of the longest crack (up 10 Points)

Tell / show the judge your measurement for the longest crack (no guessing)

Mapping the location of the cracks (5 points)

In your folder you will have 2 blank grid maps – one for each run.
Mark the cracks on the map. Include your measurement of the longest crack – written in cm.

You can use your map to tell the judge how many cracks and the length of the longest crack (do the map before the prior two steps). For example, as your pilot is moving through, another team member can be marking the map. Once all the way through, the other team member can tell the judge how many cracks there are.

EXPLORER:

Following a transect line

Teams should be close enough to the red line that they are moving back and forth / up and down. Teams are not allowed to sit back with a wide angle lens and see the whole sheet at once.

Teams get points when they go from start to finish.

Autonomous Inspection – 25 points

This means fully hands free. Companies may manually pilot to the starting location, but once there, you must go hands free. If a team needs to touch their controls, it becomes a manual inspection. A pilot may hit a button / control to start autonomous line following.

Manual inspection – 5 points

If a team touches their joystick / control system in any way during transect following, it is manual.

Companies may try this multiple times. If they first do it manually, they can go back later and try it autonomously. Let your judge know if you are doing this.

Gathering information about the length of the crack

There will be one length of blue tape in one of the 12 squares. This is the crack.
Location of the crack is not important for this step – it is all about finding the proper length.

Autonomous determination of the length of the crack concurrent with autonomous line following – up to 25 points

If the team has moved through following the transect autonomously AND determines the length of the crack autonomously – all hands free, the teams gets full 25 points.

If the team moved through following the transect manually BUT determine the length of the crack autonomously (image recognition) - the team can get up to 15 points.

If the team does any part of measuring the crack manually, tells the judge the length themselves (unless they are pointing it out on their screen), it is considered manual determination and they only get 5 points.

Mapping the location of the crack up to 10 points

In their folder teams will have 2 paper blank grid maps. They can use this to manually mark the crack on the paper grid.
Or teams can do this autonomously and display the grid and crack on a video screen for the full 10 points.

To get full 10 points – without any input from team, a 4 x 3 grid must appear on a screen (it can already be there) and the crack (or length of the crack) must be shown in the proper square. The length of the crack the team measured (right or wrong lengths – but what the team measured) must appear. The grid does not need to show the red line.

Both RANGER and EXPLORER

Inserting grout into voids underneath the dam (10 points)

There will be smallish rocks on the surface.
Companies will carry them down and fill a red plastic cup. Down in the cup is a line that must be covered completely.
Once teams have dropped enough rocks in that you can't see the line through the camera, they get points.

NOTES: Cannot drop a red cup full of rocks into the empty red cup. Or a bag full of rocks and leave the bag in the water. Anything other than the rocks is "debris" and constitute a penalty if in the water (and not attached to ROV) at the end of the run.

Removing the damaged trash rack screen (10 points)

Trash rack framework on bottom.
Damage trash rack screen (missing middle beam) on trash rack.
Teams get points when it comes back up to surface and placed on pool deck.

Installing a new screen (10 points)

New screen with middle bar on surface side of pool.
Teams must place bottom of it in black holder, and lean the top against the trash rack.
When team releases from it and it stays in place (5 seconds), they get points.

Deploying a secondary, micro-ROV from the primary ROV to inspect the inside of a pipe for indicators of possible dam failure (20 or 30 points points)

Teams have designed a micro-ROV to go into a 6-inch pipe.
Must go far enough in so a camera can see a brown foam sheet.
When the team sees that foam on a screen – they get their points.

- If they are using fiber optics – 30 points
- If they are using normal cable – 20 points

Their blue safety check card will be marked with whether they use fiber optics or copper (normal) cable – if known.

Docking the micro-ROV to the primary ROV (5 points)

Once they see the brown foam sheet, they come out of the pipe and re-dock.
Micro ROV can be in a gripper, or 'garage' or something else.

Micro ROV tether should not be hanging out below primary ROV

IT IS UP TO THE TEAM TO MAKE THIS KNOWN TO THE JUDGE / SHOW THE JUDGE THEIR MICRO ROV IS SECURE.

TEAMS CANNOT PULL MICRO-ROV TETHER FROM SURFACE.

Additional notes on micro ROV:

1. When the micro-ROV is docked with the primary ROV, teams may use its camera and thruster.
2. When the micro-ROV is away from the primary ROV (inspecting the pipe), companies cannot get points for any other in-water task (they cannot drive around and do other tasks).
3. Companies may run their micro-ROV down from the surface. The Micro-ROV tether should be attached to the primary tether – not fully independent.
   EXPLORER teams: Only a fiber optic micro-ROV may come down from the surface. A copper wire ROV from the surface would violate EXPLORER rules.
4. Companies MAY NOT pull the micro-ROV tether from the surface.
5. Micro ROV thrusters do not need to be shrouded.
6. Micro ROV thrusters do need to be waterproof.
7. MATE IS NOT SUPPLYING AN ADDITIONAL 12 VOLT SUPPLY FOR THIS. RANGER TEAMS SHOULD NOT PLUG IN THEIR MICRO ROV TO THE OTHER PLUG OF THE RANGER SUPPLY, but should have their own supply (if not running off ROV power).

Task 2: Maintaining healthy waterways

Measuring the temperature of the water with 2°C (up to 10 points)

There will be a red or black cable going from the surface read out (for the judge) into the water. Teams should take their temperature reading near that cable.

RANGER

Collect a water sample from the bottom (10 points)

Water sample is capped pipe with rope.
Teams get points when it is on surface, side of pool.

Measuring the pH (5 points)

One test tube will be labeled pH.
Teams will open the test tube and use a pH test strip to test.

Show the judge your color matching – show them the color of your pH strip next to the gauge and tell them the pH number.

Measuring the phosphate level (5 points)

One test tube will be labeled phosphate.
Teams will open the test tube and use the phosphate test strip to test.
NOTE: Test strip goes in the cap! Not in the test tube.

Show the judge your color matching – show them the color of your phosphate against the color strip on the side of the bottle.

EXPLORER

Measuring the pH (15 points)

Teams will go down to the 2-gallon bucket and have to penetrate a thin layer of plastic wrap to get to the water inside, which is a different pH than the pool.

Show the judge your pH reading of the water inside the container.

Both RANGER and EXPLORER

Lifting a rock from the bottom (5 points)

Rock is PVC framework.
Must be under control of the ROV and up off the bottom and off the benthic species to get points.

Teams can put it down anywhere they want … do not need to return to surface.

Examining the benthic species using a handbook or using image recognition

If teams are approved to use image recognition, it will be marked on their score sheet.

Handbook (5 points)

The team looks in the handbook and tells you what shapes are on the benthic species.

Image Recognition (20 points / 25 points)

The ROV hovers in front of the benthic species.
A computer program does image recognition and displays the number of each symbol on a screen.

- MUST be red text.
- MUST show a triangle/circle/rectangle/square (any order) and the proper number next to it.

- Companies may take a screen shot and transfer it to another screen.
- Companies may move their ROV to get the video image they want

Companies CANNOT define an area for their program to work in.

If a company is transferring the image to another device, they should tell you beforehand what the process is.

Recording the date, time, temperature, pH, phosphate, species diversity on a data sheet (5 or 10 points)

Teams will have these data sheets in their folder. They will have 2 … one per mission run.

MATE recommends recording (writing down) what you get as they go along.
WHAT YOUR WRITE DOWN SHOULD BE WHAT YOU MEASURED – EVEN IF THAT MEASUREMENT WAS WRONG
FOR EXAMPLE, IF A TEAM MEASURES THE WATER TEMP AT 8.3 C, BUT THE ACTUAL TEMPERATURE IS 21.5 C, THEY WOULD NOT GET POINTS FOR CORRECTLY MEASURING THE TEMPERATURE. BUT THEY SHOULD STILL WRITE DOWN 8.3 C, WHAT THEY MEASURED, TO GET POINTS FOR RECORDING.

Transporting and releasing trout fry (5 points each, 10 points total)

Two trout fry (fish) on surface.
Teams bring down and put in green square.
Cannot hold fish directly in gripper or other manner that would injure a real fish.
If the fish falls or drops out of carrying container, teams cannot retrieve them.
If the fish happen to land in the green square, great – team gets points.
If the fish land outside green square – team cannot recover and try to put in green square.

Teams cannot leave a container in the water. That is debris and a 5 point penalty.

Removing degraded tire – 10 points

The tire is round tubing.
Once it is on pool deck the team gets points.

Installing new fish / reef balls – 10 points

Bring down the reef ball and put it in the orange square.
Just 1 part of it has to be in or over the orange square – not the entire object inside the orange square.

Task 3: Preserving History

Two parts to this … recover the cannon and identifying four cannon shells as metal / non metal.
Can do either part first.
IMPORTANT ORDER:
Measure the dimensions of the cannon.
Calculate the volume / weight in water of the cannon
Then lift the cannon to the surface.

Once they start lifting the cannon – attaching a lift bag or grabbing it and moving up, they can no longer do any measurements or math.

Determining the lift capability of your ROV (5 points)

Company will tell the judge their lift capability.
MUST REPORT in NEWTONS.
When you give the judge your lift capability number, you get points.

Measuring the length of the cannon within 1 cm – 5 points

Teams will need to measure the length of the cannon.

Measuring Radius 1 of the cannon within 0.5 cm – 5 points

Teams will need to measure R1 of the cannon.
R1 is the outer radius of the smaller end

Measuring Radius 2 of the cannon within 0.5 cm – 5 points

Teams will need to measure R2 of the cannon.
R2 is the bore radius

Measuring Radius 3 of the cannon within 0.5 cm – 5 points

Teams will need to measure R3 of the cannon.
R3 is the outer radius of the larger end

Calculating the volume of a cannon (10 points)

VERY IMPORTANT
Once teams get the four measurements, they will get the different measurements to calculate the volume. These will be on a laminated card taped to the table.
Teams will use those numbers to calculate volume – not the numbers they measured in the water.

Teams must be within $10cm^3$ to get points.
Recommend teams use 3.14159 or greater as pi to be accurate.

Determine the composition (specific gravity) of the cannon using the handbook (5 points)

Teams will need to read lettering on the top/side of the cannon and then look at a handbook to determine if the cannon is iron or bronze.
When teams have done that (determined it is iron or bronze) they get points.
CAN BE DONE AT ANY TIME – does not need to be done after measurements / volume calculations.
Show the judge the letters on the cannon, and tell them foundry you think it is and therefore what the composition is (iron or bronze).

Determining the weight in water of the cannon (5 points)

Using the volume and specific gravity (given in the handbook), teams calculate its weight in water.

Determining if the ROV has enough thrust to lift the cannon – 5 points

Once teams have determined the weight in water (correctly or incorrectly), they can turn over true weight of the PVC cannon that is in the pool.
This is what the PVC cannon in the water actually weighs in the water.

Then teams determine if their ROV can lift it – THIS WILL BE A COMPARISON OF THE NUMBER THEY GAVE THE JUDGE AT THE START (LIFT CAPABILITY) VERSUS THE WEIGHT OF THE CANNON IN WATER.
The answer can be YES or NO. Doesn't matter – Teams get 5 points once they compare the two.

Returning the cannon the surface, side of the pool – 20 points

Teams can use motors, lift bags, etc.
TEAMS CANNOT PULL IT BY HAND OR A MOTOR / WINCH ON THE SURFACE.
Once the cannon is on the surface, side of the pool, teams get points.

Identifying and marking the location of metal cannon shells / non-metal debris (5 points each, 20 points total).

Teams will determine whether each object is metal or non-metal.
Teams must place a red marker at each metal object.
Teams must place a black marker at each non-metal object.
When they have placed the marker, tell the judge that is the marker you want to place (just in case a mistake is made – when you are ready, tell the judge). MUST ONLY BE ONE MARKER IN SQUARE. IF YOU ACCIDENTALLY DROP A WRONG COLORED MARKER, YOU NEED TO REMOVE IT FROM THE SQUARE.
If correct, team gets points. If not, no points (and can't try again).

COMPANIES MAY BRING THEIR OWN MARKERS … PROVIDED THEY ARE RED/BLACK TEES.
Team markers can have other ways to carry them.

ADDITIONAL NOTES:

Penalties. Teams are penalized for illegal communication, pulling on the tether, diver assistance and leaving debris in the pool.

Debris is any item the team built and is left in the water (fell off vehicle) and is still in the water at the end of mission time. Team built mission items (micro-ROV, red/black marker tees) are not debris. I.e. Anything MATE had them build for a mission and leave in the water intentionally is not debris.

Illegal communication: MATE is pretending this is deep water and those at pool side cannot see the bottom. Therefore, those at pool side cannot communicate information about what they see in the water to the pilots.

Time bonus. Teams only get a time bonus if they have completed all the tasks and have no penalties. Time stops when they touch their vehicle.

5 minute demobilization. Teams have 5 minutes to get their vehicle out of the water and demobilize (remove themselves from the product demonstration area). The judge may need to confer with the team CEO and keep them around beyond that time, which is okay and no penalty. But the team vehicle should be packed up and out of the area (or all packed up waiting nearby).

Adding up points. The judge will go over points with the CEO. The judge will let the CEO know what they got, and what they did not get.
IF THERE IS A DISAGREEMENT – OR THE TEAM THINKS THEY DID SOMETHING THAT WAS NOT SCORED PROPERLY, BRING IT UP WITH THE JUDGE IMMEDIATELY.
The judge will verify the point total with the company CEO / team captain. Once the final score is agreed upon, one of the judges signs, and the CEO signs.
Once your CEO signs the score sheet, you have agreed to that score.
Note: Occasionally the score keeper finds an addition mistake or a scoring mistake at a later time. If that happens, a head judge will find the team and go over the error – and correct the points.

OTHER GENERAL NOTES:

Company built collection baskets are allowed. This is a basket with multiple mission items in it that a team can take up and down.
Companies MAY NOT pull the collection baskets back to the surface by hand.
A collection basket counts as debris. If it is still in the pool at the end of mission time, not under control of the ROV, it counts as a 5 point penalty. If it is in the grasp of the ROV, it is considered under control.