2026 MATE ROV COMPETITION:

Pushing Performance: Science, Technology, & Discovery in Harsh Environments

EXPLORER CLASS COMPETITION MANUAL

PART 1: PRODUCT DEMONSTRATION

OVERVIEW

NOTE for 2026!!!

At the World Championship, **EXPLORER** class companies will undertake four different competition tasks at three different venues. See the Product Demonstration Notes for information on which tasks will take place at which venues. Companies will get ***ONE*** attempt at each task. The four tasks are:

TASK #1: *Seabed 2023: A Kaleidoscope of Corals in Cold Water*
TASK #2: *SmartAtlantic Alliance: Better Information, Better Decisions*
TASK #3: *Wind-Powered Offshore Oil Platform: Scalable Solutions for Global Energy Needs*
TASK #4: *MATE Floats Under the Ice*

NEW for 2026!!!

Hosting the World Championship in St. John's, Newfoundland and Labrador allows MATE to offer students the incredible opportunity to operate their technologies in unique, one-of-a-kind venues. These venues include an ice tank (where a thin layer of ice will cover the surface), a wave tank (where waves *and* wind can be generated), and a flume tank (where a current will be created).

Companies will compete in three distinct product demonstrations. The tasks will be divided amongst the three venues; ROVs will operate in the wave and flume tanks, while floats will operate in the ice tank (see PRODUCT DEMONSTRATION for information on which tasks will be at which venue).

The flume tank is located at the Marine Institute of Memorial University, while the ice and wave

tanks are located at the National Research Council, which is located 3 km (1.9 miles) away. Given the distance between and uniqueness of these venues, companies will receive only ONE attempt at each product demonstration task. All three product demonstration scores (along with the collaborative task) will be added to the engineering and communication and safety scores to determine the total overall score for the competition.

NOTE: Regional competitions may not divide the tasks into different product demonstration attempts; all four demonstration tasks may be included in each product demonstration run. Regional competitions may not include all four tasks of the product demonstration. Regional competitions may also provide companies with more than one attempt at the product demonstration. If competing at a regional event, contact your regional coordinator or visit your regional contest's website to determine what will take place at your regional competition. Regardless, the product demonstration score will be added to your ENGINEERING & COMMUNICATION and SAFETY scores to determine your total, overall score for the competition.

SCORING OVERVIEW

The competition consists of product demonstrations, engineering and communication, and safety with the following scoring breakdown:

- **Product demonstrations**
  - 350 points (max), plus a time bonus
  - Weight restrictions
    - 10 points (max)
  - Product demonstration organizational effectiveness
    - 10 points (max)
  - Jobsite Safety & Environmental Analysis
    - 5 points (max)
- **Engineering & Communication**
  - Technical documentation
    - 100 points (max)
  - Engineering presentations
    - 100 points (max)
  - Marketing displays
    - 50 points (max)
  - Company Spec Sheet
    - 20 points (max)
  - Corporate Responsibility
    - 20 points (max)
- **Safety**
  - Initial Safety and Documentation Review
    - 20 points (max)
  - Safety and Workmanship Inspection

        - 50 points (max)
    - Jobsite Safety and Environment Analysis (JSEAs)
        - 10 points (max)

TOTAL POINTS = 745

NOTE: Regional contests may not require all of the Engineering & Communications components or offer the opportunity to earn points for Corporate Responsibility. If competing at a regional event, contact your regional coordinator or visit your regional contest's website for more information.

TIME

NEW for 2026!!!

Each product demonstration includes:

- 5 minutes to set up at the product demonstration station
- 15 minutes to attempt the tasks
- 5 minutes to break down and exit the product demonstration station

Your company will have 5 minutes to set up your system, 15 minutes to complete the tasks, and 5 minutes to demobilize your equipment and exit the product demonstration station. During the 5-minute set-up, you may place the ROV in the water for testing and/or trimming purposes. The 15-minute demonstration period will begin after the full 5 minutes of set up time expires, regardless of whether the company is ready to start the product demonstration. It may begin sooner if your CEO notifies the product demonstration station judges that your company is ready to begin.

At any time during the demonstration, you may pilot your ROV to the surface and remove the vehicle from the water for such things as buoyancy adjustments, payload changes, and troubleshooting, but the 15-minute product demonstration clock will only stop if a judge determines it is necessary for reasons beyond your control. Otherwise, the clock will only stop after all of the tasks are successfully completed and the ROV has been piloted to the surface, side of the pool and is withing the grasp of a company member. Your ROV is not required to return to the surface between tasks.

Your 5-minute demobilization will begin as soon as the 15-minute demonstration time ends, regardless of where your ROV is located (i.e., still at depth, on the surface, etc.).

Regional competitions may alter the set-up, product demonstration time, or demobilization time. If competing at a regional event, contact your regional coordinator or visit your regional contest's website to verify the timing of your product demonstrations.

TIME BONUS

Companies will receive a time bonus for product demonstration Tasks 1 – 3 if you:

1) successfully complete all the tasks,
2) return your ROV to the surface under its own power so that it touches the side of the pool, and

3) physically touch your vehicle before the demonstration time ends.

Companies will receive 1 point for every minute and 0.01 point for every second under 15 minutes remaining.

The MATE Floats! mission will not be awarded a time bonus for early completion.

CONTEXT & NEED

What's in store for the 2026 MATE ROV Competition season? Interesting (and challenging!) mission scenarios, including a first-time ever operating environment and technology-integration task for teams advancing to the World Championship. But we're getting ahead of ourselves!

This season, alongside the Decade of Ocean Science for Sustainable Development (2021-2030), the MATE ROV Competition is highlighting priorities of the Decade of Action for Cryospheric Sciences (2025-2034). Endorsed by the United Nations, the Decade of Action for Cryospheric Sciences is a global effort to boost research, strengthen international collaboration, drive action, and raise awareness about the vital role of Earth's frozen regions. The initiative calls on scientists, technologists, governments, and communities worldwide to unite to protect the cryosphere and safeguard the billions of people who depend on it for their livelihoods and survival.

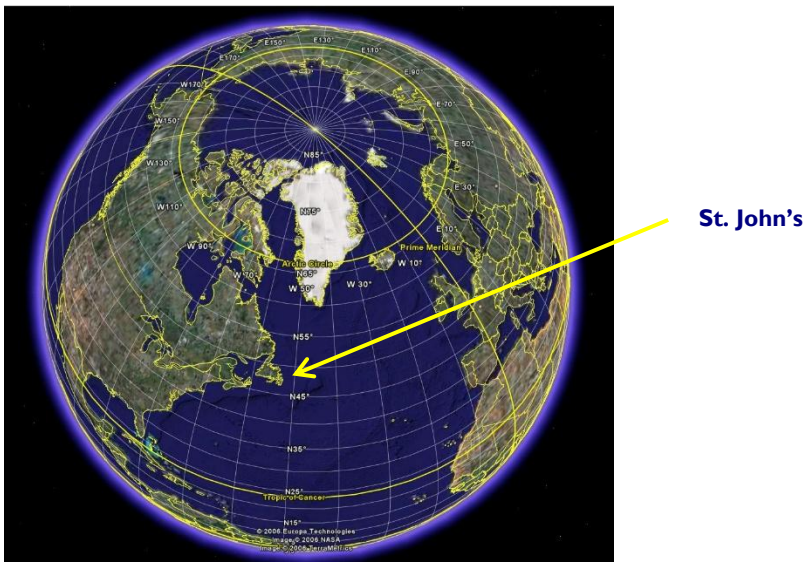
The cryosphere includes polar ice sheets and sea ice, mountain glaciers, snowpacks, ice on lakes and rivers, and permafrost (soils that stay below 0°C for years). Although it may seem remote, the cryosphere covers a huge area, around 10% of the Earth's land, and stores most of the planet's freshwater. About 70% of the world's fresh water is locked up in the cryosphere. This means most river water and drinking water ultimately come from snow and ice melt.

The UN resolution that established the Decade of Action for Cryospheric Sciences calls on us to achieve the following 4 goals to deepen our understanding of cryospheric changes and develop solutions:

- Advance scientific research and monitoring
- Raise awareness
- Support adaptation
- Build on global initiatives, like the Decade of Ocean Science for Sustainable Development

If we are to attempt to achieve these goals, we'll need technologies capable of performing in cold, icy, harsh environments – and facilities in which to test them.

It seems quite fitting, then, that the 2026 MATE World Championship is taking place in the city of St. John's. Located ~2,100 km south of the Arctic Circle, St. John's is the capital of the province of Newfoundland and Labrador, Canada, on the "Eastern Edge" of North America. The oldest city in North America, St. John's offers old-world charm, unique architectural, historic and natural attractions, and is located in close proximity to spectacular coastlines, historic villages, and a diverse selection of wildlife.



Even more relevant for the 2026 season, the city is also home to Marine Institute (MI) of Memorial University of Newfoundland and the National Research Council Canada's (NRC) world-class facilities. MI houses the world's largest flume tank, with a water capacity of 1.7 million liters and water velocity ranging from 0–1 meters per second. The flume tank's viewing gallery has a 20 meter-by-3 meter viewing window and seats 150 people. The NRC includes an ice tank and offshore engineering basin. In the ice tank, the water surface can be frozen, and the air temperature maintained at a uniform –30 to 15 degrees Celsius to simulate the polar environment. The offshore engineering basin is used to simulate the extreme ocean environment; waves, wind, and currents can be controlled to achieve various sea states.

The ability to simulate harsh, extreme conditions in a controlled environment not only makes these facilities unique, but is also sought after by organizations, institutions, and corporations from around the world that understand the need to push the performance of their technologies before deploying them in the real world. Scientists, engineers, and technicians use the facilities at the MI and NRC to demonstrate and test the vehicles, instrumentation, and equipment that supports their research, data collection, mapping, exploration, and energy operations to prove their real-world readiness because "if it works here, it will work anywhere."

This year, those teams that advance to the MATE World Championship will have access to these facilities and that same opportunity to push the performance of their technologies. (As they say at The Launch, MI's state-of-the-art marine base in Holyrood, NL, "[it's] as real as it gets.") While not staged in an ice tank, offshore engineering basin, or flume tank, the 2026 mission tasks will be equally as unique and challenging at MATE regional events, where ROVs and vertical floats will be pushed to perform in new and innovative ways.

While the specific mission tasks (including the first-ever staged in saltwater debuting at the MATE World Championship 😉) may come as a surprise, the following sentence should not. This competition season, MATE's 24th, the "client" is us: our global community of learners, inspired by the ocean, innovating and collaborating to address environmental and societal challenges.

This year the MATE ROV Competition is challenging its community to design and build a remotely operated vehicle and the necessary sensors, tooling, and complementary technologies to tackle mission tasks that include demonstrating the efficacy of offshore wind turbines in powering offshore oil rigs; mapping the seabed and documenting discoveries; deploying instrumentation and monitoring the health of cold-water habitats; and operating equipment under the ice. Equipped with scientific data (and discoveries!) and technology solutions, and with an understanding of the actions that we need to take, we can proactively and confidently move from the ocean – and cryosphere – we have to the ocean, fluid and frozen, that we want.

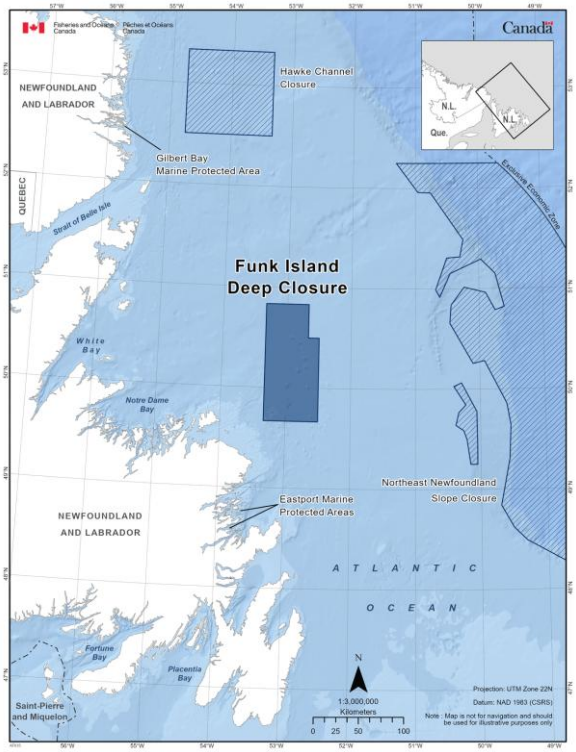
It should also come as no surprise that our success depends on an appropriately educated and skilled workforce, one that is aware of and informed about the challenges we face and prepared to apply its knowledge and skills to tackling them.

REQUEST FOR PROPOSALS (RFP)

1. General
    a. Overarching:
        Ocean Decade Challenges for collective impact:
            #9: Skills, knowledge, and technology for all
            #10: Skills, knowledge, technology and participation for all
        Decade of Action for Cryospheric Science Goals
            Advance scientific research and monitoring
            Raise awareness
            Support adaptation
            Build on global initiatives

    b. Mission Task 1: *Seabed 2023: A Kaleidoscope of Corals in Cold Water*
        Ocean Decade Challenges for collective impact:
            #2: Protect and restore ecosystems and biodiversity
            #8: Create a digital representation of the ocean

In addition to hosting the MATE World Championship, the Marine Institute of Memorial University conducts research and student training cruises in the waters around Newfoundland and Labrador. On a recent training expedition to the Funk Island Deep marine refuge, located off the northeast coast of Newfoundland, researchers discovered an amazing (and rare) site – a densely populated soft coral garden on the seafloor.



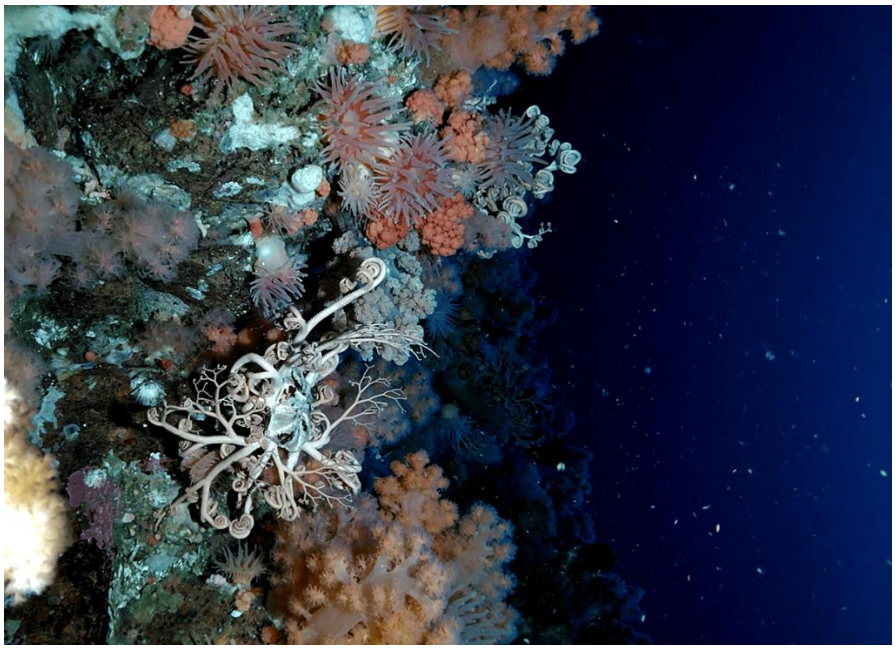
A map of the Funk Island Deep Marine Refuge. [Funk Island Deep Closure](#).

Less familiar than the hard corals that comprise warm-water coral reefs, cold-water soft corals are found worldwide in all oceans, from the tropics to the polar regions, typically in the deep sea where temperatures are cold. They can be found from a few meters deep to over 6,000 meters, often on underwater mountains, seamounts, and continental slopes.

Soft-bodied corals of the species captured by video in the Funk Island Deep are known to be abundant in the northwest Atlantic, but what made this sighting so extraordinary was both the density and the extent of the corals. Researchers estimate the area of the coral garden to be around 10,000 square meters. What was also surprising was the depth; finding such dense concentrations of corals at depths of less than 200 meters are rare.

The corals are so densely packed that researchers are unable to see the seafloor. Rare Coral Habitat Discovered using Rayfin Camera — SubC Imaging.

Using video footage, researchers were able to identify at least two different species of coral, along with other marine life, such as sponges, basket stars, anemones, crabs, arthropods, and fish. It marks the first time such a habitat has been documented in these waters. It also speaks to the potential for other, equally unique and surprising, discoveries to be made as scientists, engineers, and technicians continue to survey and map the seafloor.



Cold water soft corals found in the Funk Island Deep marine refuge. Rare Coral Habitat Discovered using Rayfin Camera — SubC Imaging.

Finding the coral garden in the Funk Island Deep is only the beginning; researchers at the Marine Institute are eager to study and understand it, including the number of coral species present, their interaction with the substrate, and their relationship with the other species that inhabit the

ecosystem. And, as part of the Institute's 4D Oceans Lab mission, they are also interested in further imaging and mapping it; while the ocean contributes significantly to Canada's economy, less than 10% has been adequately mapped and the spatial distribution of most species is not well understood.

These efforts will likely include photogrammetry, another "tool" that researchers can use to create maps and images of an area. Photogrammetry is a method of approximating a 3D structure using two dimensional images where photographs are stitched together using software to make a 3D model. It can support scientists by providing an efficient way to characterize this cold-water coral ecosystem as well as monitor future changes in it.

And while the strong currents that sweep over and around the ridge on which the corals are located can make studying and monitoring the ecosystem challenging, the Marine Institute houses the ideal training facility for operating in a current. The Marine Institute's Flume Tank, the world's largest, will offer coral garden researchers the opportunity to practice maneuvering and maintaining position in a simulated environment, enabling and empowering their work to understand this kaleidoscope of coral colors in the cold ocean.

The Flume Tank. Photo from Marine Institute.

Mission Task #2: *SmartAtlantic Alliance: Better Information, Better Decisions*
Ocean Decade Challenges for collective impact:

#2: Protect and restore ecosystems and biodiversity
#7: Expand the Global Ocean Observing System

The SmartAtlantic Alliance is an initiative of the Marine Institute of Memorial University of Newfoundland's Centre for Applied Ocean Technology and the Centre for Ocean Ventures and Entrepreneurship (COVE) of Halifax, Nova Scotia. The Alliance supports operational efficiency, situational awareness, and safety in the marine environment; its buoy data, weather forecasts, and information products contribute to the country's coastal and ocean management efforts and are available for free to the public via its website.

Part of the SmartAtlantic Alliance, the Holyrood Subsea Observatory was installed in February 2021 to enable real-time monitoring of the ocean and marine life in Conception Bay. Located approximately four kilometers north of the Marine Institute's Holyrood Marine Base (also known as The Launch), the observatory sits in water depths of 85 meters and sends real-time data to the marine base via a fiber-optic cable on the seafloor. The observatory is expandable and will also serve as a development, testing, and demonstration facility for subsea instrumentation intended for harsh environment operation.

The Launch in Holyrood

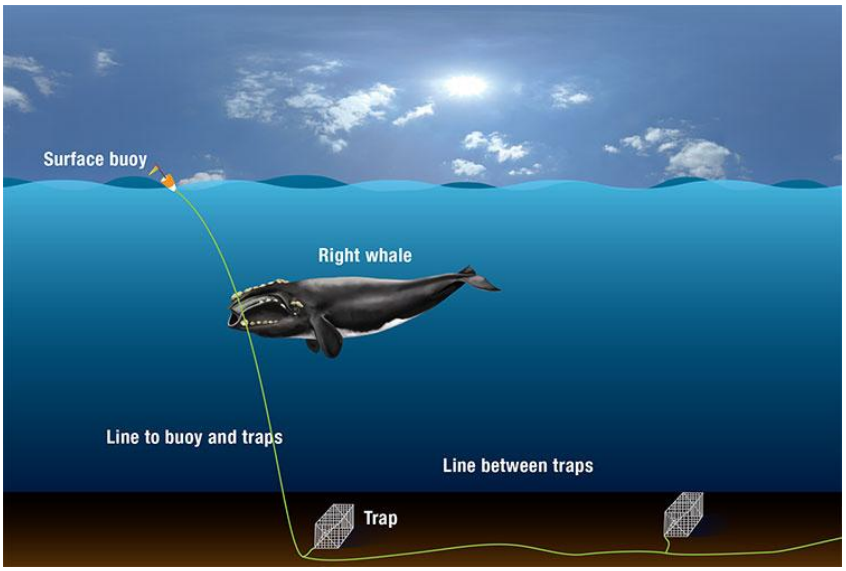
One such instrument is an eDNA sensor. eDNA technology allows for the detection and monitoring of species using DNA fragments shed by organisms in the water column. It involves collecting and processing water samples (and not organisms!) to sequence for DNA, providing a non-invasive, cost-effective, and comprehensive approach to determining the presence of species in ocean ecosystems. eDNA is a powerful tool for cataloging biodiversity; combining it with video, images, and data will help to paint a more accurate and complete picture of the environment and ecosystem.

An eDNA sensor. [Detecting fish with the innovative Fish Sensing Box]

The camera currently installed on the Holyrood Subsea Observatory also serves as a powerful tool for cataloging organisms. The camera transmits live video feed to the marine base for five minutes every hour. The video is used to identify organisms and determine their frequency, which provides an estimate on patterns and trends of diversity within the habitat and can be used to validate eDNA data – and vice versa.

While the Holyrood Subsea Observatory has been instrumental in detecting and identifying marine life, there is one species of interest that, because it inhabits shallow depth, has escaped detection. Native to central Europe, the European green crab, *Carcinus maenas*, is an invasive species in North America and in 2007, it was confirmed in the waters of Newfoundland and Labrador. The crab is naturally aggressive, consumes many native shellfish and finfish, and can damage sensitive eelgrass habitats. Current efforts are underway to mitigate their spread. These include physically removing crabs from the environment – without mistakenly removing look-alike native crab species.

Better information, better decisions – that is what new technology can enable, and that is certainly the case with the North Atlantic Right Whale. These whales are classified as critically endangered, with the population estimated at less than 400 individuals, including less than 80 breeding females. One of the issues faced by the Northern Right Whales is entanglement with fishing gear, particularly the lines used in lobster traps common in the area. Scientists and engineers have developed and are working with companies to field-test on-demand (also known as ropeless or buoyless) fishing technology. One such system replaces the vertical line in the water column with a bottom-stowed coiled rope and buoy in a weighted cage on the lobster trap. Fishers send an acoustic signal, which releases the buoy to the surface where it can immediately be recovered and hauled into their boats, increasing their reliability and efficiency all the while reducing the risk of entanglement for the whale and other marine species.



North Atlantic Right Whale | NOAA Fisheries

How to avoid colliding with an iceberg is another situation where better information is key to making better decisions. Icebergs are common in Newfoundland and Labrador waters and, while awe-inspiring when seen aboard a tour boat, can pose a threat to offshore structures, including oil platforms and their subsea assets and infrastructure. St. John's is a hub for the province's offshore petroleum industry, with four major offshore oil platforms, Hebron, Hibernia, Terra Nova and Sea Rose, within 350 km of the city. A collision with an iceberg could be disastrous, damaging the structure, endangering the lives of personnel, and potentially threatening the environment, especially given that roughly 90% of an iceberg's mass is underwater. Iceberg avoidance is a crucial consideration for platform operators, making monitoring instrumentation and data products like those provided by the SmartAtlantic Alliance all the more critical for ensuring operational efficiency, situational awareness, and safety in the marine environment.


Left: Famous Icebergs of Newfoundland & Labrador - Newfoundland and Labrador, Canada. Right: The Hibernia oil production platform, one of four installations located off the coast of Newfoundland (www.hibernia.ca)

c. Mission Task #3: *Wind-Powered Offshore Oil Platform: Scalable Solutions for Global Energy Needs*
   Ocean Decade Challenges for collective impact:
   - **#4: Develop a sustainable and equitable ocean economy**
   - **#5: Unlock ocean-based solutions to climate change**
   - **#6: Increase community resilience to ocean and coastal risks**
   - **#7: Expand the Global Ocean Observing System**

Meeting the world's energy needs now *and* into the future is a tricky business. No one source can do the trick. Energy portfolios – of a single country or the entire world – should include a diversity of sources, strategically balanced to meet the demand while also prioritizing sustainability, reliability, a healthy environment, and livelihoods. A diversified energy portfolio is also crucial for reducing dependency on a single energy source, which in turn increases energy security and minimizes environmental impacts.

It is a delicate balance, but one that can be achieved when people, companies, and world governments work together to brainstorm and advance practical, scalable solutions that take these factors into consideration. As the saying goes, where there's a will, there's a way. However, in many cases, the former holds back the latter.

But that is not the case with Equinor's Hywind Tampen, the world's first floating wind farm built specifically to power offshore oil and gas installations. A marriage of renewable and non-renewable energy production, the Hywind Tampen wind farm supplies power to Equinor's Snorre and Gullfaks platforms in the Norwegian North Sea.

The farm uses 11 floating wind turbines to supply renewable electricity to the Snorre and Gullfaks offshore oil and gas platforms, reducing their emissions (and carbon footprints) and maintaining the quality of work life for platform personnel, all the while developing new offshore wind technology. Hywind Tampen became fully operational in August 2023; it is estimated that the farm provides 35% of the annual power demand for the two platforms.

Hywind Tampen will be a test bed for further development of floating wind farms, exploring the use of new and larger turbines, installation methods, simplified moorings, and concrete substructures. It will also be used to test the integration of gas and wind power generation systems, a hybrid strategy used to ensure grid stability and reliability by balancing the inherent variability and intermittency of wind energy with the flexible, on-demand power of natural gas.

Offshore wind turbines and the Snorre oil and gas platform. [World's Largest Floating Offshore Wind Farm Officially Opens]

Expanding hybrid systems like Hywind Tampen will mean additional construction of floating wind farms and the infrastructure to connect energy production platforms. Installing floating turbines involves driving anchors, known as micropiles, into the seafloor. Drilling into the sediment is a noisy process; in an effort to prioritize a healthy environment – and to meet the regulatory requirements associated with subsea projects – bubble curtains are often used. Air hoses are laid in rings around the construction site, and compressed air is pumped into rings, creating a curtain of bubbles. The air bubbles absorb sound energy, reducing noise and the risk to marine life.

The early success of Hywind Tampen shows that the model is both practical – and scalable – and can be part of a diversified energy portfolio. It also shows that, where there is a will, there is a way.

A bubble curtain around the area during installation of an offshore wind farm in Germany. Bubble curtain - Wikipedia

Mission Task #4: MATE Floats Under the Ice

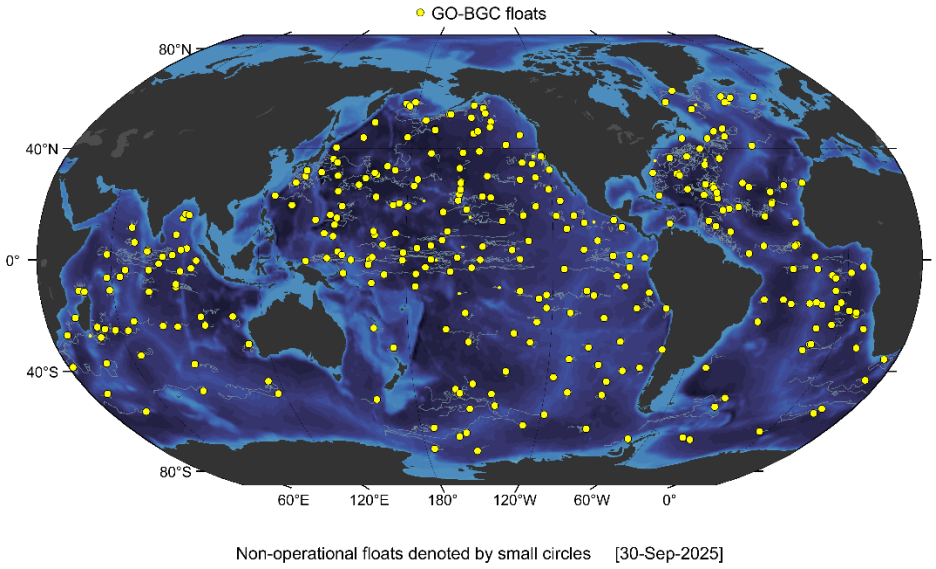
Ocean Decade Challenges for collective impact:

#5: Unlock ocean-based solutions to climate change

#7: Expand the Global Ocean Observing System

#8: Create a digital representation of the ocean

MATE Floats! 2026 is inspired by the National Science Foundation (NSF)-funded GO-BGC Project. The goal of GO-BGC is to build a global network of profiling floats with chemical and biological sensors to monitor circulation, chemistry, biology, and overall ocean health. Scientists, engineers, and technicians are using NSF grant funds to build and deploy 500 robotic ocean-monitoring floats around the globe. GO-BGC hit the 300 mark, with 325 out of the targeted 500 GO-BGC floats deployed or en route to be deployed from research vessels.



*GO-BGC Float locations as of September 30, 2025 (*Array Status | GO-BGC).

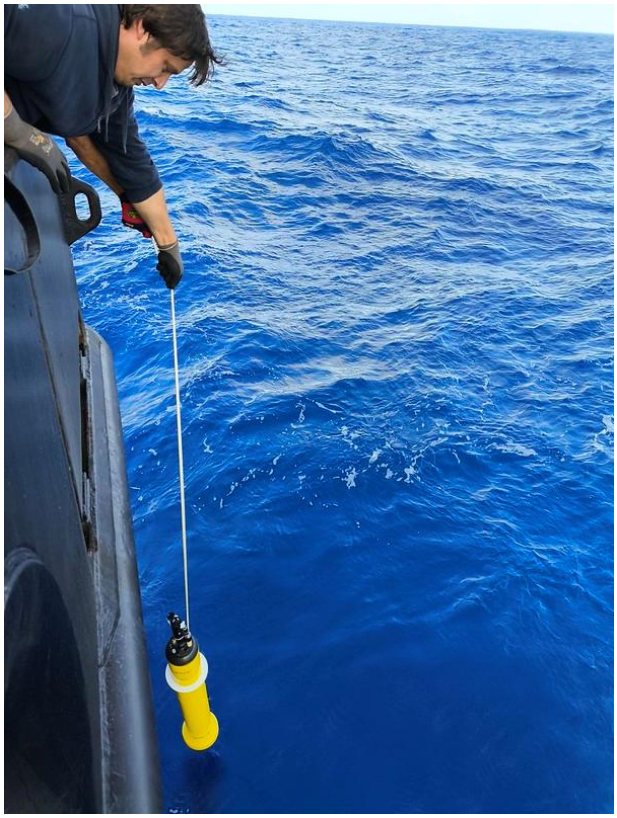
Given the location of the 2026 MATE World Championship, this year's *MATE Floats!* mission scenario takes place UNDER the ice. For regional competitions, this translates to a simulated under-ice task; for companies competing at the World Championship, this means operating under an ice sheet grown in the National Research Council's (NRC) ice tank. At 90 meters long, 12 meters wide, and 3 meters deep, the NRC's ice tank is one of the largest facilities of its kind in the world. With temperatures ranging down to -25°C , this indoor, refrigerated facility simulates realistic Arctic and northern marine conditions and has the ability to grow ice at 2.5 millimeters an hour.

Operating floats in polar waters where they may encounter ice is a real-world challenge faced by GO-BGC float technicians. Sensors and antennas, not to mention the float itself, run the risk of being damaged if the float attempts to surface with an ice sheet overhead. There is also the possibility of floats becoming entrained in sea ice and crushed. Therefore, floats deployed in polar

waters must be engineered with ice-avoidance capabilities and with the ability to store data during under-ice profiles and delay transmission until the float is clear to surface in open water. "Ice-avoidance capabilities" translates to sensors measuring water temperature and chemistry to assess if ice is detected as the float ascends to the surface, along with the decision-making capability (i.e., an ice-avoidance algorithm) to reverse course and descend rather than continuing to surface.

Simulating this within the context of a MATE ROV Competition mission task presents some challenges, especially without the ability to replicate the precise real-world conditions – even in an ice tank – that would allow a float with ice-avoidance capabilities to detect ice and reverse course

So, instead of ascending to the surface and transmitting data to the mission station, companies participating in the 2026 MATE ROV Competition are challenged to design and build a float that ascends to a specific depth below the surface and holds that position for a defined period of time before initiating another descend to depth. Only after the float is recovered is it tasked with transmitting its data to the mission station.



Deploying a GO-BGC float (GO-BGC | Global Ocean Biogeochemistry Array)

2. Mission Scope and Purpose

This and the following sections contain the technical specifications and requirements for ROV services needed to support the **Pushing Performance: Science, Technology, & Discovery in Harsh Environments**. In 2026, ROV services include:

1. Task 1. Seabed 2030: A Kaleidoscope of Corals in Cold Water
    - Collect species (basket stars and coral species) from the coral garden
    - Create a 3D image of the coral garden either autonomously or manually (CAD)
    - Maintain position / fly a transect in a current to create a video of the coral garden
2. Task 2. SmartAtlantic Alliance: Better Information, Better Decisions
    - Determine the number of invasive European Green crabs in the sample using image recognition or manually and upload data to the Invasive Species form
    - Survey an iceberg and measure its keel depth
    - Use the location, heading and keel depth of the iceberg to determine the threat level of the iceberg to the four oil platforms
    - Simulate an acoustic release of a retrieval buoy on whale safe fishing gear and recover the lobster pot
    - Attach a recovery line to the buoy anchor and return the line to the surface, side of the pool
    - Replace an eDNA sensor, connecting the new sensor to the Holyrood subsea observatory
    - Analyze data to determine frequency seen
    - Remove biofouling from the observatory's camera
3. Task 3. Wind-Powered Offshore Oil Platform: Scalable Solutions for Global Energy Needs
    - Place a bubble curtain around the designated location and install a micropile
    - Retrieve the power connector from the wind farm subsea station and lay the cable through a waypoint
    - Remove the cover from the oil platform port and install the power connector
4. Task 4. MATE Floats Under the Ice
    - Prior to the competition, design and construct an operational profiling float
    - Float communicates with the mission station prior to descending
    - Float completes two vertical profiles under the ice
    - Float maintains depth at 2.5 meters and 40 cm
    - Float communicates data to the mission station after recovery
    - Data is graphed as depth over time

3. Specifications

See the specific tasks described below as well as the **VEHICLE DESIGN & BUILDING SPECIFICATIONS** and **COMPETITION RULES** sections.

4. Maintenance and Technical Support

The company shall warrant the ROV and associated systems and equipment for at least the duration of the product demonstrations. Repair or replacement shall be at the company's expense, including the cost of shipping the ROV to and from the competition facility.

During regional events, the company shall provide at least one day of technical support to resolve hardware, software, and operational issues. They shall provide at least three days of the same for the World Championship event.

5. Shipping and Storage

   Refer to Shipping Information for specifics on shipping to the MATE World Championship site.

   Delivery of the ROV and associated systems and equipment shall be no later than the date of the geographically closest regional contest or by the final check-in day of the MATE World Championship (June 24, 2026).

6. Evaluation Criteria
   a. Technical documentation
   b. Engineering presentation
   c. Marketing display
   d. Company spec sheet
   e. Corporate responsibility (optional)
   f. Product demonstration
   g. Safety

7. References
   a. General
      - United Nations Decade of Ocean Science for Sustainable Development
      - 17 UN Sustainable Development Goals
      - 10 Challenges - Ocean Decade
      - A Hotter Future Is Certain, Climate Panel Warns. But How Hot Is Up to Us
      - ESG (environmental, social and governance)
      - Decade of Action for Cryospheric Sciences (2025-2034)
      - Photos from the 2015 World Championship in St. John's | Flickr

   b. Task 1: Seabed 2030: A Kaleidoscope of Corals in Cold Water
      - Rare Coral Habitat Discovered using Rayfin Camera
      - 'Corals as far as the eye can see' a rare find for Marine Institute researchers
      - Spotting soft coral garden off Newfoundland 'once in a lifetime' opportunity, researcher says
      - Photogrammetry - NOAA Ocean Exploration

   c. Task 2: SmartAtlantic Alliance: Better Information, Better Decisions
      - European Green Crab in Newfoundland Waters
      - European Green Crab
      - Identification Guide for Eastern Canada Crabs - Wanted Invaders
      - Hibernia
      - Hibernia Platform Collision Avoidance - Offshore Energy Surveillance System

- Infographic: How Newfoundland deals with its yearly iceberg rush
- North Atlantic right whale
- Whalesafe fishing gear
- SmartAtlantic - Holyrood Buoy 2
- SmartAtlantic - Holyrood Subsea Observatory
- BeWild & Fugro Launch Remote Ecology Survey at CrossWind
- The BeWild project: Advancing marine biodiversity monitoring at offshore wind farms
- Detecting fish with the innovative Fish Sensing Box
- ~~Seeing, hearing and testing underwater~~
- ~~Marine biodiversity assessment using eDNA sequencing~~

d. Task 3: Wind-Powered Offshore Oil Platform: Scalable Solutions for Global Energy Needs
    - How to meet global energy demand in the age of electricity?
    - Fugro Blue Essence Completes First Remote Offshore Wind ROV
    - Hywind Tampen: the World's largest floating wind farm and the first for oil platforms
    - Remote Anchoring & MicroPiler (RAMP)
e. Task 4: MATE Floats Under the Ice
    - GO-BGC | Global Ocean Biogeochemistry Array
    - Expanding Fleet of Autonomous Floating Robots Targets Deeper Understanding of Global Ocean Dynamics
    - Profiling Floats in SOCCOM: Technical Capabilities for Studying the Southern Ocean
    - Ice tank – 90 m research facility - National Research Council Canada

WEIGHT RESTRICTIONS

Considering some of the environments in which the ROVs will be operating, an ROV weight requirement has been included in the request for proposals (RFP). Lighter vehicles will be given special consideration and vehicles above a certain weight will not be considered. The dimensions of the ROV may be limited by product demonstration tasks.

Note for 2026!!!

All weight measurements will include the vehicle and all tools and components. The weight measurement will NOT include the tether. The following will NOT be included in the weight measurement:

- The topside control system and the tether
- The vertical profiling float
- Any independent sensors if removable from the ROV

At the World Championship, companies will complete their ROV weight measurements during their onsite safety inspection. The weight measurement will be documented on the weight score sheet and included as part of the overall score.

Note: Regional competitions may handle size and weight measurements differently. Regional competitions that combine all the tasks into one product demonstration run may weigh vehicles prior to each run. For EXPLORER class companies competing at a regional event, contact your regional coordinator or visit your regional contest's website for more information.

Weight measurements will be conducted using a digital scale. In addition, companies must be able to personally transport the vehicle and associated equipment to the product demonstration station and to the engineering presentation room. ROV systems must be capable of being safely hand launched.

Competition officials will use the following chart to award points for weight:

Weight (in air)	
< 18 kg	+10 points
18.01 kg to 25 kg	+5 points
25.01 kg to 35 kg	+0 points

Vehicles greater than 35 kg in weight will not be allowed to compete in the product demonstration.

A video showing a simulated weight measurement is posted here.

PRODUCT DEMONSTRATION

IMPORTANT NOTE: Questions about the competition, the production demonstrations and design and building specifications should be posted to the MATE ROV Competition Forum Board. Questions will be answered by MATE ROV Competition staff so that all companies can see the questions and answers. This will also help to avoid duplicate questions. That said, please make sure that your question(s) has not already been asked – and answered – before posting. It is up to you and your company to read, comprehend, and comply with ALL rulings posted on the site. All pertinent rulings will be posted to the 2026 Official Rulings thread, which will be pinned to the top of the forum board.

ORGANIZATIONAL AND OPERATIONAL EFFECTIVENESS

Companies will receive up to 10 points for Organizational and Operational Effectiveness. This includes points for teamwork, collaboration and communication, project management, problem solving and the ability to deal with obstacles, and system design and control.

Organizational and operational effectiveness is included on the product demonstration rubric posted here. This rubric will be posted by March 1, 2026. In the meantime, companies may refer to the previous year's rubrics for a general idea of the categories and points.

TASK 1: *Seabed 2030: A Kaleidoscope of Corals in Cold Water*

This task involves the following steps:

Task 1.1 Collect species from the coral garden

- **Collect two basket stars and return them to the surface, side of the pool – 5 points each, 10 points total**
- **Collect two coral species and return them to the surface, side of the pool**
  - **Collect coral by the substrate only – 10 points each, 20 points total**
  - **Collect corals not by the substrate – 5 points each, 10 points total**

Task 1.2 Coral garden ridge modelling

- **Via photogrammetry, autonomously create a scaled 3D model of the coral garden – up to 40 points**
  - **Create a 3D model of the coral garden – up to 20 points**
    - **Model shows all 8 targets – 20 points**
    - **Model shows 4 to 7 targets – 15 points**
    - **Model shows 1 to 3 targets – 10 points**
    - **Model shows 0 targets – 5 points**
  - **Measure the length of the coral garden within 5 cm – 10 points**
  - **Scale the 3D model using the length of the coral garden – 5 points**
  - **Use the properly scaled 3D model to estimate the height of the coral garden (within 5 cm) – 5 points**

Or

- **Manually (CAD) create a scaled 3D model of the coral garden – up to 30 points**
  - **Measure the length of the coral garden (within 5 cm) – 10 points**
  - **Measure the height of the coral garden (within 5 cm) – 10 points**
  - **Create a scaled 3D model of the coral restoration area displaying the length and height measurements – 10 points**

Task 1.3 Fly a transect over the coral garden

- **At the World Championship**
  - **Maintain position over the coral garden in a current to create a video of the coral garden – 15 points**
- **At a regional competition**
  - **Fly a transect to create a video of the coral garden – 15 points**

Total points = 85 points

Product Demonstration Notes:

Task 1.1 Collect species from the coral garden
At the World Championship, Task 1.1 collect species from the coral garden will take place in the Flume Tank.

Companies must collect two basket stars and two coral species and return them to the surface, side of the pool. The basket stars and coral species will be located on the bottom of the pool within 2 meters of the coral garden.

Two basket stars, simulated by O-balls with a ½-inch PVC base will be located near the coral garden. Companies will receive 5 points for successfully returning each basket star to the surface, side of the pool, 10 points total. Successfully returning a basket star to the surface, side of the pool is defined as removing it from the water and placing it on the pool deck.

Basket stars will weigh less than 15 Newtons in water.

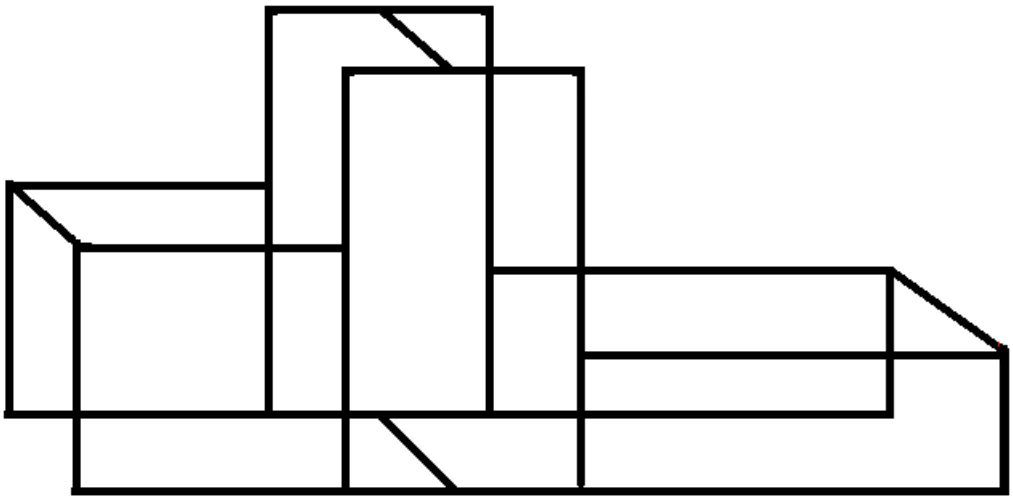
Two coral species will also be located on the coral garden. Coral species will be constructed of colored chenille pipe cleaners attached to a 2-inch end cap with 2-inch knockout cap, and a ½-inch PVC base. The end cap and pipe will be the "substrate" of the coral.

Companies will receive 10 points for successfully collecting a coral species by the substrate, 20 points total. Companies will receive only 5 points for successfully collecting the coral not by the substrate, 10 points total. Successfully collecting a coral species is defined as removing it from the water and placing it on the pool deck. Collecting the coral species by the substrate is defined as removing it and placing it on the pool deck only touching the 2-inch end cap or PVC pipe and not the chenille pipe cleaners. Companies may receive points for collecting one coral by the substrate and one coral not by the substrate.

Corals will weigh less than 15 Newtons in water.

Task 1.2 Coral garden ridge modelling
At the World Championship, Task 1.2 coral garden ridge modelling will take place in the Flume Tank.

Companies must measure the coral garden and create a 3D model of the garden area. The coral garden will be constructed from ½-inch PVC pipe, will be between 1 meter and 2.5 meters in length, approximately 36 cm wide and an unknown height. Eight 10 cm x 10 cm colored squares, constructed from corrugated plastic sheeting, will be attached to the PVC of the coral garden. These will be targets for modelling the coral garden.



The coral garden

Companies choosing to create a 3D model of the coral garden autonomously must use photogrammetry to create a 3D model of the coral garden in a CAD program with the proper dimensions displayed. Companies may manually maneuver around the coral garden to take photos. Companies may transfer any images from the ROV to a computer or device at the mission station. This transfer does not have to be done autonomously; it can be accomplished "by hand." Companies are permitted to place an object of known dimensions (e.g., a ruler) on or near the coral garden to assist in the measurements. Note that this object of known dimensions will count as debris if it is not under control of the ROV or removed from the pool by the end of product demonstration time.

Companies will receive up to 20 points for successfully modeling the coral garden via photogrammetry. Successfully modeling the coral garden via photogrammetry is defined as the coral garden displayed as a 3D image on a screen at the product demonstration station. The image should be able to be rotated so that the station judge can view it from any angle. The 3D image must show all eight targets (10 cm x 10 cm colored squares). Companies that display all eight targets on their model will receive 20 points. If four to seven targets are displayed on the model, companies will receive 15 points. If one to three targets are displayed, companies will receive 10 points. If no targets are displayed, but the company does display a 3D model, companies will receive 5 points.

Companies must also measure the length of the coral garden and use that length to scale the 3D image accordingly. Companies will receive 10 points for successfully measuring the length of the coral garden. Successfully measuring the length of the coral garden is defined as the company's measurement being within 5 cm of the true length. Companies must show the station judge their measurement or explain how they are estimating the measurement; companies may not guess. Once the company provides their length measurement (regardless if it is within 5 cm), the station judge will provide the company with the true length of the coral garden. A company that does not

attempt to measure the length will not receive the true length of the coral garden from the station judge and therefore cannot complete the scaling or height estimation steps.

Companies should use the true length provided by the station judge to scale their 3D model of the coral garden. Companies will receive 5 points for successfully scaling their 3D model and displaying the length measurement on that model. Successfully scaling the model and displaying the length is defined as the station judge being able to see the true length displayed on the 3D model.

Using the scaled length of the 3D model, companies must estimate the height of the coral garden. The height includes the height of any PVC tees on top of the coral garden; the height measurement is from the bottom of the coral garden structure to the top of the coral garden. Companies will receive 5 points when they successfully estimate the height of the coral garden within 5 cm. Successfully estimating the height of the coral garden is defined as using the 3D image properly scaled for length to determine the height. The station judge must be able to see the height displayed on the 3D model, and that height must be within 5 cm of the true height.

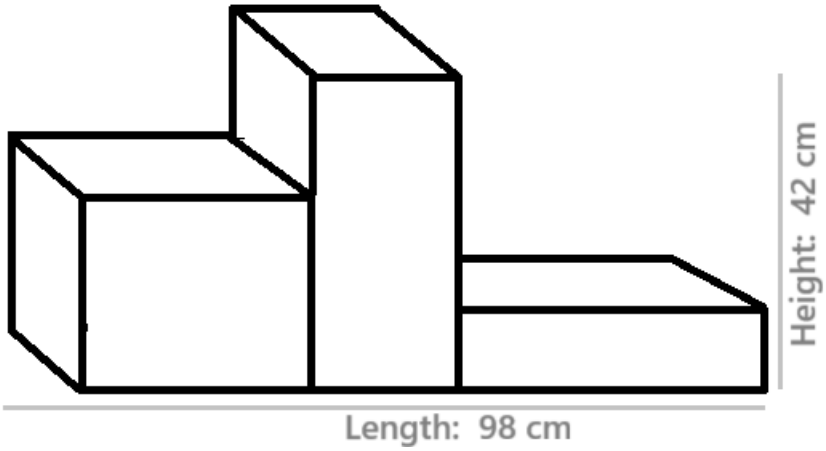
Companies choosing to create a 3D model of the coral garden manually using CAD must first measure the length and height of the area.

Companies must measure the length and height of the coral garden. Companies will receive 10 points for successfully measuring the length of the coral garden. Companies will receive 10 points for successfully measuring the height of the coral garden. Successfully measuring the length and height of the coral garden is defined as the company measurement within 5 cm of the true length or true height. The height includes the height of any PVC tees on top of the coral garden; the height measurement is from the bottom of the coral garden to the top of the coral garden. Companies must show the station judge both of their measurements or explain how they are estimating the measurement; companies may not guess. Companies are permitted to place an object of known dimensions (e.g., a ruler) on or near the coral garden to assist in the measurements. Note that this object of known dimensions will count as debris if it is not under control of the ROV or removed from the pool by the end of product demonstration time.

Companies should then create a 3D model of the coral garden in a CAD or other program. Companies may input their measurements manually into a CAD or other program to create their 3D model. The length and height measurements should be included in the 3D model, even if those measurements are incorrect. Companies will not receive points for properly measuring the dimensions of the coral garden area but can still receive points for modeling the area with the measurements taken.

Companies will receive 10 points for successfully modeling the 3D coral garden manually. Successfully modeling the coral garden is defined as the model of the coral garden displayed as a CAD model on a screen at the station and the length and height dimensions included on the model. The 3D model should be able to be rotated and viewed from any angle. The length and height dimensions measured by the company must be included on the model.

The 3D model should only include the basic structure of the coral garden. The manual 3D CAD model does not need to incorporate each section of PVC pipe and each fitting. A general model, showing three rectangular prisms, should be displayed. The targets do not need to be displayed on the 3D model created manually.



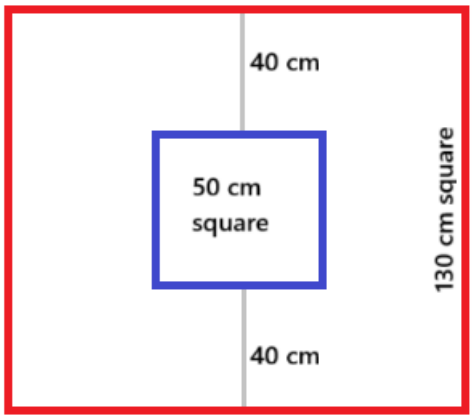
A 2D representation of a manually-created 3D CAD model consisting of three rectangular prisms. Length and height dimensions are included.

NOTE: Companies will only receive points for one method of modeling the coral garden. However, companies may attempt more than one method. For example, a company could manually create a 3D image of the coral garden while a computer program works to autonomously create a 3D model. If the program is successful at creating the model autonomously, the company would receive 40 points. But if the program is not successful, the company would still receive 30 points for successfully creating the 3D image manually.

Task 1.3 Fly a transect over the coral garden

At the World Championship, Task 1.3 fly a transect over the coral garden will take place in the Flume Tank.

At the World Championship, companies must maintain their position over the coral garden in a current. The coral garden will be a 50 cm blue square painted blue. An additional 130 cm square will surround the coral garden area. These additional lengths of pipe will be painted red. The transect area will be located on the bottom of the pool.



A diagram of the transect area at the World Championship. The blue and red lines are painted ½-inch PVC pipes, the gray lines are white PVC pipe.

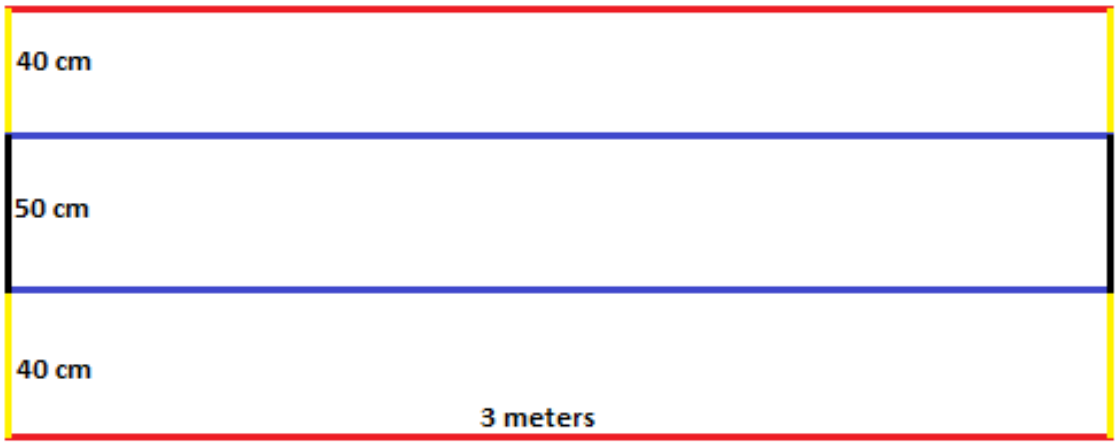
Companies must maintain position over the area in a current for 30 seconds, displaying the video image of the transect area (blue square) on a display for the station judge. Companies will receive 15 points for successfully maintain position over the area for 30 seconds. Successfully maintaining position is defined as the entire blue square in the video display for the entire 30 seconds, but no portion of the red square visible in the video display. If any section of the red pipe is seen in the video display, or if the entire blue square is not seen in the video display at all times, the ROV has failed to maintain position. Holding position must be done for 30 consecutive seconds. If the team fails to maintain position, they may reposition and restart the mission but must maintain position for a new consecutive 30 seconds.

A video showing successful and unsuccessful maintaining position over the coral garden area can be seen here.

If companies have multiple camera views from the ROV, companies should indicate to the station judge which video screen shows maintaining position over the coral garden. That video screen must comply with the maintaining position specifications; other video displays could show a wider view.

At EXPLORER class regional competitions, companies must fly a transect line over an area. The area will be simulated by a ½-inch PVC pipe rectangle 3 meters long by 0.5 meters wide. The 3-meter lengths of PVC pipe that make up the "top" and "bottom" of the area will be painted blue. The 0.5-meter "ends" of the transect area will be painted black.

An additional 3-meter length of PVC pipe will be located 40 cm from the top and bottom of the search area. These additional lengths of pipe will be painted red. The 0.4-meter "ends" of these transect areas will be painted yellow. The transect area will be located on the bottom of the pool.



A diagram of the transect area. The blue, red, yellow, and black lines are painted ½-inch PVC pipes.

Companies must fly a transect line over the area, displaying the video image of the transect on a display screen for the station judge. Companies will receive 15 points for successfully flying a transect. Successfully flying a transect over the area is defined as starting at one end of the transect and moving to the other end of the transect. Starting at one end of the transect is defined as the ROV directly above the black length of PVC pipe on either end of the transect.

The ROV must also remain at a certain height over the transect area. While flying the transect, both blue painted PVC pipes must be in the video display at all times and neither red pipe may be visible in the video display. If any section of red pipe is seen in the video display, or both blue pipes are not seen in the video display at all times, the ROV has failed to successfully fly the transect.

A video showing successful and unsuccessful flying of the transect line can be seen here.

If companies have multiple camera views from the ROV, companies should indicate to the station judge which video screen shows the flying the transect task. That video screen must comply with the flying the transect specifications; other video displays could show a wider view.

TASK 2: *SmartAtlantic Alliance: Better Information, Better Decisions*

This task involves the following steps:

Task 2.1 Mitigate invasive species

- **Determine the number of invasive European Green crabs in the sample**
  - **Using image recognition – 15 points**
  - **Manually – 5 points**
- **Upload the data to the Invasive Species Form – 5 points**

Task 2.2 Iceberg tracking

- **Track icebergs headed towards offshore oil platforms**

- **Survey the iceberg at five points around its perimeter – up to 10 points**
  - **Survey all five points – 10 points**
  - **Survey one to four points – 5 points**
- **Measure the keel depth of the iceberg within 10 cm of true depth – up to 10 points**
  - **Within 5 cm of the true depth – 10 points**
  - **Within 5.01 to 10 cm of the true depth – 5 points**
  - **Greater than 10.1 cm of the true depth – 0 points**
- **Use the location, heading, and keel depth to determine the threat level of the iceberg to the four area oil platforms – up to 15 points**
  - **Determine the threat level to the offshore platform – up to 10 points**
    - **Correctly report the threat level to all four platforms – 10 points**
    - **Correctly report the threat level to only three platforms – 5 points**
  - **Determine the threat level to the offshore platform's subsea assets – 5 points**

Task 2.3 Testing whale safe fishing gear

- **Turn the handle to simulate the acoustic release of the retrieval buoy – 10 points**
- **Recover the lobster pot to the surface, side of the pool – up to 10 points**
  - **Recover the lobster pot off the bottom – 5 points**
  - **Return the lobster pot to the surface, side of the pool – 5 points**

Task 2.4 Recover the buoy anchor

- **Attach a recovery line to the buoy anchor – 10 points**
- **Return the line to the surface, side of the pool – 5 points**

Task 2.5 Service the Holyrood subsea observatory

- **Recover the old eDNA sensor**
  - **Recover the old sensor to the surface, side of the pool – 5 points**
  - **Analyze the sensor's data to determine the percent frequency seen of various organisms – 10 points**
- **Install a new eDNA sensor**
  - **Place the sensor in the designated area – 10 points**
  - **Connect the sensor to the Holyrood subsea observatory – 10 points**
- **Remove biofouling from the Holyrood subsea observatory camera – 10 points**

Total points = 135 points

Product Demonstration Notes:

Task 2.1 Mitigate invasive species

At the World Championship competition, Task 2.1 mitigate invasive species will take place in the Flume Tank.

Companies must determine the number of invasive European Green crabs in a sample. Crab images will be printed, laminated, and secured with clear tape to one side of a 50 cm x 50 cm

length of corrugated plastic sheeting. Crab images will include a variety of European Green crabs, native Rock crabs, and native Jonah's crabs. The images below will be used to represent each variety of crab. No additional photos or variations will be used. Images may be resized to be larger or smaller; images may be rotated to any angle on the corrugated plastic sheeting.

Left: European Green crab. Photo from European Green Crab. Center: Native Rock crab. Photo from European Green Crab. Right: Native Jonah crab. Photo from NicePNG. Individual crab images will be provided in the Product Demonstration Resources section of the MATE ROV Competition website.

Companies may use image recognition to count the number of European Green crabs in the sample. Companies will receive 15 points for successfully using image recognition to determine the number of European Green crabs in the sample. Successfully using image recognition to identify green crabs is defined as a computer program identifying and counting the green crabs. Companies may pilot their ROV manually to provide an image of the corrugated plastic sheeting with crab images then begin to run their program, but the program (and not company members using the ROV's video) must identify and provide a count of the European Green crabs. Identifying a European Green crab in the image is defined as the crab image being surrounded by a bounding box on the screen. Providing a count of the European Green crabs is defined as the total number of European Green crabs on the screen being displayed on the screen. For example, if 7 European Green crabs are in the video display, each should have a bounding box around it and the number 7 should be displayed on the video screen. Rock crab and Jonah crab images should not have a bounding box around them nor should they be included in the invasive crab count. Companies must show the station judge their video display showing the entire 50 cm x 50 cm area and all European Green crabs in the sample.

Alternatively, companies may manually determine the number of invasive European Green crabs in the sample. Companies will receive 5 points for manually determining the number of invasive European Green crabs in the sample. Manually determining the number is defined as a company member counting the number of European Green crabs and providing that count to the station judge.

For both image recognition and manually determining the number of crabs, companies only need to report the number of European Green crabs in the sample. Companies do not need to report numbers of native Rock crabs or native Jonah crabs. If using image recognition, Rock crab and Jonah crab images should not have a bounding box around them nor should they be included in the invasive crab count. For both image recognition and manually determining the number of crabs,

companies will only receive one chance at informing the station judge of the correct number. Companies may not guess at the number of European Green crabs; they must either show their image recognition count on the video display or manually count crabs so the judge can observe the count.

After determining the number of crabs in the sample, companies must upload data to the 2026 MATE ROV Competition – Invasive Species Reporting Form.

A QR code will be available at the mission station, allowing companies to access the form directly. Companies may complete the form on a computer, phone, or other device. When the form is completed and submitted, companies will receive a message confirming that their submission was successful. Companies must show that message, which will include the number of crabs that they determined were in the sample, to the station judge. Companies will receive 5 points when they successfully complete the Invasive Species Reporting form. Successfully completing the form is defined as showing the judge the confirmation of your successful submission.

Task 2.2 Iceberg Tracking

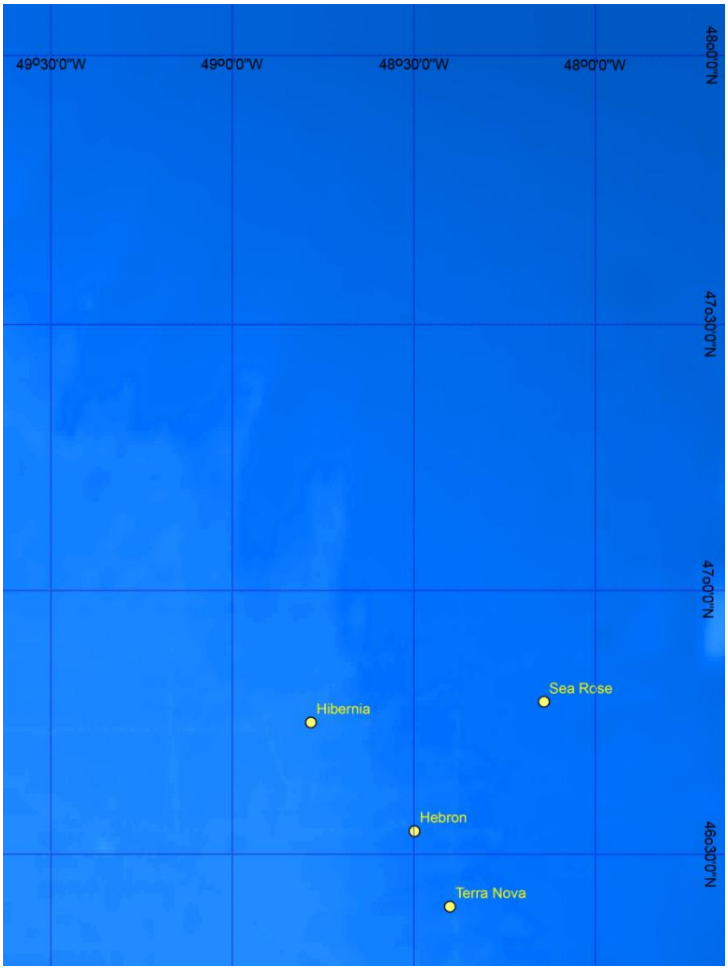
At the World Championship competition, Task 2.2 iceberg tracking will take place in the Flume Tank.

Companies must track icebergs as they head towards offshore oil platforms and their subsea assets. Companies must first survey the iceberg at five locations around its perimeter and measure the keel depth of the iceberg. The iceberg will be constructed from ½-inch PVC pipe and bubble wrap/clear plastic.

The iceberg will have five numbers attached to it, one at each corner and one on the bottom of a PVC length extending underwater. The numbers at the corners will be 15 cm below the surface and attached to a small rectangle of corrugated plastic sheeting. Companies will receive up to 10 points for successfully surveying all five numbers around the perimeter of the iceberg. Companies that only survey one to four of the numbers around the perimeter will receive 5 points. Successfully surveying a point is defined as showing the station judge in a video display each of the five numbers. Note the five numbers on each iceberg will be sequential, either 0 through 4 or 5 through 9.

Companies must also measure the keel depth of the iceberg. The keel of the iceberg will be constructed from ½-inch PVC pipe and will be extending down from one corner of the iceberg. This length will be between 0.5 meters and 1.5 meters in length. Companies must measure the depth that this PVC pipe extends down from the surface. Companies will receive 10 points for successfully measuring the keel depth of the iceberg within 5 cm of the true depth. Companies will receive 5 points if they measure the keel depth of the iceberg but are between 5.01 and 10 cm from the true depth. Successfully measuring the keel depth is defined as showing the station judge their measurement or explaining how they are estimating the measurement; companies may not guess at the keel depth.

Once the companies have surveyed the iceberg at all five locations around its perimeter, companies will receive the iceberg information sheet and an offshore oil platform map and data sheet. The iceberg information sheet will contain the location (longitude and latitude) of the iceberg, its heading, and a proper keel depth (reflecting a real iceberg). The offshore oil platform map will show the location of the four area oil platforms. This map will also include the following table showing the location of the platforms and water depth at each platform. This map and table will also be available in the Product Demonstration Resources section of the MATE ROV Competition website.



A map of the oil platforms.

Platform	Location		Ocean depth (m)
	Latitude	Longitude	
Hibernia	43.7504	-48.7819	-78
Sea Rose	46.7895	-48.1417	-107
Terra Nova	46.4	-48.4	-91
Hebron	46.544	-48.498	-93

A table of oil platforms location and depth.

Using this information, companies must determine the threat level for the four surface platforms. The threat levels are green, yellow, and red. If the iceberg is passing more than 10 nautical miles

away from a platform, the iceberg poses a green threat level. If the iceberg is passing between 5 and 10 nautical miles from a platform, it poses a yellow threat level. If the iceberg is passing less than 5 nautical miles from a platform, it poses a red threat level. If the keel depth of the iceberg is 110% or greater than the depth of the water where the platform is located, it is never a threat to the platform as it will ground before reaching the platform. Threat level to the platform is green.

Note that 1 minute of latitude is equal to 1 nautical mile.

Companies will receive 10 points for successfully using the location, heading, and keel depth to determine the threat level to all four platforms. Successfully determining the threat level is defined as informing the station judge of the proper threat level, green, yellow or red, for each of the four oil platforms. Companies will receive 5 points if they are successful in determining the threat level to three platforms. Companies that are successful in determining the threat level to 2 or less platforms will receive 0 points.

Companies must also determine the threat level for the subsea assets. Any iceberg passing within 25 nautical miles of an oil platform could potentially be a threat for subsea assets. Companies will use the keel depth to evaluate the threat level to any iceberg that passes within 25 nautical miles of subsea assets.

- If the keel depth of the iceberg is 110% or greater than the depth of the water the platform is located in, it is never a threat to the subsea assets as it will ground before reaching the assets. Threat level to subsea assets is green. Note that at this keel depth, the threat to the surface platform is also green.
- If the keel depth of the iceberg is 90% to 110% of the depth of the water the platform is located in, the subsea assets are in critical danger. Threat level to the subsea assets is red.
- If the keel depth of the iceberg is 70% - 90% of the depth of the water the platform is located in, caution should be maintained as the keel may impact the seafloor. Threat level to the subsea assets is yellow.
- If the keel depth of the iceberg is <70% of the depth of the water the platform is located in, it is never a threat to the subsea assets. Threat level to subsea assets will be green.

Companies will receive 5 points when they successfully determine the threat level to the oil platform subsea assets. Successfully determining the threat level is defined as informing the station judge of the proper threat level, green, yellow or red, for each of the four platform subsea assets. There are no partial points; companies must correctly determine the threat level to all four subsea assets.

Companies may not guess at the threat levels for either the platforms or the subsea assets; companies must show the judge a map with the oil platforms and iceberg track. Companies may track the iceberg on a paper map (judges will have paper maps at the station upon request or companies may bring their own paper maps) or companies may track the iceberg on a digital version of the map. See the Product Demonstration Resources section for maps.

Companies will only get one attempt to evaluate the threat levels for oil platforms and one attempt for the subsea assets. Companies that are incorrect may not re-evaluate the threat levels. Companies must report all threat levels during the product demonstration time; companies may not report to the judge after the time has ended.

Task 2.3 Testing whale safe fishing gear

At the World Championship, Task 2.3 testing whale safe fishing gear will take place in the Offshore Engineering Basin Tank.

Companies must simulate the deployment and testing of whale safe fishing gear. A whale safe lobster pot will be on the bottom at the start of the product demonstration run. The lobster pot will be constructed from a milk crate with ½-inch PVC pipe and 3-inch PVC pipe. A corrugated plastic sheet attached to ½-inch PVC pipe will cover the 3-inch pipe that holds the 2-inch PVC pipe retrieval buoy. A length of rope, long enough for the buoy to reach the surface, will attach the buoy to the milk crate. Companies must turn a ½-inch PVC pipe handle to simulate an acoustic release of the retrieval buoy. Companies will receive 10 points when they successfully turn the handle and release the buoy. Successfully turning the handle and releasing the buoy is defined as the buoy no longer in contact with the 3-inch PVC pipe.

Companies must also recover the lobster pot to the surface, side the pool. A company unable to release the retrieval buoy will still be able to recover the lobster pot, but once the lobster pot is recovered, companies can no longer receive points for releasing the buoy. To recover the lobster pot, the ROV must lift the lobster pot off the bottom and return it to the surface, side of the pool. Companies may not drag the lobster pot across the bottom by pulling on the rope or buoy. Companies will receive 5 points when they successfully recover the lobster pot. Successfully recovering the lobster pot is defined as the lobster pot under control of the ROV and no longer touching the bottom. Companies will then receive 5 points for successfully returning the lobster pot to the surface, side of the pool. Successfully returning the lobster pot is defined as the milk crate removed from the pool and placed on the pool deck.

The lobster pot will weigh less than 20 Newtons in water.

Task 2.4 Recover the buoy anchor

At the World Championship, Task 2.4 recover the buoy anchor will take place in the Offshore Engineering Basin Tank.

Companies must attach a recovery line to the buoy anchor. The buoy anchor will be constructed from a 2-gallon bucket with a lid. A #310 U-bolt will be located in the center of the lid; companies will attach the recovery line to that U-bolt. Companies must provide their own recovery line and mechanism to attach their recovery line to U-bolt; MATE will **NOT** provide this. The recovery line is required to make a secure connection to the U-bolt. A secure connection means that the attachment mechanism completely encompasses the U-bolt (a full 360° wrap around the U-bolt, such as a carabiner) and does not come loose once it is attached.

Companies will receive 10 points when they successfully attach the recovery line to the buoy anchor. Successfully attaching the recovery line to the buoy anchor is defined as the carabiner or other attachment device no longer in contact with the ROV and secured to the #310 U-bolt.

After attaching the recovery line to the U-bolt, companies must return to the surface, spooling out the line inside the device as they do so. Prior to connecting the device, the line is REQUIRED to be fully contained within the attachment mechanism or on the ROV. The line must spool out as the ROV returns to the surface; companies may not have any line/rope loose in the pool prior to connecting the line to the #310 U-bolt. If line is loose in the pool prior to attaching, companies will not receive points for this task. If the line is loose, companies may return to the surface and recoil the line into the attachment mechanism and try again. The mechanism must stay connected to the U-bolt for the entire product demonstration run. If the mechanism comes off of the U-bolt, companies will lose points for both attaching the line to the buoy anchor and returning the line to the surface, side of the pool. Companies may attempt to reattach the line to regain those points. Companies will receive 5 points when they successfully return the line to the surface, side of the pool. Successfully returning the line to the surface, side of the pool is defined as a company member on the pool deck holding the line, with the mechanism on the other end of the line attached to the U-bolt on the buoy anchor.

Task 2.5 Service the Holyrood subsea observatory

At the World Championship, Task 2.5 service the Holyrood subsea observatory will take place in the Offshore Engineering Basin Tank.

Companies must recover the old eDNA sensor to analyze its data. The eDNA sensor will be constructed from ½-inch and 2-inch PVC pipe. A 50 cm length of rope will act as a carrying mechanism. At the start of the product demonstration run, the old eDNA sensor will be on the bottom inside the designated area. The designated area will be a 50 cm square constructed from ½-inch PVC pipe painted yellow. Companies will receive 5 points when they successfully recover the old eDNA sensor to the surface, side of the pool. Successfully recovering the old eDNA sensor is defined as placing the sensor on the pool deck.

The old eDNA sensor will weigh less than 10 Newtons in water.

Once the old eDNA sensor has been successfully recovered, the station judge will provide companies with the frequency data. The frequency data will have ten species listed, along with the number of times that organism was seen in the videos from the Holyrood subsea observatory. To determine the percent frequency seen, companies must determine the occurrences of each species, calculate the total count of species, then divide each species frequency by the total count. Multiply by 100 to find the percentage frequency. Companies will receive 10 points when they successfully determine the percentage frequency seen of the various organisms. Successfully determining the percentage frequency seen is defined as showing the station judge the percentage frequency for each of the ten species within the videos from the Holyrood subsea observatory.

Species	Number Seen

Snow crab (*chionecetes opilio*)	19
Acadian hermit crab (*Pagarus acadianus*)	3
Western Atlantic Hairy Hermit Crab (*Pagarus arcuatus*)	1
European Green Crab (*Carcinus maenas*)	9
Rock Crab (*Cancer pagurus*)	10
Jonah Crab (*Cancer borealis*)	5
Spiny Sunstar (*Crossaster papposus*)	8
Sea Urchin (*Stronglyocentrotus droebachiensis*)	10
Boreal Sea Star (*Boreal asterias*)	12
Daisy brittle star (*Ophiopholis aculeata*)	7

A frequency data table of species with numbers seen of each species. Companies calculate the sum total of numbers seen (in this case, 84).

Species	Number Seen	% frequency
Snow crab (*chionecetes opilio*)	19	22.61904762
Acadian hermit crab (*Pagarus acadianus*)	3	3.571428571
Western Atlantic Hairy Hermit Crab (*Pagarus arcuatus*)	1	1.19047619
European Green Crab (*Carcinus maenas*)	9	10.71428571
Rock Crab (*Cancer pagurus*)	10	11.9047619
Jonah Crab (*Cancer borealis*)	5	5.952380952
Spiny Sunstar (*Crossaster papposus*)	8	9.523809524
Sea Urchin (*Stronglyocentrotus droebachiensis*)	10	11.9047619
Boreal Sea Star (*Boreal asterias*)	12	14.28571429
Daisy brittle star (*Ophiopholis aculeata*)	7	8.333333333

A table showing species, numbers seen, and percentage frequency. Percentage frequency is calculated by dividing the number seen for each species by the total (84). For example, for the Snow crab, 19 species were seen out of 84, so the percentage seen in 22.62%.

Companies must then install a new eDNA sensor into the designated location. The sensor will be constructed from ½-inch pipe, 1-inch pipe and 2-inch pipe. A 50 cm length of rope will act as a carrying mechanism. The connector for the sensor will be constructed from ½-inch PVC pipe. 2 meters of cable will attach the sensor connector to the eDNA sensor. At the start of the product demonstration run the new eDNA sensor will be on the surface, side of the pool. The designated location will be the same as that of the old eDNA sensor. It will be a 50 cm square constructed from ½-inch pipe painted yellow. The old eDNA sensor must be recovered before the new eDNA sensor can be installed.

Companies will receive 10 points for successfully placing the new eDNA sensor in the designated location. Successfully placing the sensor is defined as the sensor no longer in contact with the ROV, completely inside the designated location, and upright. The sensor connector can still be on board the ROV, but the sensor must no longer be in contact with the ROV. The sensor must remain upright and completely inside the designated area for the entire product demonstration run. If the connector comes out of the designated area, or falls over, companies will lose points for placing

the sensor into the designated area. Companies may attempt to replace the sensor or turn the sensor upright to regain those points.

The new eDNA sensor will weigh less than 10 Newtons in water.

Companies must connect the new eDNA sensor to the Holyrood subsea observatory. The Holyrood subsea observatory will be constructed from ½-inch PVC, 1 ½-inch PVC and corrugated plastic sheeting. The connection port on the subsea observatory will be constructed from 1 ½-inch PVC pipe. Companies will receive 10 points when they successfully connect the new eDNA sensor to the Holyrood subsea observatory. Successfully connecting the sensor is defined as the connector no longer in contact with the ROV and inserted into the two openings of the connection port on the subsea observatory. The sensor connector must stay inserted into the port for the entire product demonstration run. If the connector is removed from the port at any time during the product demonstration run, companies will lose points for connecting the sensor to the Holyrood subsea observatory. Companies may attempt to reconnect the sensor to regain those points.

Companies must remove biofouling from the Holyrood subsea observatory camera. The camera biofouling area will be connected to the Holyrood subsea observatory. The camera will be simulated by two layers of corrugated plastic sheeting. The outer plastic sheet will be attached to the ½-inch framework of the observatory and have a 5 cm x 5 cm hole cut into it. The inner plastic sheet will rotate behind the outer plastic sheet. It will be attached to a ½-inch PVC tee that the ROV can rotate. The inner plastic sheet will be colored orange and blue; these colored areas will appear through the window cut into the outer layer. To simulate removing biofouling from the observatory, companies must spin the inner plastic sheeting three times around and then have the appropriate color appear through the window. The station judge will inform the company of what color should appear through the window, orange or blue.

Companies will receive 10 points when they successfully remove the biofouling from the Holyrood subsea observatory camera. Successfully removing the biofouling is defined as rotating the inner plastic sheeting three times around and having the appropriate color appearing through the window. Companies should show the station judge that the color in the window passes three times, demonstrating that the sheet has been rotated three times around. For example, if the station judge informs the company to have blue showing through the window, companies would rotate the inner sheeting until blue is showing, continue rotating it past that point until blue is not showing, continue rotating until blue is showing a second time, continue rotating it past that point until blue is not showing, then finally continue to rotate until blue is seen for the third time. When the entire window is fully showing blue (or orange if that is the color given by the station judge) for the third time, companies have successfully cleaned the camera. Companies may rotate the inner plastic sheeting either clockwise or counterclockwise, but all rotation must be in the same direction. The station judge must be able to see the proper color pass by for all three rotations.

TASK 3: *Wind-Powered Offshore Oil Platform: Scalable Solutions for Global Energy Needs*

This task involves the following steps:

Task 3.1 Micropile installation

- **Install a micropile into the seafloor to secure the wind turbine**
  - **Place a bubble curtain device around the micropile designated location – 10 points**
  - **Guide a micropile to the designated location – 10 points**
  - **Pull a pin to release the micropile – 10 points**

Task 3.2 Powering an oil platform from a wind turbine

- **Connect the wind farm power connector to the oil platform**
  - **Retrieve the power connector from the wind farm subsea station – 5 points**
  - **Lay the power connector cable through a waypoint away from the micropile – 10 points**
  - **Remove the cover from the oil platform port – 5 points**
  - **Install the power connector into the oil platform port – 10 points**

Total points = 60 points

Product Demonstration Notes:

Task 3.1 Micropile installation

At the World Championship , Task 3.1 micropile installation will take place in the Offshore Engineering Basin Tank.

Companies must place a bubble curtain device around the location designated for the micropile. The bubble curtain device will be located on the surface, side of the pool at the start of the product demonstration. The bubble curtain device will be constructed from ½-inch PEX tubing and rope. The designated location for the micropile will be constructed from ½-inch pipe, 2-inch pipe, a 3-inch to 2-inch reducer bushing, and corrugated plastic sheeting. The ½-inch pipe at the bottom of the micropile designated location will be painted orange. Companies must place the bubble curtain around the designated location.

Companies will receive 10 points for successfully placing the bubble curtain device around the designated location. Successfully placing the bubble curtain device is defined as the bubble curtain device no longer in contact with the ROV and completely surrounding the orange PVC pipe at the bottom of the designated location. Companies must place the bubble curtain prior to installing the micropile into the designated location. Once the micropile has been installed, companies may no longer receive points for placing the bubble curtain.

Companies must guide the micropile into the designated location. The micropile will be lowered from the surface by hand by company members at the side of the pool. The micropile cannot be carried down by the ROV, and the ROV may not touch the micropile until the installation is complete. The ROV's cameras can provide visual guidance for this task. Pilots observing the task through the ROV's cameras can provide verbal instructions to the company members at poolside to install the micropile into the designated location. For example, pilots may communicate to the poolside company members to move the micropile 20 cm to the right then lower it 50 cm. Pilots may also inform the poolside company member when micropile is successfully installed.

The micropile will be located on the surface, side of the pool at the start of the product demonstration. The micropile will be constructed from 1-inch PVC pipe with a rope connecting it to the surface. A pin will connect the rope to the 1-inch pipe. On the surface, companies will have a 3.1 meter length of ½-inch PVC pipe with a tee at the end. The rope from the micropile will pass through the tee; the 3.1 meter length of pipe will allow companies to extend their reach 3 meters out over the water. The designated location will be within 2 meters of the side of the pool. The designated location may be obscured from surface view by waves (World Championship offshore engineering basin) or by corrugated plastic (EXPLORER class regionals).

Companies will receive 10 points when they successfully guide the micropile into the designated location. Successfully guiding the micropile to the designated location is defined as the micropile inside the 2-inch pipe of the designated location. The ROV may not touch, push or contact the micropile prior to pulling the pin to release the micropile. The micropile must be lowered from the surface by hand, with the pilot using the view from the ROV's camera to provide visual guidance and instructions the companies members guiding the micropile. Companies will be penalized five points each time their ROV touches the micropile prior to installation, up to two times (10 penalty points) total.

Once the micropile has been successfully guided into place and installed, companies must pull the pin to release the micropile. The pin will extend through two 3/16-inch holes drilled in the 2-inch pipe and through a loop in the rope. Companies may insert the pin before lowering it down from the surface, setting it to any location they prefer. Note that, however, if the micropile becomes detached from the rope prior to installation, companies will not be able to recover it. Once guided and installed into the designated location, companies may touch the micropile while attempting to pull the pin.

Companies will receive 10 points for successfully pulling the pin to release the micropile. Successfully pulling the pin to release the micropile is defined as the pin no longer in contact with the 2-inch pipe and the rope holding the micropile removed from the water. The pin is considered debris.

The micropile must remain installed for the entire product demonstration run. If the micropile is removed from the designated location at any time during the product demonstration run,

companies will lose their points for guiding it to the designated location. If the rope is still attached to the micropile, companies may attempt to reinstall the micropile to regain those points. If the rope is no longer in place, companies may no longer complete this portion of the task.

Task 3.2 Powering an oil platform from a wind turbine

At the World Championship, Task 3.2 powering an oil platform from a wind turbine will take place in the Offshore Engineering Basin Tank.

Companies must connect the oil platform to the power from the offshore wind farm. The oil platform will consist of only the power connection port; the wind farm will consist of only a subsea platform and power connector. Neither the oil platform nor the wind farm will have surface components; no ropes or lines will connect these subsurface assets to the surface. The oil platform power connector port will be constructed from 1 ½-inch PVC pipe and a ½-inch PVC framework. The wind farm power connector will be constructed from ½-inch PVC pipe with a screw hook as a carrying mechanism for the power connector. The platform will be constructed from ½-inch PVC pipe and corrugated plastic sheeting. Four meters of wire cable will connect the platform to the power connector.

Companies must retrieve the power connector from the wind farm subsea platform. Companies will receive 5 points when they successfully retrieve the power connector from the wind farm subsea platform. Successfully retrieving the power connector is defined as the connector in control of the ROV and no longer touching the platform or bottom of the pool. If the connector is dropped by the ROV at a later time, companies will not lose their points for retrieving the connector but may need to recover it to complete the remaining product demonstration tasks.

Companies must lay the power connector cable through a waypoint attached to the micropile. The waypoint will be constructed from ½-inch PVC pipe and will be located approximately 40 cm away from the micropile. Two lengths of ½-inch PVC will protrude vertically from the waypoint, companies must lay the power cable between those two lengths of pipe.

Companies will receive 10 points when they successfully lay the power connector cable through the waypoint. Successfully laying the power cable through the waypoint is defined as the wire cable of the power connector on the pool bottom and inside of the two vertical PVC lengths. The power connector cable must stay inside the waypoint for the entire product demonstration run. If the cable is removed from the waypoint at any time during the product demonstration run, companies will lose points for laying the cable through the waypoint. Companies may attempt to re-lay the cable into the waypoint to regain those points.

Companies must also remove the cover from the oil platform port. Companies may remove the cover from the oil platform port before or after they pick up the power connector. The oil platform port will be constructed from 1 ½-inch PVC pipe. The cover of the port will be constructed from a 3-inch PVC end cap. A rope will act as a carrying mechanism for the cover.

Companies will receive 5 points when they successfully remove the cover from the oil platform port. Successfully removing the cover is defined as the cover under control of the ROV and no longer in contact with the connection port. The cover is considered debris; companies must return the cover to the surface or it must be under control of their ROV at the end of the product demonstration run.

Once the power connector has been retrieved and the cover has been removed from the oil platform port, companies must install the power connector into the connection port. The end of the connector will be covered by Velcro hooks. The inside of the port will be covered by Velcro loops.

Companies will receive 10 points when the connector is successfully installed into the port. Successfully installing the connector is defined as the connector no longer in contact with the ROV, the connector inserted into the 1 ½-inch port, and the connector making a Velcro-to-Velcro stick. Once installed, the power connector must remain installed for the entire product demonstration run. If the connector becomes disconnected, companies will lose their points for installing the connector. Companies may attempt to reinstall the power connector to regain those points.

TASK 4: *MATE Floats Under the Ice*

MATE Floats! 2026 is inspired by the National Science Foundation (NSF)-funded GO-BGC Project. The goal of GO-BGC is to build a global network of profiling floats with chemical and biological sensors to monitor circulation, chemistry, biology, and overall ocean health. Scientists, engineers, and technicians are using NSF grant funds to build and deploy 500 robotic ocean-monitoring floats around the globe. GO-BGC hit the 300 mark, with 325 out of the targeted 500 GO-BGC floats deployed or en route to be deployed from research vessels.

Given the location of the 2026 MATE World Championship, this year's *MATE Floats!* mission scenario takes place UNDER the ice. For regional competitions, this translates to a simulated under-ice task; for companies competing at the World Championship, this means operating under an ice sheet grown in the National Research Council's (NRC) ice tank. At 90 meters long, 12 meters wide, and 3 meters deep, the NRC's ice tank is one of the largest facilities of its kind in the world. With temperatures ranging down to -25 °C , this indoor, refrigerated facility simulates realistic Arctic and northern marine conditions and has the ability to grow ice at 2.5 millimeters an hour.

Operating floats in polar waters where they may encounter ice is a real-world challenge faced by GO-BGC float technicians. Sensors and antennas, not to mention the float itself, run the risk of being damaged if the float attempts to surface with an ice sheet overhead. There is also the possibility of floats becoming entrained in sea ice and crushed. Therefore, floats deployed in polar waters must be engineered with ice-avoidance capabilities and with the ability to store data during under-ice profiles and delay transmission until the float is clear to surface in open water. "Ice-avoidance capabilities" translates to sensors measuring water temperature and chemistry to

assess if ice is detected as the float ascends to the surface, along with the decision-making capability (i.e., an ice-avoidance algorithm) to reverse course and descend rather than continuing to surface.

Simulating this within the context of a MATE ROV Competition mission task presents some challenges, especially without the ability to replicate the precise real-world conditions – even in an ice tank – that would allow a float with ice-avoidance capabilities to detect ice and reverse course

So, instead of ascending to the surface and transmitting data to the mission station, companies participating in the 2026 MATE ROV Competition are challenged to design and build a float that ascends to a specific depth below the surface and holds that position for a defined period of time before initiating another descend to depth. Only after the float is recovered is it tasked with transmitting its data to the mission station.

This task involves the following steps:

Task 4.1 Design and construct an operational vertical profiling float

- **Prior to the competition, design and construct a vertical profiling float – 5 points**
- **Float communicates with the station prior to descending – 5 points**
- **Float completes two vertical profiles under the ice**
    - **Vertical profile 1**
        - **Float completes first vertical profile using a buoyancy engine – 10 points**
        - **Float maintains a depth of 2.5 meters for 30 seconds – 5 points**
        - **Float maintains a depth of 40 cm for 30 seconds – 5 points**
            - **Float breaks the surface or contacts the ice sheet – 5 point penalty**
    - **Vertical profile 2**
        - **Float completes second vertical profile using a buoyancy engine – 10 points**
        - **Float maintains a depth of 2.5 meters for 30 seconds – 5 points**
        - **Float maintains a depth of 40 cm for 30 seconds – 5 points**
            - **Float breaks the surface or contacts the ice sheet – 5 point penalty**
- **After recovery, float communicates with (transmits data autonomously to) the station**
    - **Float communicates data to the mission station – up to 10 points**
        - **Float communicates all data packets – 10 points**
        - **Float communicates at least one data packet – 5 points**
    - **Profile is graphed as depth over time – 10 points**

OR

- **Company does not design and construct a vertical profiling float, or float does not communicate data to the mission station after recovery**

- **Data provided by MATE is used to graph depth over time – 10 points**

Total points = 70 points

Product Demonstration Notes:
At the World Championship competition, Task 4.1 MATE Floats Under the Ice, will take place in the Ice Tank.

Prior to the competition, companies must build a float capable of completing a vertical profile (i.e., traveling from the surface to a depth of 2.5 meters, maintaining depth for 30 seconds, ascending to a depth of 40 cm and holding at that depth for 30 seconds) and collecting and transmitting data to the mission station.

Companies must design their float with a buoyancy engine. A buoyancy engine moves fluid from inside the float to outside the float, displacing seawater and changing the density of the float. Using motors to move air or liquid does constitute a buoyancy engine. Using motors as thrusters to directly move the float, by turning a propeller or emitting a jet of water, is not a buoyancy engine. The float must also be capable of communicating data to a receiving device (i.e., the receiver) located at the surface at the mission station. The company is responsible for designing and constructing both the transmitter on the float and the receiver that displays the data at the mission station.

Companies must submit a non-ROV device document outlining their float design, detailing its operation, and demonstrating that it does not violate any safety rules. This document must also detail the onboard battery design, fuse size for safe discharge of the current, and how the float communicates with the company's receiver at the mission station. See DOC-004 for more details. This non-ROV device document must be submitted in advance of the competition. Companies will receive 5 points for designing and building a float. Successfully designing and building a float is defined as submitting a non-ROV device document that meets the requirements of DOC-004, i.e., the float has a buoyancy engine to move the float vertically in the water column and transporting the float to the product demonstration station.

Companies competing at an EXPLORER class regional may or not be required to submit float documentation. Contact your regional coordinator or visit your regional contest's website to determine if you must submit your float design document prior to the competition. IF REQUIRED BY THE REGIONAL COMPETITION, COMPANIES MUST SUBMIT FLOAT DOCUMENTATION OR THEY WILL NOT BE RECEIVE POINTS FOR DESIGING AND BUILDING THE FLOAT.

Companies may hand-launch the float at the side of the pool. Once deployed, the float must communicate with the mission station to receive points for communication. Deploying the float is defined as the float no longer in contact with any station personnel and floating on the surface. Once the float has been deployed, it must communicate to the receiver located on the surface at the shore station. Companies are responsible for constructing both the transmitter on the float and the receiver at the shore station.

The float must communicate (i.e., transmit) the following information to the mission station, referred to as the defined data packet:

- Company number (provided by MATE a few weeks prior to the competition)
- Time data (UTC or local or float time [float time would be time since float starts recording])
- Pressure data and/or depth data
- Any additional data as required by the company to complete this task

Pressure data must be displayed in pascals (pa) or kilopascals (kpa).
Depth data must be displayed in meters (m) or centimeters (cm).

Pressure/depth data must correlate to a set time transmitted from the float. For example, a defined data packet from EXPLORER 01 could be:

EX01 1:51:42 UTC 9.8 kpa 1.00 meters

NOTE: MATE is requiring WHAT data is transmitted (i.e., company number, time, pressure/depth). Companies must determine HOW to transmit that data and should consider that there will be other companies transmitting data at same time.

Companies will receive 5 points when their float is deployed into the water and successfully transmits the defined data packet to the receiver at the mission station upon deployment. Successfully transmitting the information is defined as the station judge seeing at least ONE defined data packet from the float on a screen or display at the mission station. The float only needs to transmit ONE defined data package prior to descending, but companies will not be penalized for sending additional defined data packets. The receiver should not receive transmissions from any source other than the float. The float must transmit the defined data packet before starting its first vertical profile. If the float does not transmit and has not started its first vertical profile, companies may recover the float and attempt repairs. If the float descends before transmitting, companies can continue with the remaining float tasks but will not receive points for transmitting before the first vertical profile.

The float should attempt to complete two vertical profiles.

The float will be considered to be under the ice. For teams at a regional competition, ice will be assumed to be on the surface. At the World Championship, this task will be conducted in the NRC's tank with an ice sheet between 1 cm and 5 cm thick at the surface. Companies will hand-launch their floats through a 1 meter x 1 meter hole cut into the ice sheet. The water in the tank will be comprised of an EGADS (ethylene glycol, aliphatic detergent, and sugar) solution. The EGADS water solution has a specific gravity of approximately 1.025 but can vary slightly. Companies should consider bringing warm clothing, especially gloves that may become wet when deploying the float, for working in the cold environment and water of the ice tank.

A vertical profile under the ice is defined as the float on the surface and descending to and maintaining a depth of 2.5 meters (+/- 33 cm) for 30 seconds. After maintaining depth at 2.5

meters, the float must ascend to a depth of 40 centimeters (+/- 33 cm) but should not break the surface or contact the ice. The float must maintain a depth at 40 cm for 30 seconds. A float that breaks the surface at any time after descending, or contacts the ice sheet, will be penalized 5 points on that vertical profile.

Companies will receive 10 points for successfully completing their first vertical profile. Successfully completing a vertical profile is defined as the float descending to 2.5 meters (+/- 33 cm) then ascending to 40 cm (+/- 33 cm) using a buoyancy engine. For example, a float that descends to the bottom of the pool, then ascends to the surface would be considered to have completed a vertical profile. In this example the float did descend to 2.5 meters (and went beyond that), and then ascended to 40 cm (and went beyond that as well) This float would not receive points for maintaining depth at either 2.5 meters or 40 cm and would also be penalized for breaking the surface / contacting the ice sheet, but the float would be considered to have completed a vertical profile.

During the vertical profile, the float must maintain a depth of 2.5 meters for 30 seconds. Companies will receive 5 points for successfully maintaining a depth of 2.5 meters for 30 seconds. This is defined as the bottom of the float at 2.5 meters of depth (+/- 33 cm) for 30 seconds. The bottom of the float should be used for calculating this depth, i.e., the bottom of the float should be at 2.5 meters (+/- 33 cm). After recovery and transmission, the data packets should show seven (7) sequential data packets where the depth is 2.27 meters to 2.83 meters. Companies must display all data packets on a screen for the station judge; the company should point out the seven sequential data packets at the proper depth. If the float drifts outside of this range at any time during the 30 seconds, the float must return to the designated range for an entirely new 30 second period. For example, if the float maintains depth at 2.76 meters for 20 seconds but then descends to 2.91 meters (outside of the given range), the float must ascend back into the range for an entire 30 seconds, not just the remaining 10 seconds from the first attempt at maintaining of depth. If the float's depth/pressure sensor is not at the bottom of the float, communicate the offset to the station judge. For example, if the float's depth/pressure sensor is 25 cm above the bottom of the float, when the bottom of the float is at 2.5 meters, the pressure sensor would be at 2.25 meters. Thus, the proper range for the depth/pressure sensor would be 2.58 meters to 1.92 meters. Communicate that adjusted range to the judge prior to deployment.

After maintaining a depth of 2.5 meters, the float should ascend to 40 cm (+/- 33 cm), just beneath the surface of the ice sheet. Companies will receive 5 points for successfully maintaining a depth of 40 cm for 30 seconds. This is defined as the top of the float at 40 cm of depth (+/- 33 cm) for 30 seconds. The top of the float should be used for calculating this depth, i.e. the top of the float should be at 40 cm (+/- 33 cm). After recovery and transmission, the data packets should show seven (7) sequential data packets where the depth is 0.07 meters to 0.73 meters. Companies must display all data packets on a screen for the station judge; the company should point out the seven sequential data packets at the proper depth. If the float drifts outside of this range at any time during the 30 seconds, the float must return to the designated range for an entirely new 30 second period. For example, if the float maintains a depth at 52 cm for 20 seconds but then descends to 75 cm (outside the given range), the float must ascend back into range for an entire 30 seconds, not

just the remaining 10 seconds from the first maintaining of depth. If the float's depth/pressure sensor is not at the top of the float, communicate the offset to the station judge. Communicate that adjusted range to the judge prior to deployment.

As noted, if at any time during a vertical profile the float breaks the surface or contacts the ice sheet, companies will be penalized 5 points for that vertical profile.

Companies must show the station judge data packets confirming the proper depth range. There must be seven sequential data packets spanning 30 seconds (0, 5, 10, 15, 20, 25 and 30) for each depth. If the float is not recovered, or if the float does not transmit data packets to the receiver, companies will not be awarded points for maintaining depth.

The float should then attempt to complete a second vertical profile. Companies will receive 10 points for successfully completing a second vertical profile using a buoyancy engine. Successfully completing a vertical profile is defined as the float descending to 2.5 meters (+/- 33 cm) then ascending to 40 cm (+/- 33 cm).

During the second vertical profile, companies will receive 5 points for successfully maintaining a depth of 2.5 meters for 30 seconds. This is defined as the bottom of the float at 2.5 meters of depth (+/- 33 cm) for 30 seconds. Data packets should show seven (7) sequential data packets where the depth is 2.27 meters to 2.83 meters, offset for the position of the sensor. Companies should indicate to the station judge the seven data packets at the proper depth for the second vertical profile.

Companies will receive 5 points for successfully maintaining a depth of 40 cm for 30 seconds. This is defined as the top of the float at 40 cm of depth (+/- 33 cm) for 30 seconds. When the float is recovered to the surface and data packets received, the data packets should show seven (7) sequential data packets where the depth is 0.07 meters to 0.73 meters, offset for the position of the sensor. Companies should indicate to the station judge the seven data packets at the proper depth for the second vertical profile

After successfully completing the second vertical profile, the in-water portion of the float task is complete. The float can be recovered. Recovery is defined as the float being returned to the surface, side of the pool. At regional competitions, the company's ROV should recover the float to the surface, side of the pool. At the World Championship, an ROV piloted by MATE staff will recover the float to the surface side of the pool. In the ice tank at the World Championship, companies should inform the station judge that they are ready to recover their vehicle. The station judge will stop their mission time and allow the MATE ROV to recover their float.

If a penalty occurs, or if the float does not maintain the proper depth for 30 seconds, companies will not receive full points for that vertical profile. It is up to the company to decide when they are ready to recover the float and therefore when the in-water portion of the float task is complete.

If upon recovery and transmission it is discovered that the float did not maintain the proper depth, companies will not receive points for that portion of the task. Companies are not permitted to return their float to the water to attempt to complete additional profiles. If prior to recovery the company believes their float may not have maintained depth, or if the company knows their float contacted the ice or breached the surface, companies may have the float complete additional vertical profiles in an attempt to increase their score. If the float completes an additional vertical profile that would receive a higher score, companies may use that score instead of the penalized profile score.

Companies may not mix and match portions of a vertical profile, the entire vertical profile must be considered. For example, if during the first vertical profile, the float does not maintain depth at 2.5 meters but does maintain depth at 40 cm (and does not break the surface), companies would receive 15 points for that vertical profile. If during a subsequent profile (beyond the two profiles required), the float maintains depth at 2.5 meters, maintains depth at 40 cm, but breaks the surface, companies would still only receive 15 points for that vertical profile; companies are not permitted to pair not breaking the surface in the first profile with maintaining the proper depth in the subsequent profile.

Companies are permitted to include visual cues (e.g., colored LEDs or other devices) that can be detected from the surface to signify a successful profile. For example, a company could have a blue LED signal when their float is within the 2.5 meter range, and a green LED signal for when their float is within the 0.4 meter range. A company member on the surface could track the timing of these visual cues in order to determine if the float needs to continue profiling or whether it can be recovered. Visual cues are optional and will not influence scoring but may help the company to determine when to recover their float.

Once recovered onto the pool deck, the float should communicate data by transmitting data packets wirelessly to the receiver. Companies will receive 10 points when the float successfully communicates all of its data packets to the shore station. Successfully communicating all data packets is defined as showing the station judge one data packet from every 5 seconds of both vertical profiles. If the float does not communicate all data packets but successfully communicates at least one data packet from the vertical profiles, the company will receive 5 points. Successfully communicating at least one data packet, but not all data packets, is defined as at least one data packet from the vertical profiles being shown to the station judge. This data packet must be from after the float descends; it cannot be a data packet from before the float began vertical profiles.

Companies will use the data packets received from the float to graph depth over time. Companies will receive 10 points for successfully graphing depth over time. Successfully graphing depth over time is defined as showing the station judge a graph with time on the X axis and depth on the Y axis. Companies must graph the data received from their vertical profiles, and there must be at least 20 data packets included on the graph. If the float did not collect and transmit 20 data packets, the company will not be able to graph its data and may instead elect to graph the data provided by

MATE. Companies must use a computer or device to graph the data; companies may not draw a graph by hand. Data points may be entered (or cut and pasted) to a device by hand.

At a regional competition, recovery of the float and data transmission, as well as graphing of that data must occur within the 15-minute product demonstration time. At the World Championship, companies will have 15 minutes for the task, but the time will stop for the MATE ROV to recover their float. Once the float is recovered and in possession of a member of the company, the station judge will restart the product demonstration time and the company will have the remaining time to receive communication from the float and graph the data. Data transmission and graphing may happen at a data station away from mission station. If that is the case, time will not restart until the company arrives at the data station.

Data will be available from MATE if the company does not build a float or if the float fails to communicate after it is recovered from the water. Likewise, if the float does not communicate at least 20 data packets from the profile, data will be available from MATE. Graphing MATE data replaces graphing profile data AND the float communicating all data packets to the shore station. Companies that graph MATE data may still earn points for completing vertical profiles and transmitting at least one data packet.

Companies that choose to use MATE data should inform the station judge that they require this data. The judge will then provide a set of time and depth data to the company. Once a company requests data from MATE, they can no longer receive points for communicating all data packets to the station or for graphing data from their own float.

Companies will receive 10 points for successfully graphing depth over time. Successfully graphing depth over time is defined as showing the station judge a graph with time on the X axis and depth on the Y axis. Companies must use a computer or device to graph the data; companies may not draw a graph by hand. Data points may be entered (or cut and pasted) to a device by hand.

*Regional competitions may take place in pools that are shallower than 2.5 meters +/- 33 cm. If that is the case, contact your regional coordinator or visit your regional contest's website to determine what depth the float should maintain depth at and what depth you must reach before you start your ascent for collecting sensor data.

Float Specifications:
The float must be less than 1 meter in overall height.
The float must be less than 18 cm in diameter/length/width.
The float may not have an airline to the surface or a rope/line to the surface or the bottom.
The entire float must be less than 1 meter in length, including an antenna for broadcasting data.
The float must be less than 1 meter in length for the entire mission, it cannot have multiple compartments that separate, nor may it raise or lower any objects beyond the 1-meter limit.

New for 2026!!!

Companies are **REQUIRED** to incorporate a feature to aid recovery of their floats by the MATE Competition ROV under the ice. Potential examples include a loop of rope or wire, a U-bolt (#310 U-bolt or one of larger diameter), or any other means that is at least 5 cm in width, protrudes 5 cm from the float, and by which the MATE ROV can grasp and return the float to the surface.

The feature must be easily accessible and can protrude beyond the 18 cm maximum diameter of the float. MATE recommends incorporating redundant features to help ensure a quick and easy recovery; the more quickly and easily the float is to recover, the more time a company will have to evaluate the data.

The float must operate independently; it cannot be connected to the shore by a tether, and the ROV cannot interact with the float other than during recovery.

Any air used on the float must be stored on the float. Floats may not have an airline to the surface. All electrical power to the float MUST go through a single fuse. The float will operate as a non-ROV device (see 3.3.1 Non-ROV Device Power Specifications for additional rules on powering a non-ROV device). Small button batteries are allowed to power timing devices on the float. All other batteries must adhere to the non-ROV device battery rules.

New for 2026!!!

PREVIEW OF THE COLLABORATIVE BONUS MISSION @ THE WORLD CHAMPIONSHIP

This is the FIRST time in history that the MATE ROV Competition is challenging companies to tackle a task – collaborative bonus or otherwise! – staged in SALTWATER *and* involving SONAR (the real thing, not simulated!). This is made possible because of the unique facilities of our host institution, the Marine Institute of Memorial University, and the generous support of Cerulean Sonar, manufacturer of the Omniscan 450 FS Imaging Sonar.

Omniscan 450FS - Cerulean Sonar

Companies will have the opportunity to integrate and test the sonar as part of their check-in and safety and workmanship inspection. And on Saturday, June 26, the MATE ROV Competition will transport competitors to The Launch where they will be challenged to operate in SALTWATER.

Details on the collaborative bonus mission will be provided once companies submit their documentation (see SUBMISSION GUIDELINES AND KEY DEADLINES). What follows are the

technical specifications for preparing your vehicle to integrate the sonar both mechanically and electrically.

NOTE for 2026!!!
Companies do not need to purchase this sonar; Cerulean Sonar will be providing this sonar to all companies at the MATE ROV Competition to integrate into their vehicles and use for the bonus mission on site in St. John's.

Specifications
The Omniscan 450 FS Imaging Sonar will be:

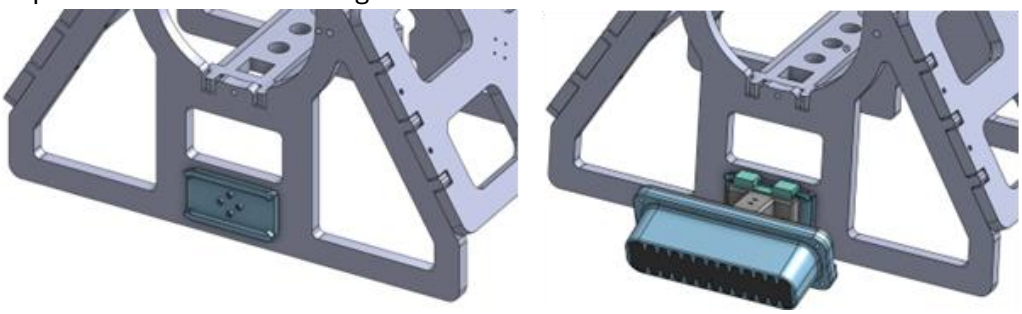
- Neutrally buoyant in seawater*.
- Independently powered from the surface; companies do not need to incorporate power links into their ROV.

*The Omniscan sonar is approximately 60 g positively buoyant. Prior to the collaborative bonus mission, weight will be added to the sonar to achieve near neutral buoyancy.

Companies will be required to attach the sonar to their ROV. The dimensions of the sonar can be found here: CAD Drawing of Omniscan sonar; companies should have room on the front of their ROV to attach this device. The sonar comes with a quick release mount. Companies will need to install a quick release plate to their ROV; the mount on the sonar can quickly connect to this release plate.

- Quick Release Plate Only (Amazon US): https://a.co/d/2zXv5pB
- Quick Release Plate and Mount(Amazon US): https://a.co/d/5krr
- 3D Model of the Plate for modification and 3D printing: STEP File STL File

Note that only the quick release plate is needed on the ROV, the mount is included on the provided Cerulean sonar. Companies may wish to purchase the quick release plate with the mount to practice and test attaching the sonar to their vehicle.



CAD image of the mounting plate (left) and sonar (right) installed on an ROV frame.

Prior to the collaborative bonus mission, companies will have approximately 20 minutes to integrate the sonar into their vehicle. This will include mounting the sonar to their vehicle and securing its tether cable to the ROV tether (MATE will provide cable ties to all companies in the collaborative bonus mission staging area). After completing the bonus mission, companies will have approximately 10 minutes to remove the sonar from their vehicle and detach its tether cable.

The sonar will connect to a laptop or other device on the surface via an Ethernet port. Companies must provide a computer or other device with this port that can receive the sonar signal. Companies should download SonarView onto their device prior to the World Championship. An overview of the system and SonarView installation directions can be found here: Cerulean website. Companies can familiarize themselves with SonarView by downloading a few example logs and the view from this website.

NOTE for 2026!!!
Companies must arrive on site with SonarView installed on their system. MATE will not provide additional time to download and install the necessary.

Questions concerning the specifications and integration of the Cerulean sonar system will be answered on the MATE ROV Competition Forum Board. Questions regarding the bonus collaborative mission itself will not be answered until that mission document has been provided to companies.

PRODUCT DEMONSTRATION RESOURCES

Product Demonstration resources can be found on the Competition Class page.
These resources include:

- Videos showing the successful and unsuccessful flying of the transect and maintaining position over the coral garden.
- European Green crab, native Rock crab, and native Jonah crab species images.
- Crab counting sample practice examples.
- Link to the 2026 MATE ROV Competition – Invasive Species Reporting Form.
- Offshore oil platform map in color and in black and white.
- The oil platform information table.
- Iceberg track practice examples.
- eDNA sensor frequency seen practice examples.
- MATE Floats data practice examples.

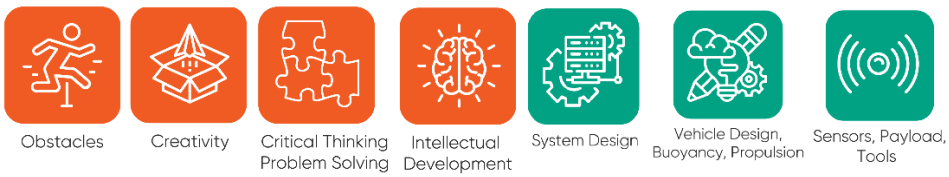
PRODUCT DEMONSTRATION RESPONSIBILITIES

Companies are responsible for designing, building, and bringing their own operational vertical profiling float. Companies must also design and bring any tools or devices to complete the required MATE product demonstration tasks.

Companies are permitted to create a basket to collect multiple product demonstration items. Any collection basket MUST be included in weight measurements. A collection basket is considered debris if still in the pool and not under control of the ROV when product demonstration time ends. Any collection basket must be deployed and returned by the ROV; it may not be pulled to the surface by hand or a surface device.

The MATE ROV Competition will provide all of the remaining product demonstration items.

PRODUCT DEMONSTRATION PROP BUILDING INSTRUCTIONS & PHOTOS



The Product Demonstration Prop Building Instructions & Photos will be released separate from the competition manual.