



BUILD CONTEST

Preliminary Design Review Q&A Responses

Ocean Observing Prize Administration Team

Updated: December 13, 2021

Safety

- Because each vehicle is unique, the prize administration will not require a universal kill switch design, kill switch location, lift point load rating, or lift plan. However, these are critical design decisions for facilitating the practical, safe recovery of a vehicle in off-nominal situations.
 - To ensure the safety of support staff, all teams will be required to submit a safety plan for deployment at Carderock, due on the date of the team's final TDR.
 - A template for this safety plan will be provided no later than two months in advance of the TDR and will likely include, but will not be limited to, risk assessment and identification of potential failure modes, kill switch wiring, emergency operations, pinch points and other information at the discretion of the prize administration team.
 - Teams should think through worst case deployment, kill, recovery scenarios and explain how support staff could activate the kill switch and rig up lifting straps to recover a vehicle in the midst of wave action, from a boat or as a diver in the water.
- Safety Data Sheets for any chemicals that will be brought into MASK need to be submitted to OceanObserving@nrel.gov - this includes oil contained in vehicle, lubricants for connectors, solvents, etc.

Kill Switch

- The vehicle kill switch should kill power to all propulsion on the vehicle and should not rely on software.
- The kill switch should also be well located and easily accessible by a diver or boat operator such that risk of pinch points or other bodily harm is minimized, and ease of successfully depressing the kill switch in an emergency is maximized.
- Teams are encouraged to submit their kill switch design to OceanObserving@nrel.gov for approval if there is any doubt about whether the design is acceptable.

Lift Points

- Requirement 8 listed in the [System Requirements: Physical Characteristics and Principal Dimensions table in the Official Rules Document](#) states *"The assembled system must be safe and stable while lifted during deployment and recovery and have at least one hard lift point that is easily accessible, or as many as needed to ensure stable orientation while lifted. If the design uses two separate bodies, each body may be lifted separately or together."*
- Hand-carry transport and deployments are not acceptable at Carderock due to OSHA safe lifting limits and due to the height and angles that would be required to lift a vehicle into the MASK basin. OSHA and Carderock limit each person to lift a maximum of 50 lbs.
- Beach launching is not possible due to the construction of the tank - the MASK basin "beach" is blocked by the sides of the tank.
- All teams are required to have a hard lift/tag point that will allow a boat operator to hook the vehicle with a boat hook when coming alongside to assist with vehicle recovery. Please be sure there is adequate clearance for a boat hook or carabiner to fit through the hard point.
- Lifting straps: If teams choose to bring their own straps, they must provide Carderock with hoisting strap and hardware certifications. If teams choose to use Carderock's hoisting gear, they must provide a detailed, comprehensive list of strap and hardware requirements.

Carderock Testing

- Can you clarify the beam length requirement?
 - [This question is answered in the HeroX FAQ.](#)
- When the vehicle is in the tank, are there any people around it?
 - [This question is answered in the FAQ.](#)
- Can you tell us more about the lighting in the MASK facility?
 - The MASK is a dark environment illuminated by several 1000 Watt Metal Halide overhead lamps, which are about 60 ft above the water surface.
 - Recent recordings of light were recorded per a team's request and the highest reading in the MASK was 19 LUX, with the average around 10 LUX. These readings were taken with an Android phone app at three different locations along the basin just above the water surface.
 - [A resource that was published with pictures of what the lighting looks like in the MASK facility](#) has been updated to include screenshots of the LUX readings at these three locations.
- Can you tell us more about the magnitude and direction of the waves during the test?
 - [Section 3.5.2. Wave Profiles of the Official Rules Document](#) contains information about magnitude and spectral content of the generated wave field. Direction is not specified, but the MASK layout in the [MASK Basin Dimensions and Safety Procedures Section of the Official Rules Document](#) shows the location of the paddles and the wavemaker limit plot. This plot is applicable across the full 90 degree range of direction. The direction of the wave field will be chosen by the Ocean Observing Prize Team to best allow testing of the specific functions of a device.
- How can we navigate without GPS?
 - [This question is answered in the FAQ.](#)
- Can we use remote control to satisfy the maneuvering requirements?
 - No, demonstrating vehicle maneuvering with remote control does NOT satisfy the maneuvering requirements.
 - Remote control is allowed to position the vehicle in the tank during initial deployment, reset between tests, and final recovery. The maneuvering test must be completed by the vehicle autonomously, without operator intervention.
- Is satellite blocked in Carderock?
 - Competitors are advised that communications signals (e.g., satellite-based, cellular, RF, etc.) originating from outside the MASK Basin cannot be guaranteed or expected to be received within the facility.
- If satellite is blocked, why do we need to demonstrate satellite communication at BUILD?
SATCOMs equipment and subscriptions are expensive.
 - The ability to communicate via satellite is required per the [Official Rules Document](#) of the BUILD competition. This capability will be important for open water deployments in the SPLASH competition.
 - Difficulties with cost have been noted. Stay tuned for details about support that may help with this expense.
- Are CTDs required for the BUILD test? Why?
 - Requirement 14 listed in the [System Requirements: System Requirements: Data Collection and Communications Requirements](#) table states "System must incorporate a commercially available CTD instrument that is able to sample at the rated depth of the

system. The CTD does not need to be a single instrument, but the conductivity, temperature, and depth must all be captured using commercially-available sensors, powered by wave energy.”

- The ability to measure conductivity, temperature, and depth is required per the rules of the BUILD Competition for the profiling body.
- These measurements may be taken with any commercial CTD unit or with independent sensors.
- Sensors do not need to be scientific-grade.
- For NOAA’s hurricane monitoring mission, it is essential to have the profiling capability to record CTD data at depths throughout the water column. Other industry partners also expressed interest in collecting data at depth.
- Are ADCPs required? Is the DPPM an ADCP?
 - The DPPM does not and will not function as an ADCP during the BUILD or SPLASH competitions.
 - Integration of an ADCP is not a requirement of the BUILD or SPLASH Competition.
 - The DPPM must be accommodated per the competition rules and is intended as a proxy for a third-party sensor integration. If competitors wish to use an ADCP, this must be a separate unit, as one will not be supplied.
 - If you want to learn more about ADCPs, check the manufacturer websites. Many ADCP manufacturers have a theory section published on their websites.
- What other profiling capabilities currently exist in industry?
 - There are many. An incomplete list includes towfish, drag sleds, fly kites, AUVs, gliders, CTDs, and ADCPs.
 - NOAA currently uses downward looking doppler for some oceanographic applications. NOAA glider fleet specifications are published and available.

Scoring

- Will teams receive results from the competition, including numerical scores and feedback?
 - Numerical scores will not be shared, but broad area feedback will be provided, including reviewer comments.

SPLASH Considerations

- Although SPLASH is a long way off, here are a few things to keep in mind during your design process:
 - A hard tow point will be required for SPLASH such that a boat operator can attach a tow line with a carabiner-type clip and tow the vehicle behind a boat
 - Communications antennas will need to be well above waterline for vehicles to have reliable surface communications
 - All vehicles will likely be required to have a bright 360° white light visible when the vehicle is at the surface. This light may strobe or remain solid - the intent is to increase visibility of partially submerged equipment in low-light conditions. Additional lighting may be required to comply with USCG regulations

- If your design includes lasers or acoustic devices aside from ADCPs or DVLs, this should be disclosed to Ocean Observing Prize Team as early as possible, as approval will be needed for NEPA permitting

Continued Support

- The Ocean Observing Prize team is working to provide all teams with more information on support we can offer. We appreciate everyone's patience as we work our way through the approvals process. **We do plan to update teams on or by January 19th, 2022.**
- Where can we find other sources of funding?
 - On Tuesday, December 7, the Water Power Technologies Office (WPTO) held a webinar to discuss for an overview of the [water power-focused topics/sub-topics](#) in the Fiscal Year (FY) 2022 Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs. These topics include:
 - Cost Saving Innovations for Water Conveyance Systems for Powering Non-Powered Dams
 - Innovative Hydropower Technologies for Low Head (Less Than 30-ft.)
 - Innovations Accelerating Pumped Storage Hydropower Deployment
 - Co-Development of Marine Energy Technologies with End User Partners.
 - In addition, there are three joint topics:
 - Technology Solutions for Advancing Ocean Co-Existence and Co-Use with Marine Energy and Communities
 - Development of Cost Effective Subsea Wet-Mateable Connector Technologies
 - Community-Driven Solutions for a Just and Equitable Energy Transition.
 - For additional details, see the U.S. Department of Energy's (DOE) [FY22 SBIR/STTR Phase I Release 2 Topics](#), which were issued on November 8, 2021.
 - During the webinar, hear highlights on each WPTO sub-topic before the Funding Opportunity Announcement is released on December 13. No specific technologies or projects will be discussed but questions regarding the sub-topics are welcome.
 - [The SBIR and STTR Programs](#) offer competitively awarded grants to small businesses to support scientific excellence and technological innovation. The core objectives of the SBIR/STTR Programs are:
 - Increasing private-sector commercialization of technology developed through federally supported research and development.
 - Stimulating technological innovation in the private sector.
 - Encouraging participation by women-owned and minority-owned small businesses.
 - Improving the return on investment from federally funded research for economic and social benefits to the nation.
 - WPTO, as part of DOE's Office of Energy Efficiency and Renewable Energy (EERE), provides annual funding to competitively selected small businesses whose missions align with the office's priorities of advancing marine energy and next-generation hydropower and pumped storage systems for a flexible, reliable grid. For more information on EERE's SBIR and STTR Programs, visit the [EERE website](#).
 - State level funding, non-profit organizations, and crowd funding are a few other ideas for funding sources beyond the federal government.
 - Connect with Blue Power Connectors for more suggestions and advice

Contact Information

- For the most expedient response from Ocean Observing Prize team, please submit all questions to OceanObserving@nrel.gov. If you wish to reach out to a specific Ocean Observing Prize team member directly, please be sure to Cc the OceanObserving@nrel.gov email address in all correspondence.