

Rules and Requirements

2018 Maritime RobotX Challenge

www.RobotX.org

1. Introduction

This document presents the rules and safety requirements for the 2018 Maritime RobotX Challenge, which will be conducted 08 – 15 December 2018 at Sand Island on Oahu, Hawaii. The primary location is the Honolulu Community College's Marine Education Training Center (METC).

The official competition website is www.RobotX.org. The 2018 documents posted at the official competition website are the official documents for the 2018 competition. All documents referenced here and in other RobotX documents are available at the official competition website. These documents are updated regularly. It is the Teams' responsibility to check the website for the most recent revisions.

The term Autonomous Maritime System (AMS) will be used throughout this document to refer to the entire maritime system, including the WAM-V and any off-board systems deployed from the surface platform.

2. Team Eligibility and Requirements

2.1. Eligibility

- Student teams from anywhere in the world are eligible to participate.
- Interested teams should apply using the [2018 RobotX Registration Form](#) found at www.robotx.org. Based on the competition venue space, the number of teams may be limited.

2.2. Industry and Student Participation

- Teams may comprise a combination of students, faculty, industrial partners, or government partners.
 - Students may be high school, undergraduate and/or graduate students. Interdisciplinary teams are encouraged.
 - Multiple educational institutions may join together to form a single team.
 - Members from industry, government agencies, or universities (in the case of faculty) may participate.
- All teams must have a member from industry.
 - The industry team member may provide any combination of technical support, financial support, resource, or facility support.
 - Former students and team members who have graduated and joined industry are encouraged to continue as team members and would fulfill the above requirements.

3. Platform Requirements

3.1. Surface Craft Requirements

1. All teams are required to use the WAM-V surface craft manufactured by Marine Advanced Research (MAR) (www.wam-v.com) as their primary competition boat.
2. All teams are **required to equip their WAM-V with buoyancy pods**. Examples of previously used pod designs are presented in the [RobotX Guide WAM-V Propulsion Examples](#) paper. Pods are also available directly from the WAM-V manufacturer.
3. Each surface craft must have at least two tow points, one set forward and one set aft. The tow points are needed to tow the AMS if it suffers a failure during course operations.
 - a. The towing points must be marked with bright orange lettering, indicating a "TOW" point.
4. Given the tropical location of Hawaii, the competition efforts will continue through a potential rain shower (light or heavy) and typical wind conditions. It is therefore recommended that teams design their systems with the local tropical weather in mind.

5. Teams are required to ensure that their design does not exceed the payload capacity of the WAM-V surface platform. Basic WAM-V specifications are available on the Maritime RobotX Challenge website. Teams are advised to address basic principles of naval architecture to include considerations of centers of buoyancy, centers of mass, and metacentric height when locating sensors and other equipment on the WAM-V.
6. It is **recommended** that the surface craft have shrouds to protect the propellers from damage in the shallow waters of the operating areas.

3.2. Off-board System Requirements

1. Off-board systems from the WAM-V must be recovered back to the WAM-V.
 - a. If an off-board platform is deployed to complete a task, it must be recovered prior to moving on to another task.
 - b. If the off-board platform is not recovered, then the run is considered finished.
 - c. This rule does not apply to the racquet balls delivered in the Detect and Deliver task.
2. Off-board systems must be tethered to the primary surface platform at all times.
 - a. The tether must be securely attached to both the USV and the off-board system.
 - b. The tether must be cable of withstanding the full weight of the off-board system out of the water.
3. Off-board systems to be used in water must be positively buoyant to assist in recovery.
4. **Propeller shrouds are required** for all Autonomous Underwater Vehicles (AUVs).
5. Unmanned Air Vehicles (UAVs) will not be permitted in the 2018 Maritime RobotX Challenge.

3.3. System Management and Monitoring Requirements

1. Each team's unmanned system must include an Operator Control Station (OCS) capable of controlling and monitoring the system.
 - a. The OCS must have the ability to start and stop autonomous operations.
 - b. The OCS must be able to operate safely aboard competition support boats, which will not have external power available.
 - c. Teams are required to connect to the Technical Director's Network via the hard-wired Ethernet link, to be provided in the team operations tent. Protocols for this communication are outlined in the [RobotX 2018 Communications Protocols](#) document.
 - d. Teams are responsible for providing robust and reliable communications between the OCS and AMS to attempt the competition tasks.
 - e. Teams must provide a display for judges showing the results for the tasks that require reporting. This display must comply with the display requirements documented in the [RobotX 2018 Task Descriptions](#).
 - f. All shore-based equipment used by the team during in-water runs must be contained to the team's designated operating tent and table.
2. Teams are required to implement a clearly visible indicator on the AMS showing operational status of the AMS. Specifications for a sample indicator are provided in the [RobotX 2018 Visual Feedback Specifications](#) document.
3. Teams are required to implement and provide a graphical display for use by judges as described in the [RobotX 2018 Task Descriptions](#) document.

4. Safety Requirements

1. Safe operations are a priority for the RobotX staff. All considerations to maintain safety for operators and the surrounding environment must be made. The following are the minimum requirements for all teams and their systems during the competition.
 - a. The AMS must comply with the kill switch requirements detailed in the [RobotX 2018 Kill Switch Specifications](#) document.
2. Before operating in the water, all unmanned systems must pass a safety inspection. This includes, but is not limited to:
 - a. A Safety Judge will complete a safety checklist, verifying successful operation of all safety features **at each unmanned system launch**.
 - b. During the safety inspection, teams will demonstrate compliance with all of the requirements above, to include identifying all actuators, and moving parts and their associated protection mechanisms (shrouds, etc.).
 - c. Verification of both kill switches' operation (remote and physical) will be repeated each time a team enters the water.
3. All Radio Frequency (RF) equipment must be operated within the rules and regulations of the host country. This includes, but is not limited to, frequency, transmitting power, antenna height, etc.
4. AMS power systems must follow the safety rules and regulations of the host country as well as the team's home country.
5. RobotX staff may suspend team operations at any time for safety considerations.
6. Teams must provide battery specifications, Material Safety Data Sheets (MSDS), and proper disposal procedures, all sourced directly from the battery manufacturer. These documents must be provided as part of the teams' Technical Submission Package, described in the [RobotX 2018 Task Descriptions](#) document.