2018 Maritime RobotX Challenge

Task Descriptions and Specifications, v1.0 *www.robotx.org*

Introduction

This document presents the detailed task descriptions and specifications 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).

RobotX Challenge Rules and Requirements are available on the official competition website. The official competition website is www.robotx.org. The 2018 documents posted on www.robotx.org are the official documents for the 2018 competition. All documents referenced here and in other RobotX documents are also available at the official competition website. These documents are updated regularly. Teams are responsible for checking the website for the most recent revisions.

The term **AMS** will be used through this document to mean the Autonomous Maritime System (AMS) and any ancillary (offboard) subsystems used to accomplish the tasks. It will be necessary for teams to develop a System of Systems (SoS) consisting of systems operating in multiple domains. All Teams must use the WAM-V surface vessel, but will also need the ability to sense and act underwater. This should be accomplished by incorporating an underwater vehicle into the system to act as an off-board sensor.

Goals

The purpose of the RobotX Challenge is to enhance the community of innovators capable of substantive contributions to the domain of autonomous, unmanned, multi-domain vehicles. This enhancement is achieved by providing a venue and mechanism whereby the practitioners of the autonomous vehicle community may form new connections and collaborations, increase their proficiency and inventiveness, and foster their passion for robotics and the maritime domain.

This competition is designed to foster student interest in autonomous robotic systems operating in the maritime domain, with an emphasis on the science and engineering of cooperative autonomy. In addition, the competition should facilitate the building of international relationships between students, academic institutions, and industry partners.

The Maritime RobotX Challenge is a capstone robotics competition which builds upon the successful implementation of other student robotics competitions such as RoboBoat and RoboSub. We encourage student teams to participate and learn from other competitions, and then apply those skills to the advanced challenges presented in the RobotX Challenge. RoboBoat and RoboSub are annual events that can serve as test beds for future RobotX Challenges

The inaugural RobotX Challenge was an autonomous surface vessel competition, however there will be a continually increasing emphasis on multi-domain and collaborative autonomy going forward.

Competition Structure

Overall Approach

The competition will be structured with several in-water and shore-based challenges. The shore-based challenges provide an opportunity for teams to present their work to the judges and explain their design philosophy. Details of these requirements are given in the RobotX Project Deliverables and Presentations section.

The in-water challenges provide opportunities to showcase the performance of the AMS by autonomously completing a range of tasks designed to represent real-world situations.

There will be multiple instances of each task element organized as sets of tasks, referred to as **Challenge Courses**. Teams will have time slots during which they may earn points towards qualifying for the Semi-final Round. Teams will rotate through the tasks on the Challenge Courses in a scheduled order.

Individual tasks, when clustered together, shall be referred to as **Competition Courses**. For the Semi-finals, at least one of the Challenge Courses will be converted to a Competition Course. On the Competition Courses the AMS must demonstrate the ability to collect and use data from previous individual tasks to complete other tasks. In other words, Teams can qualify and practice with the individual tasks leading up to the Semi-final, but to win, they have to bring it all together. During the Semi-final and Final rounds all Teams will compete on the same course layout.

Once a team has successfully demonstrated proficiency on a pre-defined number of the Challenge Course tasks, they will be qualified for the Semi-final round and become eligible to sign up for time slots on a **Competition Course**.

The practice/qualifying areas will be available throughout the competition on an assignment basis. This information will be presented to Teams during the on-site orientation. At least part of the Team must remain on site at the competition venue at all times during the challenge days to remain eligible for daily and final prizes.

Planned Sequence of Events

This section summarizes the main events of each day of the 2018 Maritime RobotX Challenge. A more detailed schedule will be provided later.

Competition Phases

There are three (3) phases to the 2018 Maritime RobotX Challenge:

- During Practice and Qualifying, Teams will be given time to assemble and test their unmanned systems, participate in initial safety inspections, practice, and qualify for Semi-finals in the water on the Challenge Courses.
- During the Semi-final Round, Teams will have the opportunity to advance to the Final Round by completing runs on the Competition Courses. Only teams that have qualified for the Semi-finals will have access to the Competition Courses.
- The Final Round will be held on Saturday, 15 December 2018.

Daily Events

Each day will start and end with a MANDATORY TEAM MEETING with the Technical Directors. At a minimum, TEAM CAPTAINS are required to attend. All participants are strongly encouraged to attend.

During the morning meetings, the plan of the day will be presented; Teams will have an opportunity to provide feedback and ask questions.

During the evening meetings, the TD will summarize the day's events and Teams will be encouraged to provide feedback. It is likely that at the evening meetings Teams can sign up for or trade time slots for the next day's in-water events. Daily course changes will be described at the evening meeting.

Judging and Scoring Guidance

Detailed task scoring breakdowns are in development. They will be provided in a separate document, *2018 Maritime RobotX Preliminary Scoring Guidance*, which will be updated independently of this document. Scores will be calculated by the Judges, and all decisions of the Judges are final.

Competition Location Information

Shore-based Areas

Competitor's Village

Each Team will be provided with a covered working area near the Marine Education Training Center (METC). This work area will have 120VAC, 60Hz power and a single hard-wired internet connection. Competitor's Village will be placed on a paved surface, making this a good area where teams may conduct development, maintenance, and repair of their systems.

Shore-side Team Areas

Teams will be provided with an area along the shoreline near the in-water course areas in which they will be able to set up their shore equipment. This space will consist of a tent-covered area (10 ft x 10 ft tent) with a table (6 ft long table), 120VAC, 60Hz power, and a hard-wired Ethernet connection to the TD network. The power provided is for OCS use only, and shall not be extended to any platforms on the beach. Currently there are no plans to provide internet connections at the shore-side team areas.

Transporting the AMSs at the Competition Venue

The RobotX organizers will provide trailers for the AMSs at the competition venue. These trailers shall be used to move the AMSs between locations on site using ground vehicles provided and operated by the organizers. Additional information regarding these trailers is available on the RobotX.org website.

In-water Areas

The 2018 Maritime RobotX Challenge will be set up along the shore and in-water near the primary public boat ramp near the METC on Sand Island in Hawaii, as represented in Figure 1. The venue will include elements of each of the competition tasks which Teams may use to train and tune their unmanned systems.

Figure 1. Overall 2016 Maritime RobotX Challenge Venue

The Challenge Course and Competition Course boundaries will be clearly identified. Leaving the assigned course or task area, whether intentionally or otherwise, will also constitute an end to that run. The Team may be permitted to restart their run if they have sufficient time remaining in their scheduled time slot.

The Team Captain may request that the run be ended or the emergency stop (kill switch) be initiated for any reason. If a RobotX staff member determines that there is an unsafe condition present or imminent, that person may activate the kill switch. The RobotX staff member is not required, nor will they have time to advise the Team prior to the decision to terminate the run attempt. In this and all other matters of safety, the decisions of the RobotX staff are final.

Challenge Courses (Practice and Qualifying Areas)

The Practice/Qualifying Area will be set up along the shore and in-water, structured as groups of the tasks arranged in Challenge Courses. The practice/qualifying area will be arranged such that multiple teams may practice or qualify at the same time.

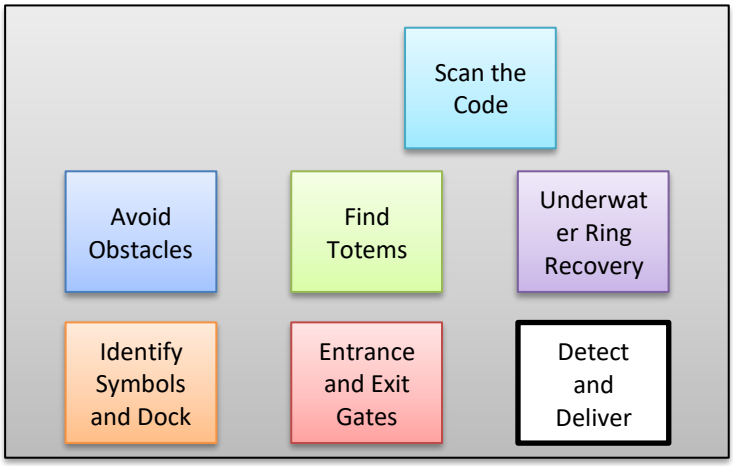

Figure 2. Example Challenge Course Layout

Competition Courses (Semi-finals and Finals)

The venue is large enough to support installation of multiple instances of each task in which Teams may practice and qualify for spaces in the Semi-final round. An example of the overall competition area is shown in **Error! Reference source not found.**. Note that the following caveats apply:

- Sizes and bearings shown are preliminary.
- Final size and layouts are subject to change.
- Dotted lines shown are only for the purpose of identifying tasks and courses on the drawing. They do not represent anything physical that will be present on or under the water.

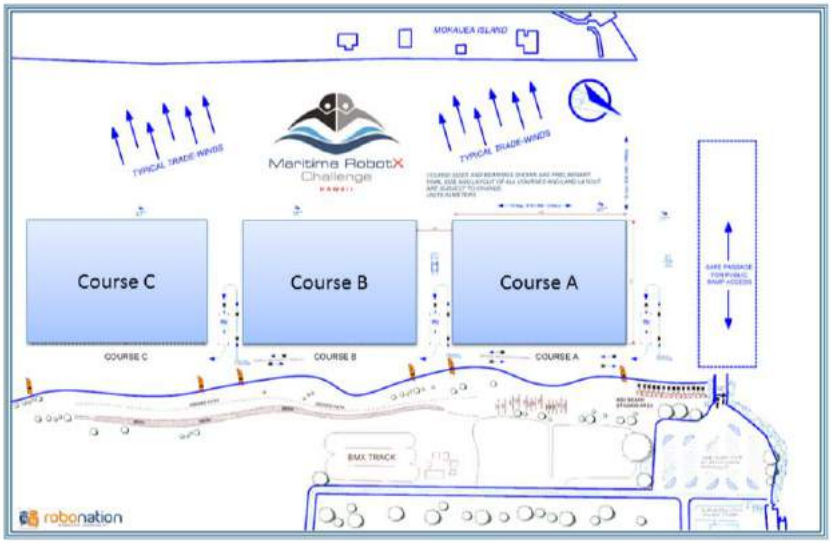

Figure 3. Planned RobotX Challenge Layout

Qualifying for Course Entry

Demonstrate Navigation and Control

It is **MANDATORY** that Teams demonstrate the AMS can maintain positive control and effectively detect and navigate the channel markers. This will be a minimum requirement to course/field entry during practice and semi-final days.

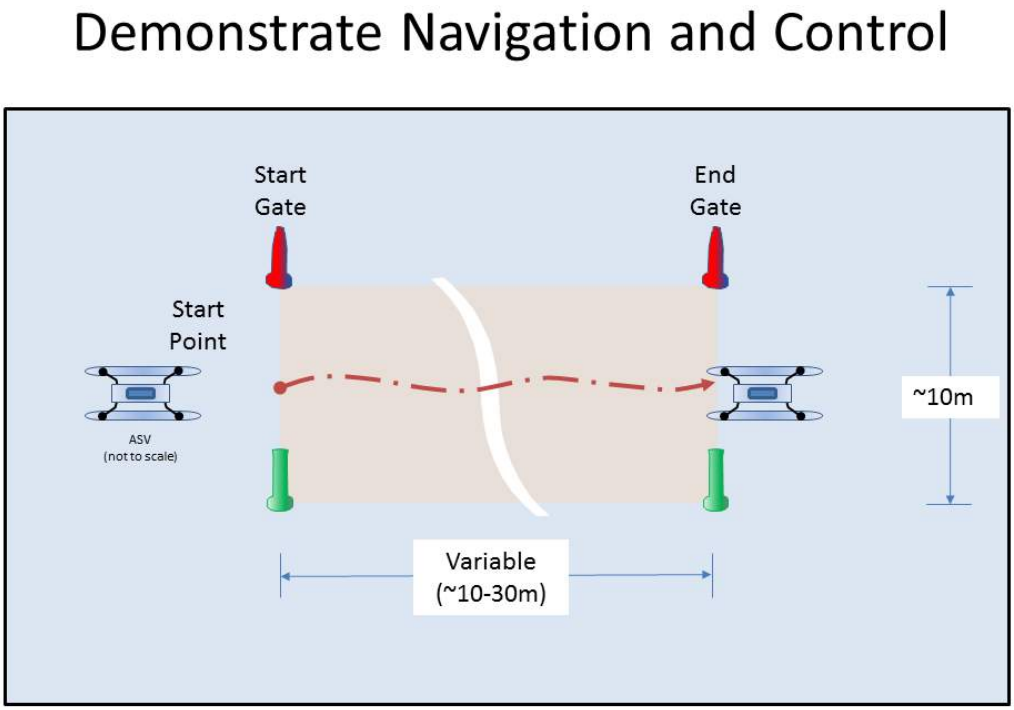

Figure 4. Demonstrate Navigation and Control

Detailed Task Description

The AMS must successfully navigate through two pairs of red and green buoys in a fully autonomous manner, demonstrating effective control of the system. After demonstrating this capability, the AMS will be allowed to proceed to the Team's assigned area.

Task Elements

Table 1. Navigation and Control Task Elements

Task Element	Description	Model No.	Ht. Above Waterline	Tower Diam.	Base Diam.
Start Gate Port Marker	Taylor Made Products Sur-Mark Can Buoy (Red)	950410	39in.	10in.	18in.
Start Gate Starboard Marker	Taylor Made Products Sur-Mark Can Buoy (Green)	950400	39in.	10in.	18in.
End Gate Port Marker	Taylor Made Products Sur-Mark Can Buoy (Red)	950410	39in.	10in.	18in.
End Gate Starboard Marker	Taylor Made Products Sur-Mark Can Buoy (Green)	950400	39in.	10in.	18in.

Demonstrate AUV Launch and Recovery

In order to qualify for underwater operations, the AMS must be capable of deploying an offboard platform, or Autonomous Underwater Vehicle (AUV). Any off-board system must comply with all requirements detailed in the *RobotX Rules and Requirements* document. Prior to being allowed to operate their AUV in the course areas, teams will be required to demonstrate safe launch and recovery of their AUV from the surface platform.

Detailed Task Description

The AMS must be able to transit from its start point on shore to the course areas with the AUV onboard the surface platform. During runs for points the AMS must start and end each run with the AUV in a captured state aboard the base surface platform. This means that while performing the competition challenges, the AUV will need to be launched and recovered from the WAM-V.

Teams must demonstrate that the AMS is capable of safely launching and recovering the AUV. This demonstration may be performed on land or in the water. This safety demonstration will be conducted at a designated area.

The AUV will be considered successfully launched when it is free to perform its assigned mission separated from the surface platform. **The AUV shall be tethered to the surface platform at all times.**

The AUV will be considered successfully recovered when it is brought under positive control within the boundaries of the surface platform.

RobotX Challenge Tasks

This section provides details of the individual RobotX 2018 Challenge tasks. For practice and qualifying days teams will attempt the tasks individually. For the Semi-finals and Finals, the tasks may be combined into new, multi-tier tasks. Potential combinations of the tasks for the Semi-finals and Finals will be released at a later date.

Entrance and Exit Gates

A set of three gates will be located in the course area with a beacon placed underwater within each gate. The AMS must detect the active underwater beacon and transit through the gate in which the active beacon is located. Beacon specifications are available in the *RobotX 2018 Beacon Specifications* document.

Detailed Task Description

After transiting through the active gate, the AMS must detect and circle one of two buoys in the field beyond the gates. One of the buoys to be circled will be an instance of the light buoy, used in the Scan the Code task, while the other will be a marker buoy, similar to the one used in the 2016 Maritime RobotX Challenge. The AMS must circle the light buoy if it actively displays a light pattern. If the light buoy is off, then the AMS must circle the marker buoy.

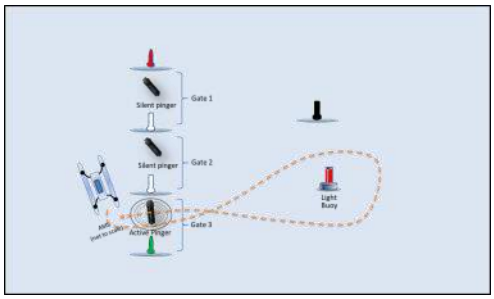

Figure 5. Entrance and Exit Gates

After the AMS has circled the correct buoy, it must return through the gate with an active underwater beacon. The gate with the active beacon may change between entry and exit.

Practice/Qualifying

For Practice and Qualifying days there will be up to four (4) instances of this task. During this challenge, one beacon will be active in each instance of the task. The beacon frequencies for each instance will be separated by at least 2kHz. Beacon frequencies for each instance will be posted daily during the competition. The beacon signals will be staggered in time as well as frequency.

Semi-Finals/Finals

For the Semi-final and Final rounds, the gates could serve as entry and exit points for the Competition Courses. The marker buoy may be replaced with another task. A single beacon will be activated at the start of each run to indicate

the correct ENTRY GATE. The beacon may change during the run to indicate a different EXIT GATE. The AMS should **record the correct ENTRY gate number** for use in combination with other tasks.

Task Elements

Planned task elements for this task are detailed in Table 2.

Table 2. Entrance and Exit Gate Task Elements

Task Element	Description	Model No.	Ht. Above Waterline	Tower Diam.	Base Diam.
Entry Gate Port Marker	Taylor Made Products Sur-Mark Can Buoy (Red)	950410	39in.	10in.	18in.
Entry Gate Middle Marker	Taylor Made Products Sur-Mark Can Buoy (White)	46104	39in.	10in.	18in.
Entry Gate Starboard Marker	Taylor Made Products Sur-Mark Can Buoy (Green)	950400	39in.	10in.	18in.
Exit Gate Port Marker	Taylor Made Products Sur-Mark Can Buoy (Green)	950410	39in.	10in.	18in.
Exit Gate Middle Marker	Taylor Made Products Sur-Mark Can Buoy (White)	46104	39in.	10in.	18in.
Exit Gate Starboard Marker	Taylor Made Products Sur-Mark Can Buoy (Red)	950400	39in.	10in.	18in.
Buoy to Circle Around	Taylor Made Products Sur-Mark Can Buoy (White) with black cover	46104	39in.	10in.	18in.

Avoid Obstacles

Detailed Task Description

For the 2018 Maritime RobotX Challenge, this task has been modified to provide a real-world challenge. Rather than being grouped as a separate task, as has been done in previous years, obstacle buoys will be placed throughout the operating areas.

During the practice and qualifying days, the obstacle area may be marked by four white buoys (listed in Table 3) around an area approximately 40m x 40m. The obstacles will be placed inside the area. Entering the obstacle avoidance field and avoiding at least one obstacle will be considered as an attempt at completing this task.

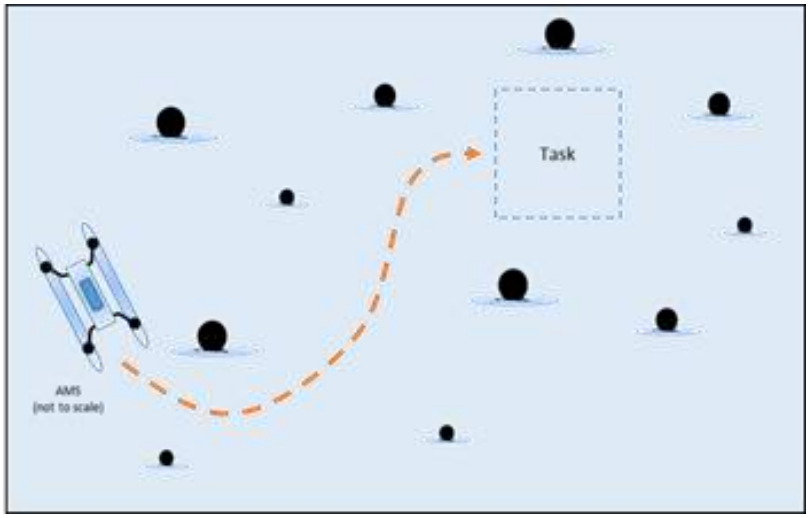

Figure 6. Avoid Obstacles

Task Elements

The task elements used for this task are listed below.

Table 3. Find Totems and Avoid Obstacles Task Elements

Task Element	Description	Model No.	Ht. Above Waterline	Tower Diam.	Base Diam.
Obstacle Field Boundary Marker	Taylor Made Products Sur-Mark Can Buoy (White)	46104	39in.	10in.	18in.
Obstacle – Small	PolyForm A-3 Black Buoy (17")	A-3 Black			
Obstacle – Medium	PolyForm A-5 Black Buoy (27")	A-5 Black			
Obstacle – Large	PolyForm A-7 Black Buoy (39")	A-7 Black			

Find Totems

Detailed Task Description

The Find Totems task requires the AMS to locate and circumnavigate two distinct objects, representing traditional Hawaiian Tiki totems.

For practice and qualifying days, the totems may be placed within a field of obstacles; the totem area may be marked by four white buoys (listed in Table 3) around an area approximately 40m x 40m.

On these days, the TD will announce the assigned totem sequence and direction. The AMS will demonstrate it has identified the object of interest by circumnavigating the correct totems in the correct direction. On practice and qualifying days, the Technical Director (TD) will post the order and color totems for that day.

For the semifinals and finals courses the totems will be placed at random locations around the competition course. The AMS will be required to find and circumnavigate totems based on information gathered from other tasks.

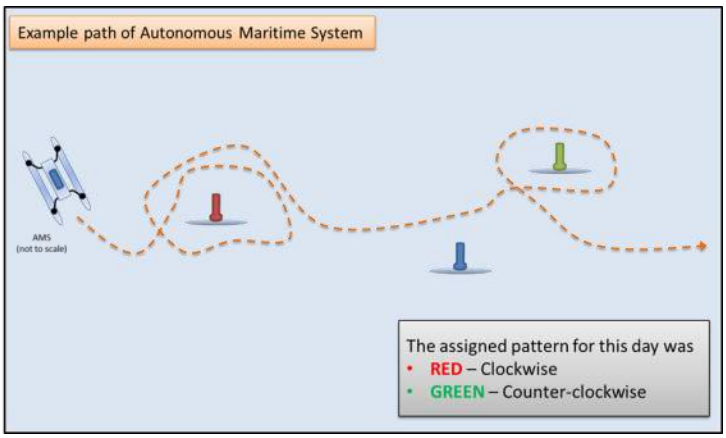

Figure 7. Find Totems

Table 4. Totem Colors and Directions

Color	Direction
Red	Clockwise
Green	Counter-clockwise
Blue	Clockwise
Yellow	Counter-clockwise

The AMS must circumnavigate the totems in the correct order and in the correct direction, as listed in Table 4. During the practice and qualifying days, the required order will be posted. Entering the totem field and circling any totem will be considered as an attempt at completing this task.

Figure 8. Totem Concept Image

Task Elements

The "Tiki totems" will rise 1-2 meters high above the water's surface, based on the Taylor Made White Sur-Mark Buoys. There will be red, green, yellow, and blue totems present in the field. The various floating obstacles in the field will be placed at random positions and moored. These moored obstacles will be floating on the surface, visible, and of various sizes as described in Table 3.

Table 5. Find Totems and Avoid Obstacles Task Elements

Task Element	Description	Model No.	Ht. Above Waterline	Tower Diam.	Base Diam.
Totem Marker	Taylor Made Products Sur-Mark Can Buoy (White)	46104	39in.	10in.	18in.
Obstacle Field Boundary Marker	Taylor Made Products Sur-Mark Can Buoy (White)	46104	39in.	10in.	18in.

Station Keeping

Autonomous station keeping is a core capability that enables successful completion of several tasks in the 2018 Maritime RobotX Challenge. Autonomous station keeping can be demonstrated either by holding position adjacent to the Underwater Ring Recovery marker buoy, within the docking bay of the Identify Symbols and Dock task, or adjacent to the Detect and Deliver task.

Scan the Code

The AMS is required to observe a light sequence displayed by an RGB buoy and report the color pattern. This is similar to the 2014 and 2016 RobotX light buoy task.

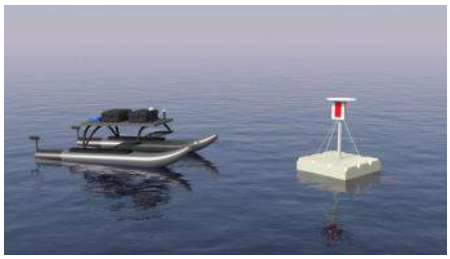

Figure 9. Scan the Code

Detailed Task Description

A floating platform with a vertical pole (similar to Figure 9) will be located within the search area, of approximately 40 X 40 meters. The light bar atop the buoy will be no more than 3 meters above the water's surface and will display any three of the three colors: red, green, or blue. The light bar will appear black when it is off. The light assembly on the buoy will successively display colors one at a time to generate a sequential pattern of three colors (e.g., red-green-red). Each individual color will appear for 1 second, after which the lights will remain off (black) for 2 seconds before repeating the same pattern. A color may be repeated in the pattern, but the same color will not appear twice in a row.

During practice and qualifying days, the teams will report the detected light sequence using a Scan the Code reporting message as detailed in the *2018 RobotX Communications Protocol*.

During semifinals and finals, the AMS will demonstrate that it has successfully observed the light buoy by using the sequence to inform completion of other tasks. The AMS should also report the observed light sequence using the Scan the Code reporting method.

Contact with the light buoy is not permitted. Striking the buoy will result in termination of the run with no points scored.

Task Elements

Further details of the light buoy are available in the *2018 RobotX Light Buoy Specifications* document.

Identify Symbols and Dock

The docking task will be configured as shown in with colored shapes similar to those used in the 2016 RobotX Challenge. Dock materials will be the same as those used in 2016.

The AMS may demonstrate its autonomous station keeping ability by holding position within the docking bay of this task.

Detailed Task Description

The AMS must demonstrate the ability to successfully dock in bays identified by a color and shape.

The task will consist of two identical docking bays arranged as depicted in Figure 10, distinguishable by a large geometric shape located at its closed end. The shapes may be red, green, or blue in color on a white background. The dock will be anchored in a fixed location, with the shapes affixed at the closed end. Each bay consists of floats positioned to form a cul-de-sac with sufficient clearance on both port and starboard sides as represented in Figure 10.

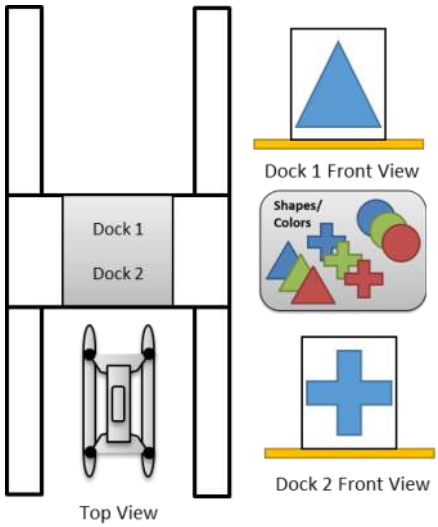

Figure 10. Identify Symbols and Dock

A large white placard will be affixed to each docking bay. This placard will have a cruciform, a circle, or a triangle to provide a visual reference mark for each respective docking bay. The shapes will be at least 1m across on the white background, and may not be precisely centered in the docking bay. The shapes will be presented in one of three colors: red, green, or blue. During the Practice and Qualifying days one of the colored symbols (the circle, the triangle, or the cruciform) will be designated as "Color/Symbol of the Day".

When the AMS approaches this task, it must identify the colored symbols for that day, and enter the docking bay that displays that colors/shape combination. The symbol placards may be randomly moved from one docking bay to another at any time during each day of the competition. There may be multiple placards with the same color but a different shape. There may be multiple placards with the same shape but a different color. Once a Team begins their time slot, the position of the symbols will remain fixed throughout that time slot.

Task Elements

The docks for this task will be constructed from Jet Dock assembly cubes (size large). The Jet Dock System is made from Ultra High Molecular Weight High Density Polyethylene Plastic. Jet Dock Large Cubes are 20" X 20" square by 16" tall. Jet Dock Large Cubes weigh 14 pounds each, and have 3.7 cubic feet of volume.

Task Element	Description	Manufacturer	Example Image
Dock Material	CUBE - LARGE (BEIGE) Item code: C000000008	Jet Dock www.jetdock.com	

Figure 11. Identify Symbols and Dock

Detect and Deliver

A floating platform will be tethered in an open area. A colored shape and a pair of square holes, one small and one large, will be visible on two opposite faces of the platform. The AMS must propel or insert objects through the target holes on the face. During practice and qualifying days, the TD will designate the correct color and shape. The dock material to be used will be the same as what is used for the Identify Symbols and Dock task.

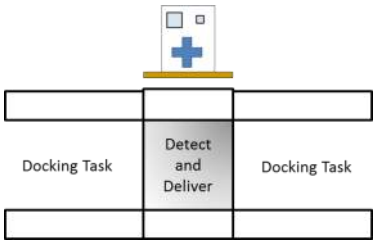

Figure 12. Detect and Deliver

For the semifinals and finals, this task will be paired with the Identify Symbols and Dock task as depicted in Figure 12. The correct shape and color may be determined by the AMS successfully completing other tasks.

Underwater Ring Recovery

The AMS must recover rings suspended underwater in the competition field.

Detailed Task Description

The final implementation method for this task is still under development; however, the current plan is to attach rings at varying depths underneath a marker buoy on the water's surface. The rings will be of various colors, sizes, and weights. Rings will be positively buoyant and may range from 6 to 14 inches in diameter. The AMS will demonstrate completion of this task by recovering a ring to the surface platform and returning it to judges.

The AMS may also demonstrate station keeping by holding position next to the marker buoy.

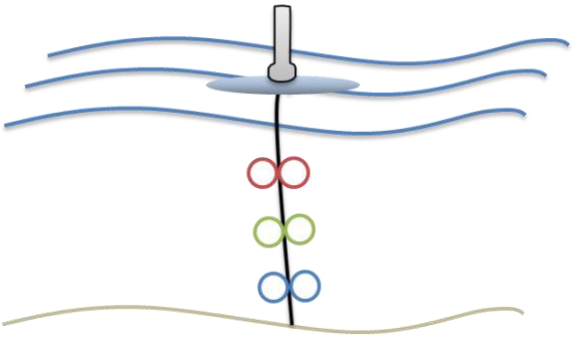

Figure 13. Underwater Ring Recovery

Task Elements

A reference buoy will be visible above the water's surface. The buoy will be as listed in Table 6. It will have a distinctive pattern on it to distinguish it from other buoys in the competition fields.

Table 6. Underwater Ring Recovery Task Elements

Task Element	Description	Model No.	Ht. Above Waterline	Tower Diam.	Base Diam.
Reference Buoy	Taylor Made Products Sur-Mark Can Buoy (White)	46104	39in.	10in.	18in.

RobotX Project Deliverables and Presentations

Each team shall design a Website, create a Team Introduction Video, write a Technical Design Report, conduct an oral presentation, participate in an interview session, and present their System for inspection. The Website, Team Introduction Video, Technical Design Report (as well as the **optional** Appendix Special Topic) will be due **BEFORE** the start of the in-water events in Hawaii. A summary of the delivery due dates is provided in Table 7. The methods of delivery will be sent to team points of contact via e-mail.

Team Technical Submission Package (Due 1200 UTC on 12 November 2018)

Website

Teams must maintain a website documenting their efforts and progress leading up to the competition. The website should include at a minimum the following information:

- Team name
- Team member information
- System Design Approach
- Media (pictures, video, etc.) taken during development and testing
- Sponsors
- Contact details for more information

The exact layout and contents of the website are left for the Teams to develop. The Technical Directors may visit this site prior to the competition to follow the Teams' progress. However, Teams are expected to continually update their website up to the start of the competition.

Team Introduction Video

Each Team must submit a 2-3 minute video introducing their Team. This video will be scored, and will be used online and onsite during the webcast. The video is not intended to present Teams' vehicle design and it may not be used as part of the design presentation.

Technical Design Report

Each Team is required to submit a technical design report in English that describes the design of their USV autonomy system, propulsion system, and control systems, as well as strategies for their approach to the tasks. They should include the rationale for their design choices. Specific requirements for the technical design report are provided in the *RobotX 2018 Technical Design Report* document on the RobotX.org website. Technical Design Reports will be published on the RobotX.org website after the competition.

Technical Design Presentation and Interview

Each Team is required to present their sensing, integration, power, propulsion, and autonomy scheme to the Judges in the form of an oral presentation (conducted in English) with visual aids.

This component of the Challenge will include a presentation to the Judges, as well as an opportunity for the Judges to interview the Team members with a specific set of standard questions. The presentation should introduce the Team, their AMS, and special features and/or strategies for the competition.

The **ENTIRE TEAM** must be present for the design presentation.

Planned Presentation Breakdown:

- Team Video will be played first.
- Teams will conduct a 20-minute oral presentation with visual aids
- Ten (10) minutes will be allotted for questions
- Ten (10) minutes will be allotted for the Judges to interview the Team.

Judges will inspect the AMS at a later time during the Documentation Judging days.

The Documentation Tasks comprise a critical element of the competition. Scores from this element will be used as a tie-breaker, if needed.

System Inspection

Judges will inspect the Team's unmanned system, assessing technical design, craftsmanship, technical innovation, and visual impact of the design. Team members should be present to answer technical questions posed by the judges during this inspection. The System Inspection schedule will be provided at the competition site.

At least one team representative must be present for the System Inspection.

Team Information Package (Due 1200 UTC on 05 November 2018)

Teams are required to submit the following items to the RoboNation organizers.

Team Biography

Your Team bio should be 250 words or less using either Microsoft Word or PDF format.

Team Logo

The Team Logo will be displayed in an App designed for mobile devices. Therefore, a school or Team logo is more appropriate than a Team photo. Please submit a Team logo in the format below:

- 200 pixels X 200 pixels
- JPEG/JPG/PNG/GIF
- 72dpi image

Team Roster

Please confirm all registration information, including Official Team Name and School or Organization Name. All t-shirt sizes must be confirmed on the official Team roster. Additionally, please confirm Web URL, Facebook and Twitter information (if this information was provided at time of registration). If this information was not provided, or has changed, please provide and/or correct.

Waiver and Release of Liability Forms

In order to participate in the 2018 RobotX Challenge, **each Team member** must submit a Release of Liability Form. Failure to submit these forms will result in non-participation. Forms must be submitted electronically as part of the Team Information Package. Each Team member must complete and submit his or her own form. These forms will be provided on the www.robotx.org website. You will first need to download the forms in order to complete and then upload the completed and signed forms back to your Team Dropbox.

Individual Student Resumes

Each Team member should submit an individual resume. Because the AUVSI Foundation offers students the opportunity to connect with industry professionals, student resumes will be distributed to AUVSI Foundation sponsors. Please upload all individual resumes to your Team Dropbox.

Shipping Plan

As stated in the *RobotX Rules and Requirements* document, Teams will be required to submit a shipping plan to RobotX organizers no later than **1200 UTC on 01 October 2018**. This is to allow time for organizers to work with Teams to ensure that their systems and support equipment can be received, worked through U.S. Customs, and staged for use during the competition. A shipping plan form, shipping address, and point of contact for the RobotX freight forwarder will be provided on the www.robotx.org website.

Table 7. Summary of Deliverables

Deliverable	Due Date
Registration Deadline	01 September 2018
Shipping Plan	01 October 2016
Team Technical Submission Package: Website, Video and Technical Design Report	12 November 2018
Team Information Package	05 November 2018

Task Reporting

Teams shall provide a display to allow judges to evaluate AMS performance against the RobotX 2018 tasks that require reporting of results. Specifications for this reporting will be provided at a later date.

Important Terms

Term	Definition
AMS	Autonomous Maritime System
AUV	Autonomous Underwater Vehicle
Challenge Course	Group of RobotX task elements organized as a set of seven tasks which Teams can attempt individually to earn points towards qualifying for the Semi-finals Round of the competition.
Competition Course	A set of RobotX tasks organized as an integrated course which Teams may attempt for points towards qualifying for the Finals Round. When using the Competition Course, Teams must attempt multiple tasks in which the information required to complete some tasks are dependent on information gathered attempting another task.
USV	Unmanned Surface Vehicle
WAM-V	Wave Adaptive Modular Vessel

Change Log

This change log lists many of the most significant changes made in this revision of the Rules. It may not be all-inclusive, as minor corrections and changes may not be listed. Teams should review and understand the entire document.

Version	Changes	Date
v0.1	First release of Preliminary Task Descriptions, based on "Task Summary" document from 25 December 2017.	31 January 2018