20th annual

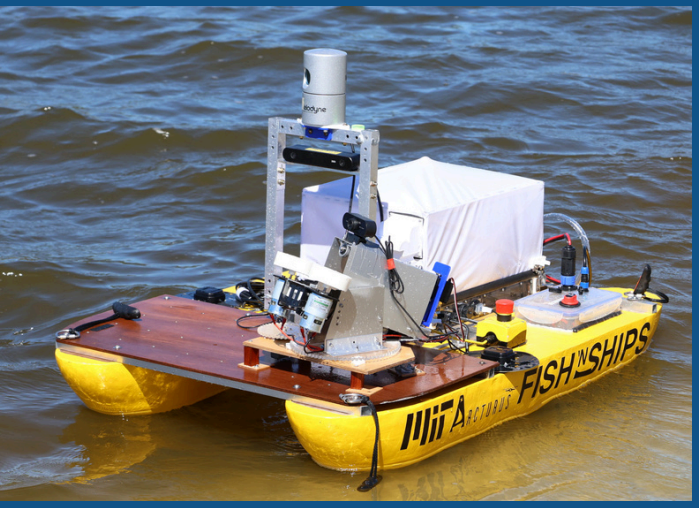
RoboBoat 2027

18-23 February 2027

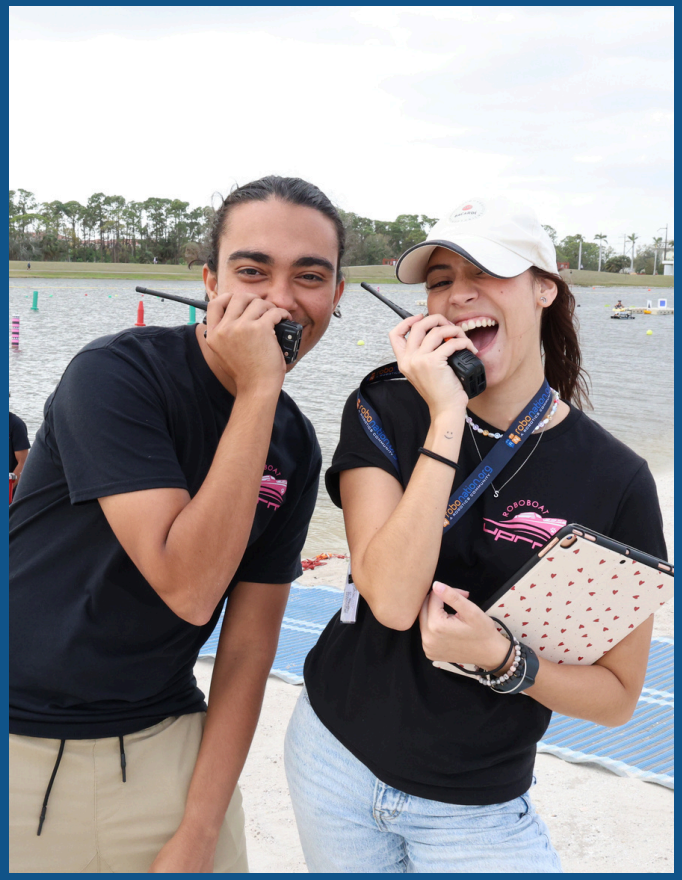
Nathan Benderson Park | Sarasota, FL

Primer & Task Ideas











Why RoboBoat?

- Increase technical proficiency;
- Establish valuable professional connections; and
- Enjoy learning and collaborating while advancing the technology of USV* systems.

The nominal winners are teams that score the most points. The real winners are participants who learn lasting lessons about working together to create an autonomous system to accomplish a challenging mission in a complex environment.

*USV = Uncrewed Surface Vehicle

roboboat

20 YEARS

Surface Vessel Full Autonomy Reporting

- **Objective:** Build an international community of innovators ranging from high school to higher education, capable of making substantive contributions to the maritime field and pushing development of small-scale (X-Class) Uncrewed Surface Vehicles (USV).

- Teams must be comprised of:
  - 75% or more full-time students (college and/or high school)
  - Three (3) team members are required to travel to competition

- Participation in RoboBoat includes:
  - Building a USV to compete, following RoboBoat's vehicle and safety requirements.
  - Providing design documentation discussing the team's technical design and competition strategy.

Find out more.

Contact RoboNation at competitions@robonation.org

ELIGIBILITY



Teams must build an USV to compete and may enter up to two vehicles in the competition.



Teams must be comprised of:

- 75% or more of full-time students, the majority of which are college or high school.
- 25% or less of alumni, industry, academic or government partners.



The majority of full-time student team members must be college or high school students. Teams may also include middle school students. Interdisciplinary teams are encouraged.



Minimum of three (3) team members are required for safe operations on-site at the competition.

COMPETITION



Mission Performance

Build a USV to showcase autonomous performance.



Mission Readiness

Prepare documentation showcasing USV design and competition strategy.

- *Team Website*
- *Technical Design Report*
- *Technical Design Display*
- *Engineering in Action*
- *Technical Interview Presentation (in-person)*
- *System Assessment (in-person)*

2027 Theme: Discover the Unknown

Every mission begins with a question: What don't we know?



Before we act with confidence, we must understand the environment. Robotics helps us reach farther, see what is hidden, and turn uncertainty into understanding.

Reach. Places we cannot easily go.
Observe. What we cannot readily so.
Understand. Insight that enables better decisions.

OPERATIONAL ENVIRONMENT:

Island Harbor & Coastal Environment

The 2027 operational environment is centered around a remote island community built around a protected harbor and marina. The surrounding area includes coastal waters, developed communities, transportation networks, public infrastructure, and natural resources.

What's New for RoboBoat 2027

Registration Fee Increase | Team registration fee has increased to $1500.

Observing Team | Teams can register as an observing team at a 50% rate of $750.

Thrust Test Removed | Teams are no longer required to conduct a thrust test.

Two-Year Competition Cycle | While the events (SeaPerch, RoboBoat, RoboSub, and RobotX) will exist within a shared world, they will have annual domain-specific challenges that culminate in a 2028 RobotX event where teams participating in the individual events will have the opportunity to showcase advanced levels of performance across multiple operating domains.

Mission Badges | Tasks are now subcomponents of missions. Teams may earn mission badges for a run by completing a series of tasks that make up one or more of the overarching missions, which will contirubte to final standings.

Design Documentation Shifts to "Mission Readiness" | Teams will prepare a coherent engineering portfolio that evaluates how to document, communicate, defend, and reflect upon their engineering work while intentionally developing workforce-ready competencies.

Proof of Readiness | Before competition, teams are required to submit proof of autonomous navigation and safety systems. This reinforces real-world engineering practices by requiring teams to validate performance, demonstrate reliability, address operational constraints, and justify deployment decisions.

Mission Badges

The **Assessment and Discovery Mission** requires the USV to localize and identify objects, avoid obstacles, and determine safe travel pathways. In order to achieve the Assessment and Discovery Mission badge, a USV must complete the following combination of tasks/tiers.

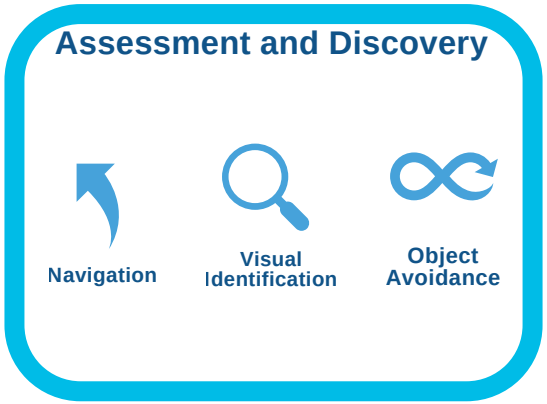
- Safe Passage at a pre-defined level.
- Navigate the Marina at a pre-defined level.
- Dynamic Response at a pre-defined level.

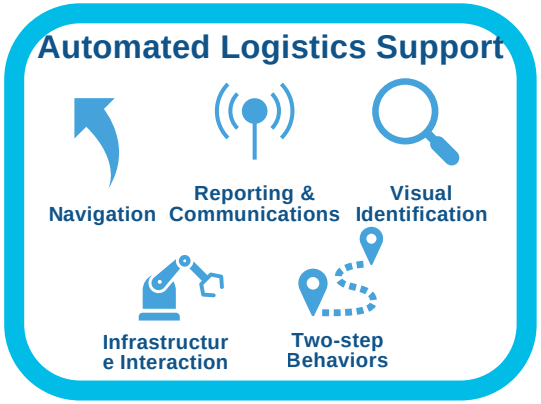
Automated Logistics Support functions include object detection and classification, precision maneuvering, interaction with infrastructure, and reporting. In order to achieve the Automated Logistics Support badge, a USV must complete the following combination of tasks/tiers.

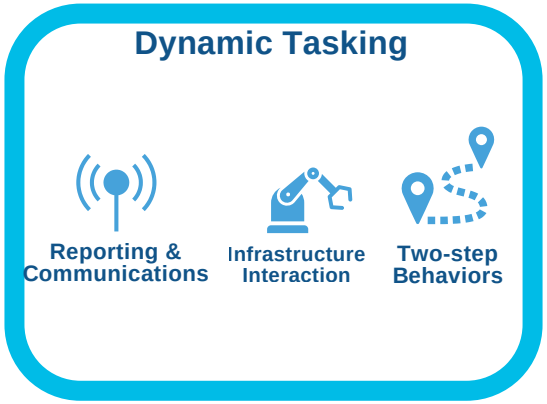
- Safe Passage at a pre-defined level.
- Navigate the Marina at a pre-defined level.
- Dynamic Response at a pre-defined level.

Dynamic Tasking capabilities are demonstrated through interaction with the RoboCommand system in response to unexpected tasking or detection reports. In order to achieve the Dynamic Tasking badge, a USV must complete the following combination of tasks/tiers.

- Safe Passage at a pre-defined level.
- Navigate the Marina at a pre-defined level.
- Dynamic Response at a pre-defined level.







Mission Badges

Assessment and Discovery



Navigation



Visual Identification



Object Avoidance

Automated Logistics Support



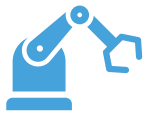
Navigation



Reporting & Communications



Visual Identification



Infrastructure Interaction

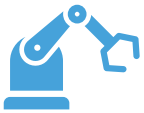


Two-step Behaviors

Dynamic Tasking



Reporting & Communications



Infrastructure Interaction



Two-step Behaviors

Mission Readiness

PRE-EVENT

Technical Design Report
6-Page Report

A concise, evidence-based technical paper that communicates the team's most significant engineering work and explains how the team's competition, design, and testing strategies contributed to the development and performance of its autonomous system.

Team Website
Website

The central digital repository for the team's documentation, that provides a comprehensive record of the team's engineering design and development process.

Engineering in Action
1-Page Submission

Overview of how teams use knowledge, skills, and opportunities to create meaningful impact beyond their own team and competition performance.

DURING EVENT

Technical Design Display
Digital/Print Poster

Visual presentation of what your team designed, why you made key engineering decisions, how you evaluated the autonomous system, and what evidence demonstrates its performance.

Technical Interview
15-minute Presentation

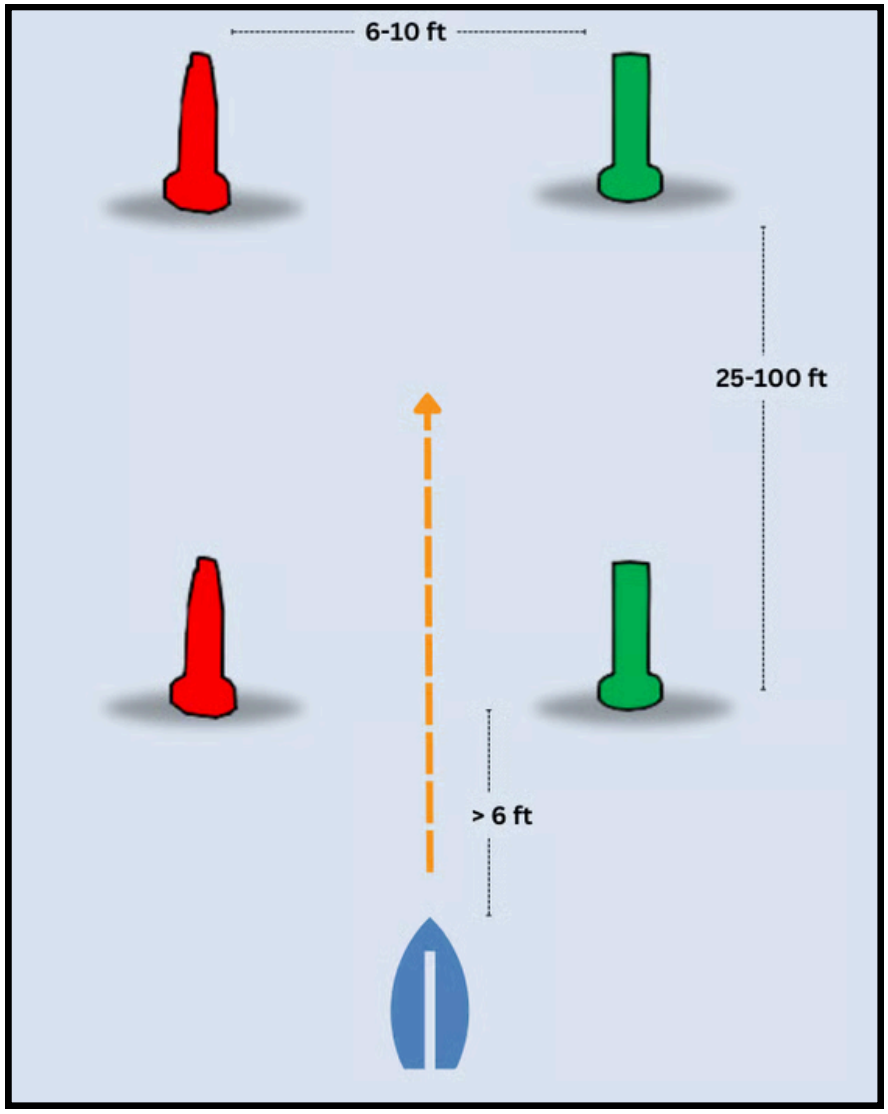
A professional engineering review in which teams present and defend their competition strategy, autonomous-system design, testing evidence, and mission readiness before a panel of subject-matter experts.

System Assessment
15-minute Assessment

Judges inspect the team's system and evaluate technical design, innovation, and craftsmanship using observable features and supporting engineering evidence.

Proof of Readiness

Prior to competition, teams will submit the following to prove preparedness for competition. Submissions will be reviewed to determine whether teams and their systems are eligible to deploy at competition.



Autonomous Navigation Demonstration (Video Submission)

- USV passes through both sets of Gates
- No obstacle strikes
- Maintain good autonomous control

Safety Systems Evaluation (Photo/Video Submission)

- Kill Switch System
- Remote Control System Compliance
- Tow Harness
- Propeller Shrouds

What next?

Continue reading through the **CHALLENGE** presented to RoboBoat teams this season.

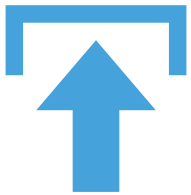
Autonomous behaviors evaluated in this year's challenge include...



Navigation



Object Avoidance



Station Keeping



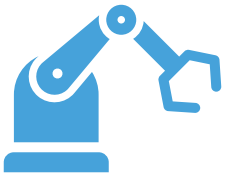
Acoustic Localization



Reporting & Communications



Visual Identification



Infrastructure Interaction



Two-step Behaviors

Mission Task Overview

Communications & Reporting

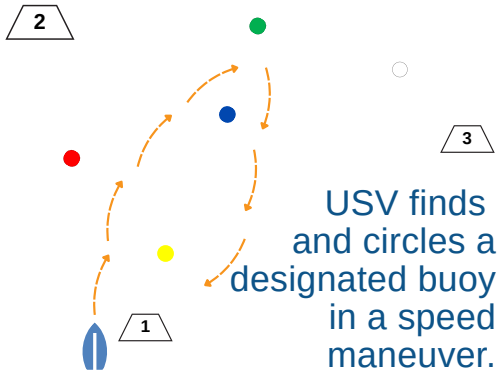
All USVs must be capable of interacting with the RoboCommand system.

Task 1: Safe Passage

A random path is generated for the system of systems to discover, report, and navigate a safe pathway to begin the survey and relief mission.

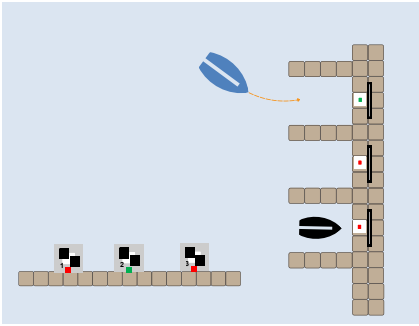


Task 2: Emergency Response



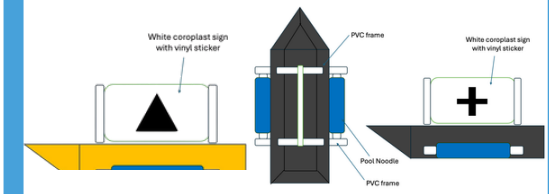
USV finds and circles a designated buoy in a speed maneuver.

Task 3: Navigate the Marina



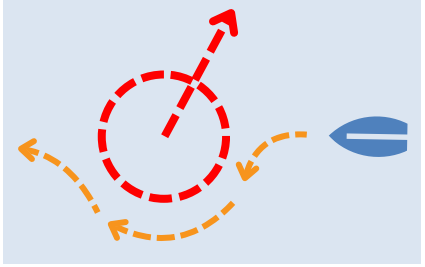
USV enters marina and docks in an unoccupied slip.

Task 4: Delivery Run



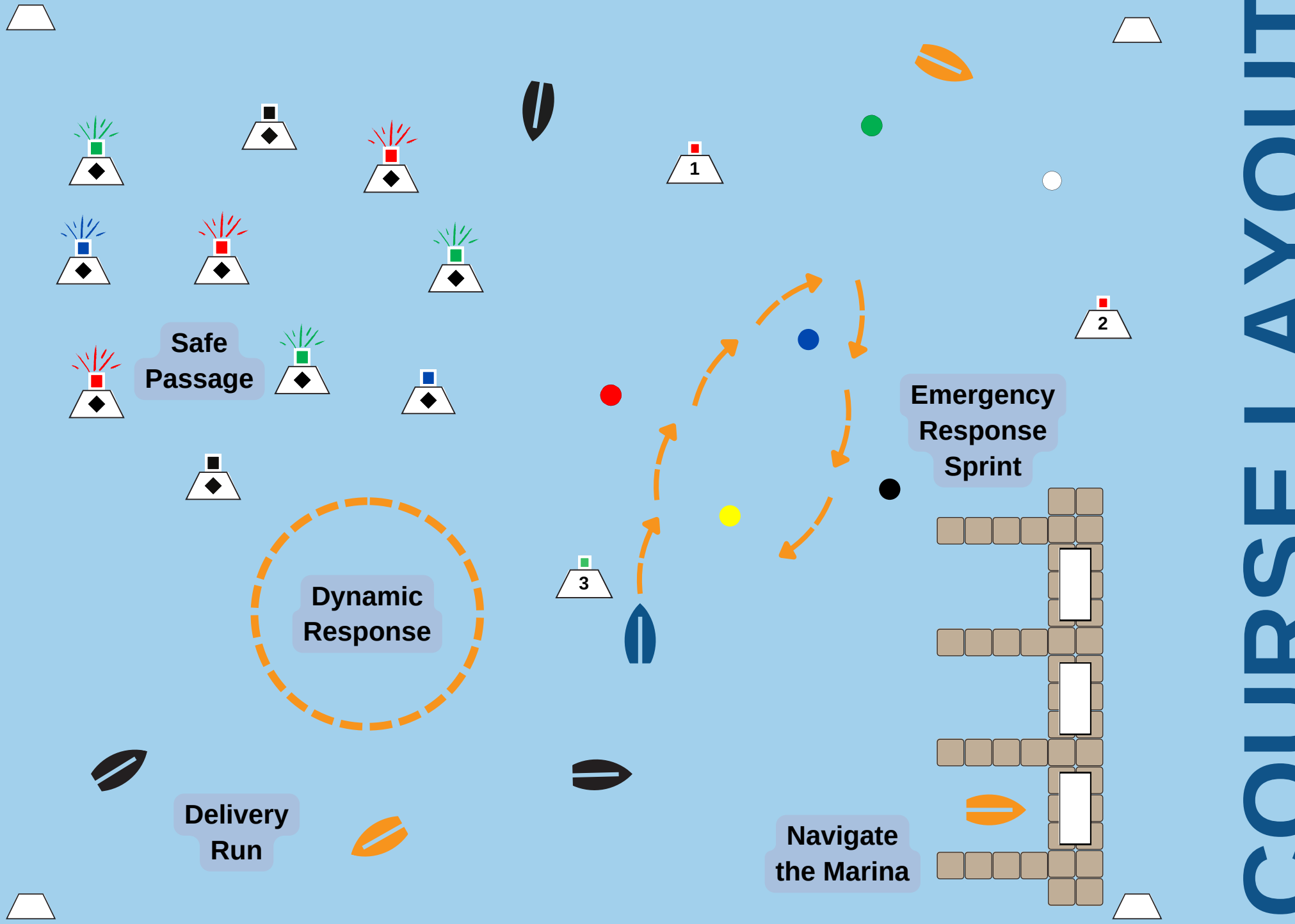
USV delivers water or racquetball supplies to stationary vessels as prompted by RoboCommand.

Task 5: Dynamic Response



USV responds in real time to unexpected changes in tasking prompted by RoboCommand.

COURSE LAYOUT



Task 1: Safe Passage

The USV must find a safe path through debris in the harbor to get from an ENTRY point to an EXIT point.

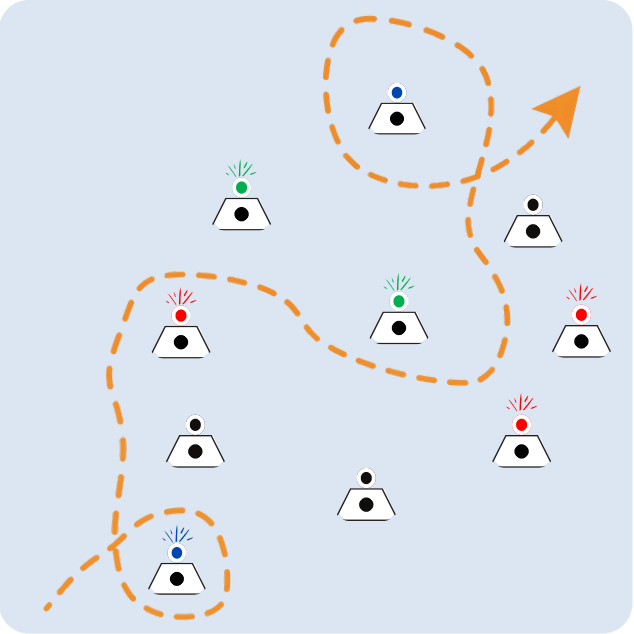
A USV must identify and report the correct ENTRY and EXIT points for the transit, as well as the RED, GREEN, and BLACK (OFF) buoys as detected and classified.

A USV must approach and fully circle the ENTRY buoy in a clockwise direction before beginning transit of the buoy field.

The USV must then transit safely through the passage, as indicated by red and green indicators.

- Pass **GREEN** buoys to the system's port.
- Pass **RED** buoys to the system's starboard.
- Avoid contact with all objects.

After transitting the buoy field, the USV must circle the EXIT buoy counterclockwise then move on.



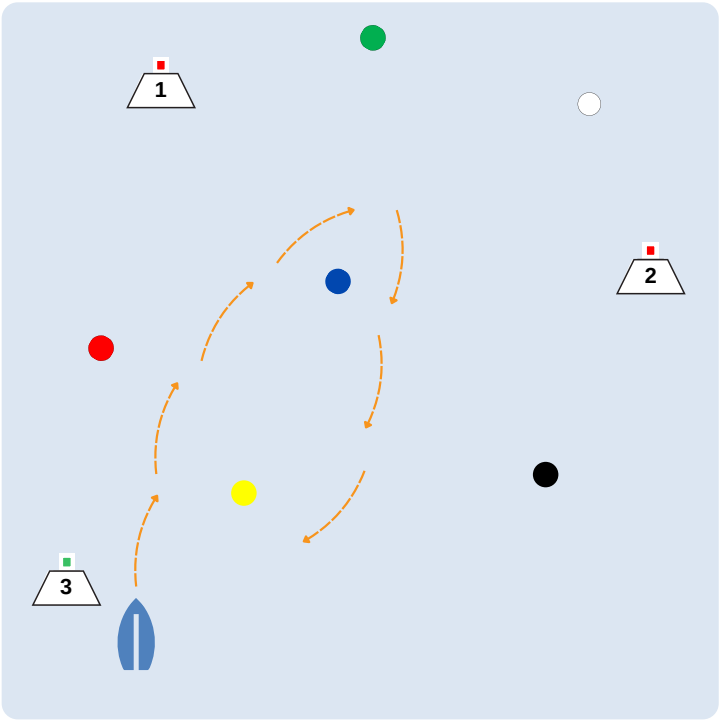
Capability Levels

- **Core:** Circle ENTRY buoy clockwise, transit field passing RED/GREEN buoys to the correct side, then circle the EXIT buoy counterclockwise.
- **Advanced:** Same as Core tier except that the EXIT buoy will change while the USV is transitting the field.
- **Disruptive:** Same as Core tier except that EXIT buoy and up to two (2) other buoys will change color.

Task 2: Emergency Response Sprint

The Emergency Response Sprint represents a situation in which a USV may need to rapidly transit from a specific location to an area requiring attention, such as rescuing a swimmer in distress.

A USV must navigate to correct START buoy, find and go around the correct colored Polyform buoy, then make a speed run to the required END buoy (depending on the tier attempted).



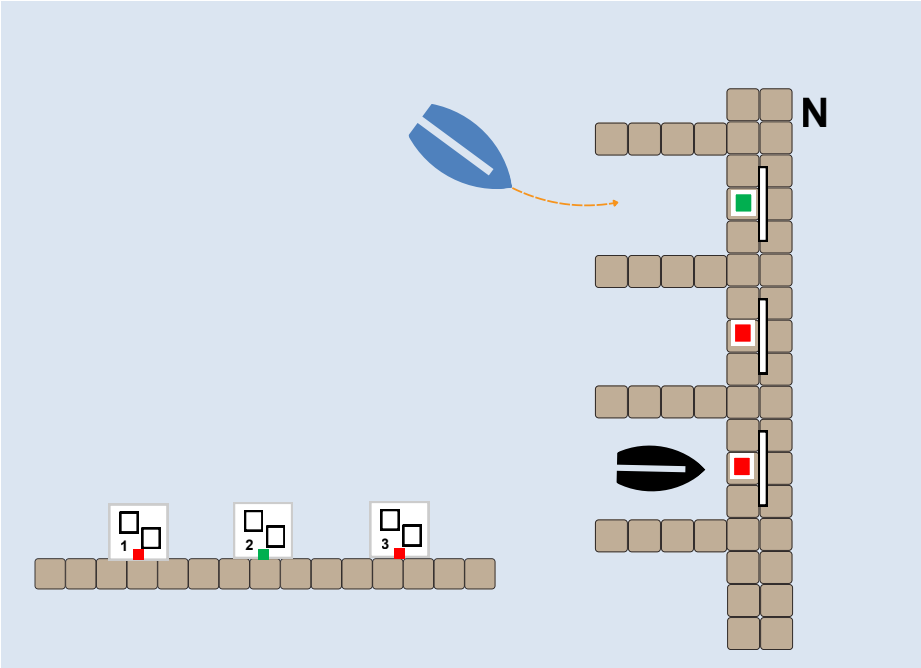
Capability Levels

- **Core:** Start at the **GREEN** buoy, loop around the correct target buoy, exit field.
- **Advanced:** Start at the **GREEN** buoy, loop around the correct target buoy, exit field near the buoy with active acoustic pinger.
- **Disruptive:** Start at the START buoy, loop around the assigned target buoy, exit field near the END buoy. Unlike at the Advanced Tier, however, the START and END points can only be determined by locating an active acoustic pinger. They can not be detected visually.

Task 3: Navigate the Marina

This task represents multiple scenarios that may exist in a marina environment: (a) the USV must find the safe docking bay, (b) complete a "firefighting task", and (c) deliver resources to another location. It is possible for uncrewed systems to work as a team to quickly complete these challenges.

A USV must enter the marina, dock in an available slip (indicated by **GREEN** color indicator), and perform a task. The correct docking slip and action to be performed will vary depending on the challenge tier being attempted.

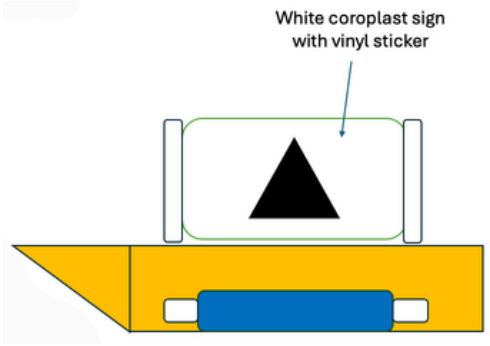


Capability Levels:

- **Core:** Dock in slip with **GREEN** color indicator, which indicates an available bay.
- **Advanced:** After successfully docking in the slip with **GREEN** color indicator, the USV must “put out a fire” represented by a **RED** light.
- **Disruptive:** After completing the Advanced tier, a window in the docking bay structure will flash a two-color sequence of light in either **RED** or **BLUE**.
  - 1st color indicates whether the USV should deliver water (**RED**) or a racquetball (**BLUE**).
  - 2nd color indicates to which distractor boat the USV must deliver the payload.

Task 4: Delivery Run

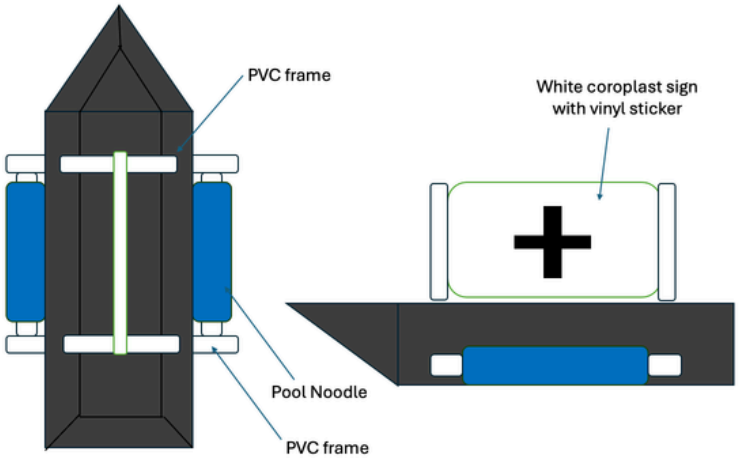
This task makes use of coroplast vessels deployed around the course. Each of these vessels will have one of four shapes on the sail area of the boat: Cruciform, Circle, Square, Triangle.



Example Water Delivery Boat

The USV will receive message from RoboCommand directing it to deliver water to one or more USVs.

This is considered an urgent request, so the USV must immediately stop what it is doing to complete the task before resuming normal operations.



Capability Levels:

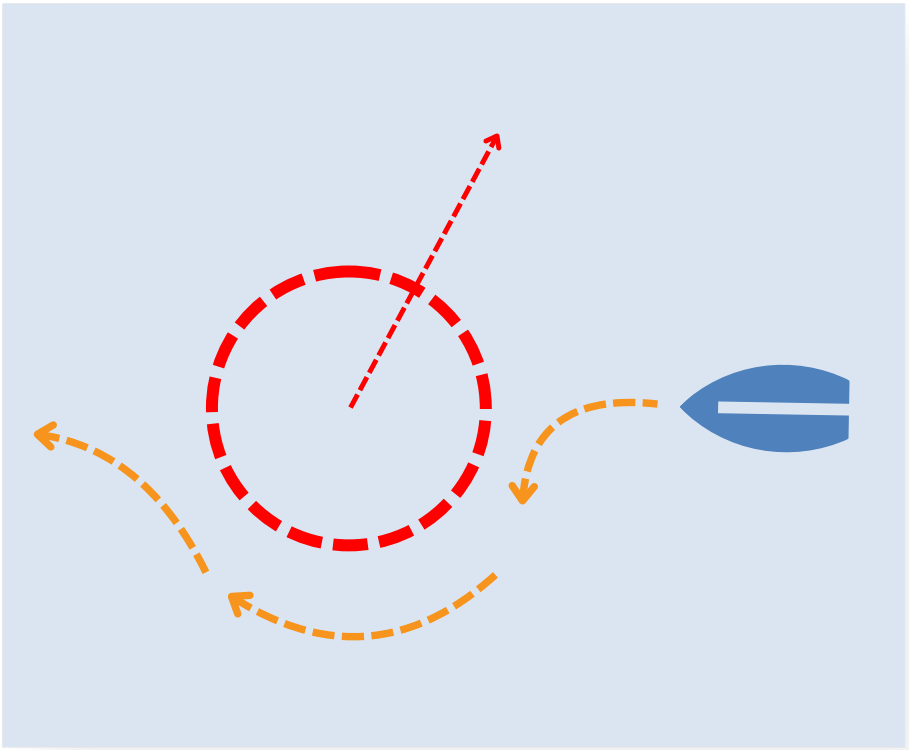
- **Core:** The USV must immediately break off its current effort and deliver water to the assigned coroplast vessel.
- **Advanced:** At the Advanced tier, the USV must deliver water to two (2) assigned vessels.
- **Distruptive**: At the Disruptive tier, the USV must deliver water to three assigned vessels.

Task 5: Dynamic Response

There are times when a USV may need to respond to unexpected tasking while conducting other mission.

This task requires the USV to respond in real time to unexpected changes in tasking requested by the RoboCommand system.

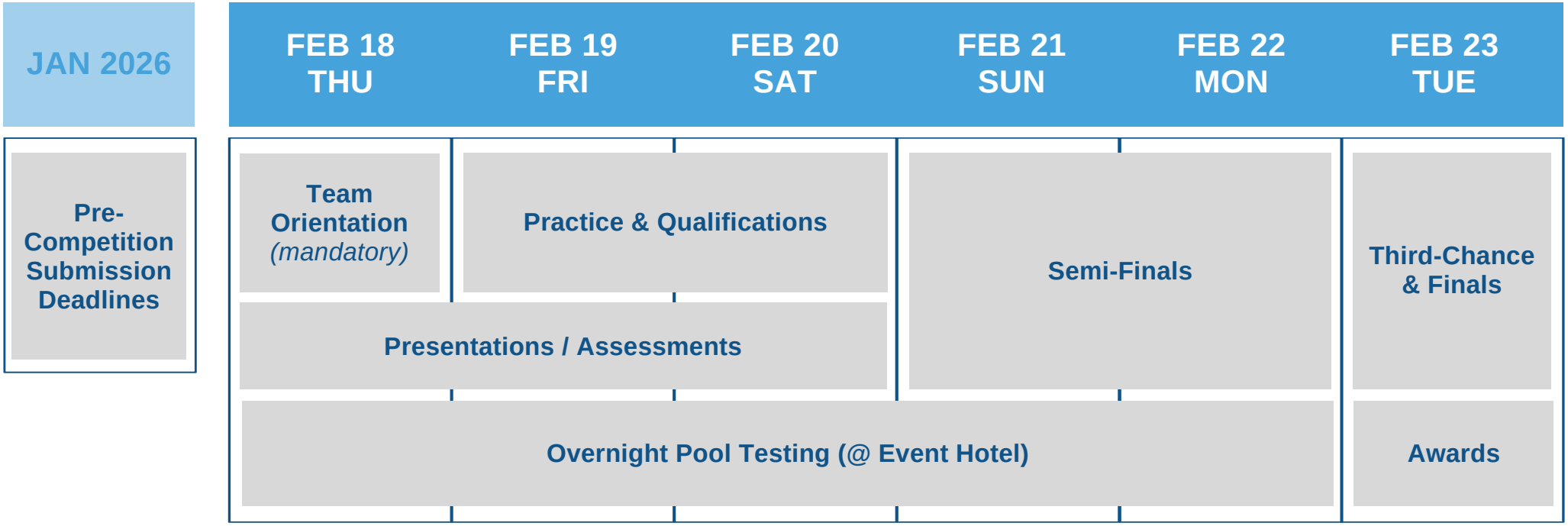
More than one USV is needed to complete this task at the Advanced and Disruptive Tiers.



Capability Levels:

- **Core:** Break out of current tasking to rally at a requested GPS point.
- **Advanced:** Two USVs work in tandem to respond to a specific Mission Badge requested by RoboCommand at the start of a run.
- **Disruptive:** USVs work in tandem to respond to a specific Mission Badge requested by RoboCommand after systems have already started other tasking.

Preliminary Schedule



Stay Updated

ALL THINGS ROBOBOAT

For all the latest information and updates for the competit season, visit the RoboBoat website!

roboboat.org

DISCORD

Stay connected and updated with the RoboBoat Discord. Scan the QR code to get started!

JOIN TODAY!

- Scan the QR code
- Select the RoboBoat role
- Turn on notifications!

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For more information contact competitions@robonation.org