

Targets

Summary:

Abiding with rules of the competition, the main targets that must be hit were the size and weight of the boat along with all the guidelines that were given in the rules handbook. Keeping the dimensions of the boat less than 5 feet in width and height as well as less than 140 lbs was the most important aspect as well as incorporating a manual and electronic kill switch. Below is a table outlining the functions matched with the metric required to compete in the competition. For all those with 'true' as the metric this was a binary pass which was to ensure that the task was completed.

<u>Boat</u>	
Physical Properties	
Function	Metric
Length	5 ft
Width	35 in
Height	28 in
Top Speed	2 m/s
Acceleration	0.25 m/s
Turn Radius	0 m
Weight	70 lbs
Thrust to Weight Ratio	70%
Buoyancy	1 hr
Water Resistance	True
Manual Kill Switch Diameter	1.5 in
Manual Kill Switch Integration	True
Electronic Properties	
Battery Voltage	22 Volt

Battery Life	60 min
Battery Dimensions	6x3x3 in
GPS Localization Accuracy	5 m
Lidar Range	25 m
Radio Communication Range	30 m
Environmental Detection	
Camera Resolution	1080p
Object Detection Range	7 m
Accuracy of Color Detection	95%
Accuracy of Distance Reading	95%
Underwater Microphone Range	5 m

<u>Drone</u>	
Physical Properties	
Length	23 in
Width	23 in
Height	4 in
Top Speed	11 mph
Acceleration	3 m/s
Range	50 meters
Weight	4 lbs
Electronic Properties	
Battery Size	1000 mAh
Battery Life	36 min
Radio Communication Range	50 m

Environmental Detection	
Camera Resolution	720p
Object Detection Range	7 m
Accuracy of Color Detection	95%
Accuracy of Distance Reading	95%

Communication	
Drone to Boat	True
Image Interpretation	True
Controller to Motors	True
Remote Kill Switch	True
Lidar Interpretation	True

Method of Validation and Discussion of Measurement

Targets will be validated in a simulated environment either at the FSU reservation or the FSU swimming pool. Testing includes measurements to confirm many of the physical targets will be done. This includes, but is not limited to a ruler, measuring tape, scale, stopwatch, and a multimeter. Additionally, visual confirmation will be used to assess some of the targets.

This includes the critical environmental detection tests for both the drone and the boat. This test will be a binary pass or fail. The boat and drone will be set in place and simulate the conditions of the competition. This includes colored buoys, obstacles, and other factors to simulate the conditions. The project will then be run. If it completes the assigned task, a pass will be given to the environmental detection portion. Communication between the boat and the drone will be under the same type of validation. If both the camera feed is seen by the boat and the boat can control the drone, a pass is deemed to the target. This will be tested by visual confirmation on the computer screen and the drone moving.

Derivation of Targets/Metrics

The targets and metrics were determined based off of the RoboBoat and Drone competition rules provided by RoboNation. The hardware specs were listed of the current hardware provided by the legacy team. Additionally, the critical targets were chosen based on the sponsor's key goal. The key goal of the sponsor is successful boat to drone communication. The key goals included this and all functions necessary to test this. For example, accuracy of color detection is required for the automation qualifying event. This qualifying event is required for the raise the flag test, which involved the boat to drone communication. The remote kill switch was chosen due to the fundamental requirements of the boat to compete in competition.

Critical Targets/Metrics

The critical targets are remote kill switch, physical kill switch, turn radius, max speed, object detection range, accuracy of color detection, and accuracy of distance reading. These tasks are directly related to completing the tasks required by the competition. The kill switches are necessary for entry to the competition, so we need to verify the functionality of both the remote kill switch and the physical kill switch on the boat. We will try to minimize the turn radius to be able to complete point turns for maximum maneuverability. The max speed will try to be maximized to complete the

tasks as quickly as possible. The accuracy of color detection and accuracy of distance reading will try to be maximized to be able to complete the tasks in a variety of environments such as rain, different reflections off the buoy, and unsteady water conditions.