

Preliminary Mission Statement for 2006 AUV Competition

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We are releasing this preliminary mission statement for comment by the teams. Please email your comments to Technical Director Dave Novick no later than February 28, 2006. We will review the comments and release the mission statement and rules as soon as possible there after.

Schedule: The location and date for the 9th annual competition have not yet been set in stone.

Mission: The fundamental goal of the mission is for an AUV to demonstrate its autonomy by completing three tasks. The first is to rendezvous with a “docking station” (Station A). The second is to inspect a pipeline, with the vehicle finding and marking one of four bins in the pipeline (Station B). The third task is to home in on an acoustic beacon and breach within a surface zone marked on the surface with floats (Station C). These three tasks can be completed in any order. A random order light box will be positioned just outside the gate and will be used to signify which of the four bins from Station B to drop markers in.

We expect each vehicle to have 15 minutes to complete the tasks (with an additional 5 minutes of dock preparation time). Any vehicle that touches the docking station, places at least one marker in the bin or on the target area and has the vehicle surface (at least briefly) fully within the recovery zone (no part outside the zone) will receive bonus points proportional to the unused time. Each vehicle must begin the run by passing under a validation gate. At any time during the run, if a vehicle breaches the surface, the run is terminated (See the section "Breaching" for an exception).

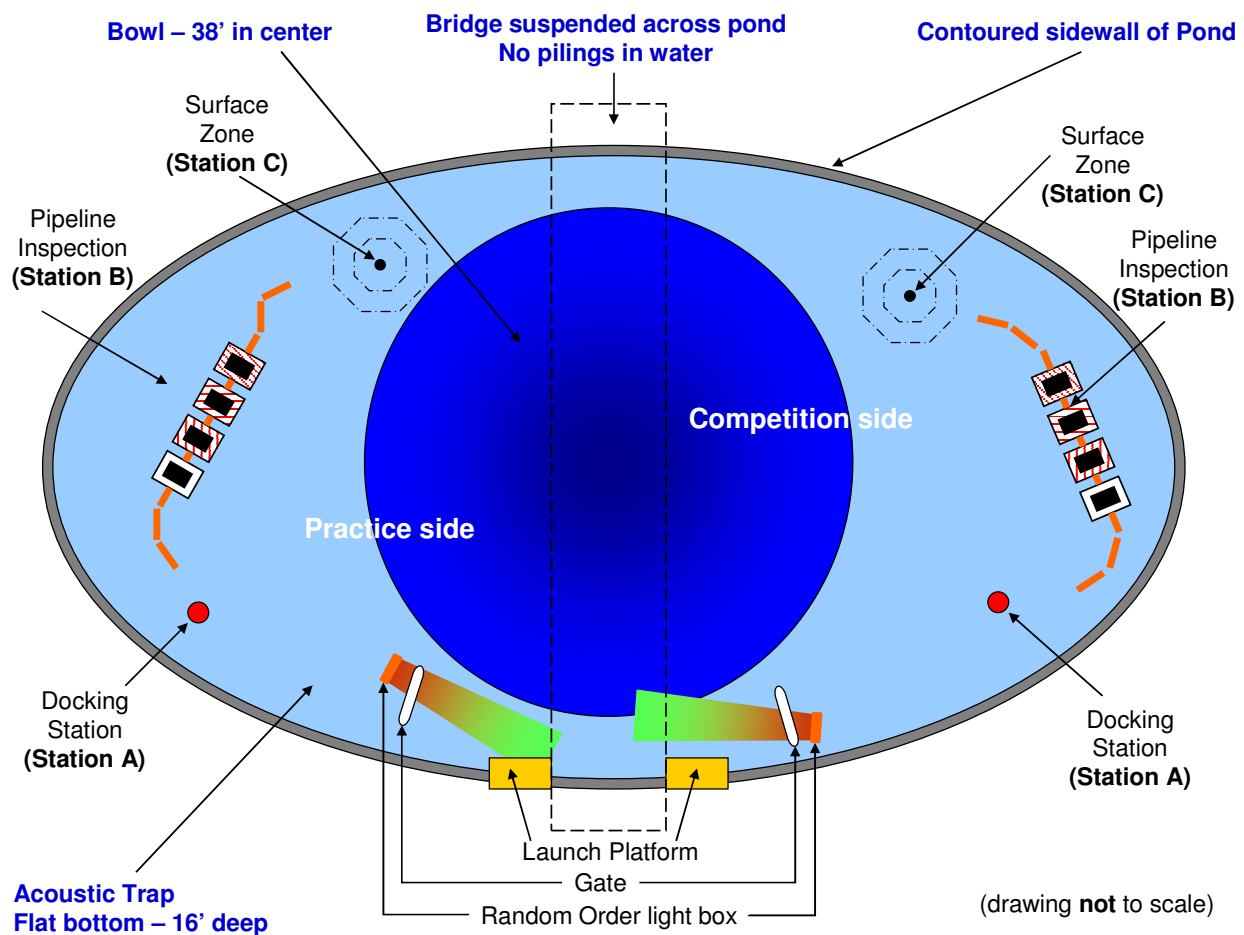
Weight and Size Constraints: For the 9th International AUV Competition, each entry must fit within a six-foot long, by three-foot wide, by three-foot high “box” (1.83 m x 0.91 m x 0.91 m). Table 1 shows the bonuses and penalties associated with a vehicle’s weight in air.

Table 1. **Size and weight constraints on AUVs entered into the 2006 competition**

	Bonus	Penalty
AUV Weight > 140 lbs (AUV Weight > 63.5 kg)	N/A	Disqualified
140 lbs ≥ AUV Weight > 110 (63.5 kg ≥ AUV Weight > 50 kg)	N/A	Loss of 250 + 5 (lb – 110) 250 + 11(kg – 50)
110 lbs ≥ AUV Weight > 70 (50 kg ≥ AUV Weight > 32 kg)	Bonus of 2(110 – lb) 4.4(50 – kg)	N/A
AUV Weight ≤ 70 lbs (AUV Weight ≤ 32 kg)	Bonus of 80 + (70 – lb) 80 + 2.2(32 – kg)	N/A

Question to the competitors: In the past any light source was modulated at two different frequencies, for example the docking station had a 3 kHz signal gated on and off at 3 Hz. Do any of you use the higher frequencies for detection? Can I remove the higher frequency and just modulate the light at 3 Hz? This will increase the brightness of the light.

Placement of Competition Elements in the Arena: The Launch point, Gate, Docking Station, Pipe Inspection, and Recovery Zone will be placed in such a way as to not have any three elements along a line.



Description of Tasks:

Docking Station (Station A) – This task consists of a docking station with an omnidirectional **RED** light. The light will be modulated at two different rates. The light will blink on and off at a rate of 3 Hz (**assuming that the higher frequency is not necessary**). The goal is to “dock” with the light, which means you have to push the

light away with your vehicle as you pass through (nose the light over). With a successful “dock”, the flash rate will change to 7 Hz for 10 seconds.

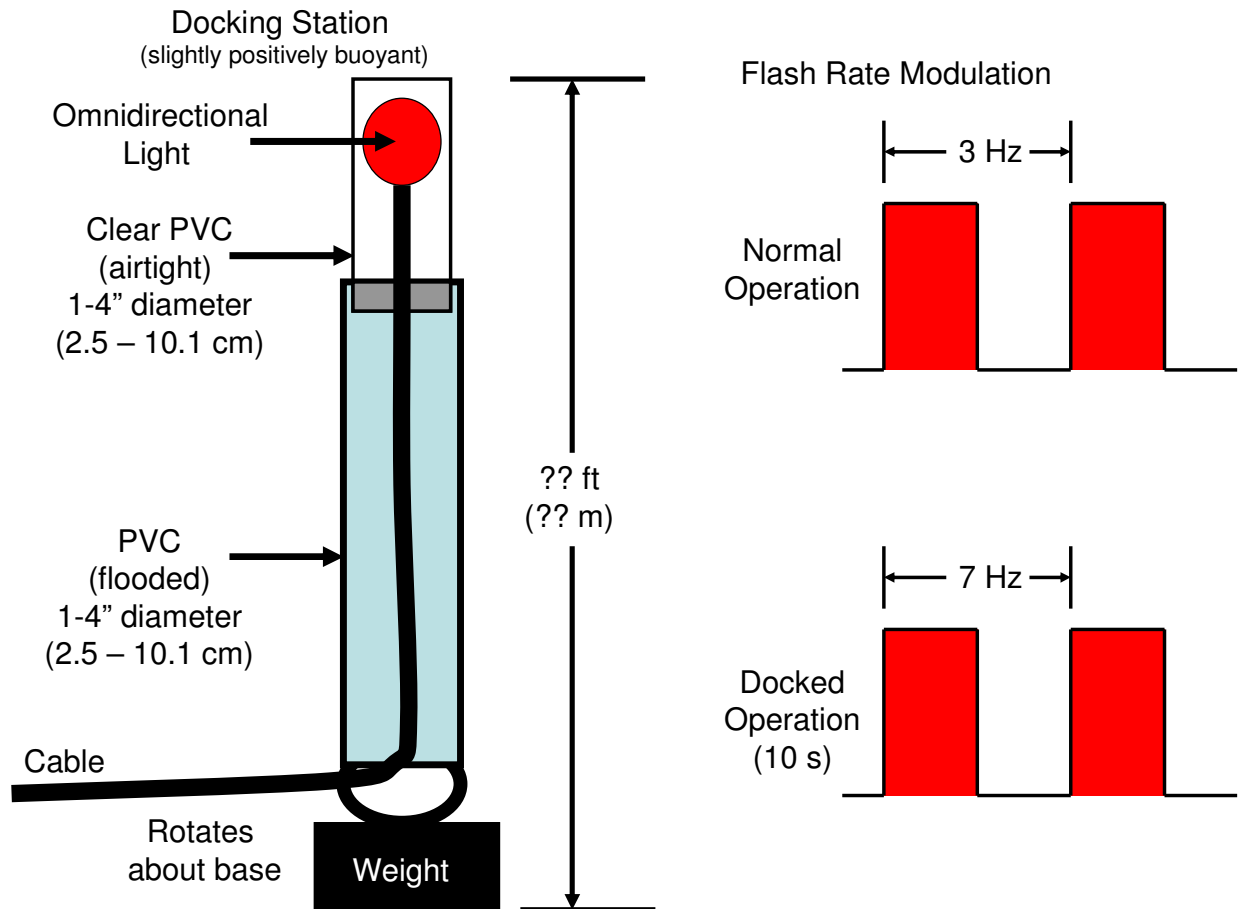


Figure 2: Docking station and flash modulation

Pipeline Inspection (Station B) - This task consists of a “pipeline” constructed of 3 separate 4 foot long sections of PVC snaking their way to four sequential 12” x 24” x 6” square bins (black in color). Each bin is separated by a distance of 2 feet. The pipeline will be constructed of 6 inch wide by 4 foot long sections of PVC sheet. It will be painted **orange (any other color choices?)**. See Figure 3.

The “pipeline” and bins are raised off the floor of the pool (1-2 feet) and the “pipeline” will not have a relative angle between two pieces of more than 45°. The two “lines” of the pipeline will, in general, point to the Docking station and the Surface zone. The black bin will be surrounded by a 6” white border. The longer edge of the bin will be aligned perpendicular to the pipeline, and each of the bins will be distinguished by a hatching style. One bin will have no hatching, one will have 45° hatching, one will have hatching parallel to the short side (parallel to the pipeline) and one will have hatching parallel to the long side (perpendicular to the pipeline) (**Preferences: Color of**

hatching? Thickness of hatching? Equal spacing between hatching and white space?)

Up to two markers can be dropped into the target bins. Each marker in a bin will score points.

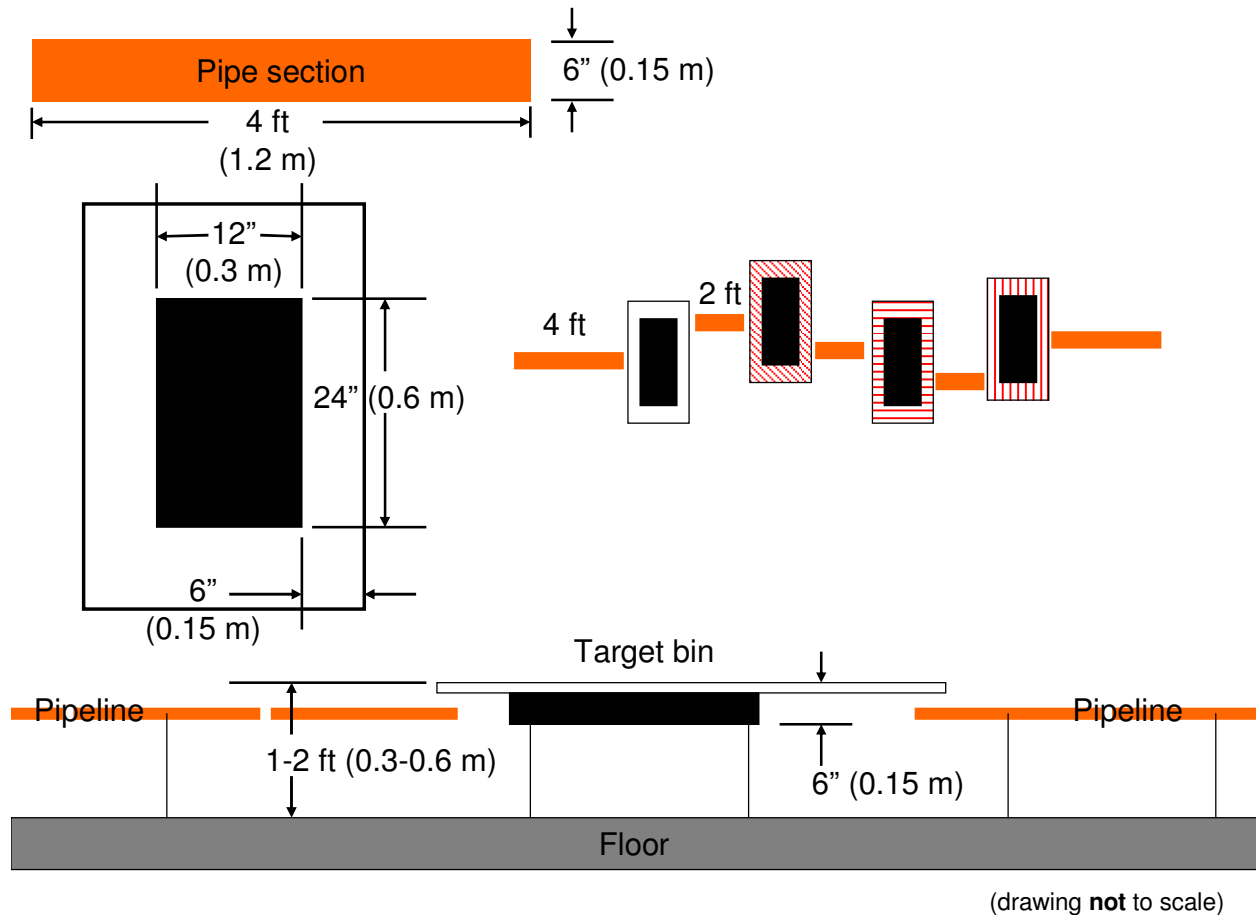


Figure 3: Pipeline inspection task

Marker – The specification for the markers is that each must fit within a box 1.5” square and 6” long. Each must weight no more than 1.5 lbs in air. Any marker that exceeds these limits by less than 10% will result in a significant point penalty. Any marker that exceeds these limits by more than 10% will disqualify that entry. Each marker must bear the team name or team marking.

Surface Zone (Station C) – This task consists of an acoustic pinger located off the floor of the pool. Floating above the pinger on the surface will be two concentric octagons representing the surface zone (**Diameter of octagons?**). In order to obtain full points for the zone, your vehicle must surface fully inside the octagon (the inner octagon worth more points then the outer).

The frequency range of the pingers will be in the range of 20-40 kHz. The competition and practice side pingers will ping at a range of 0.5 Hz (2 seconds), and separated by 0.9 seconds. The pingers will be synchronized.

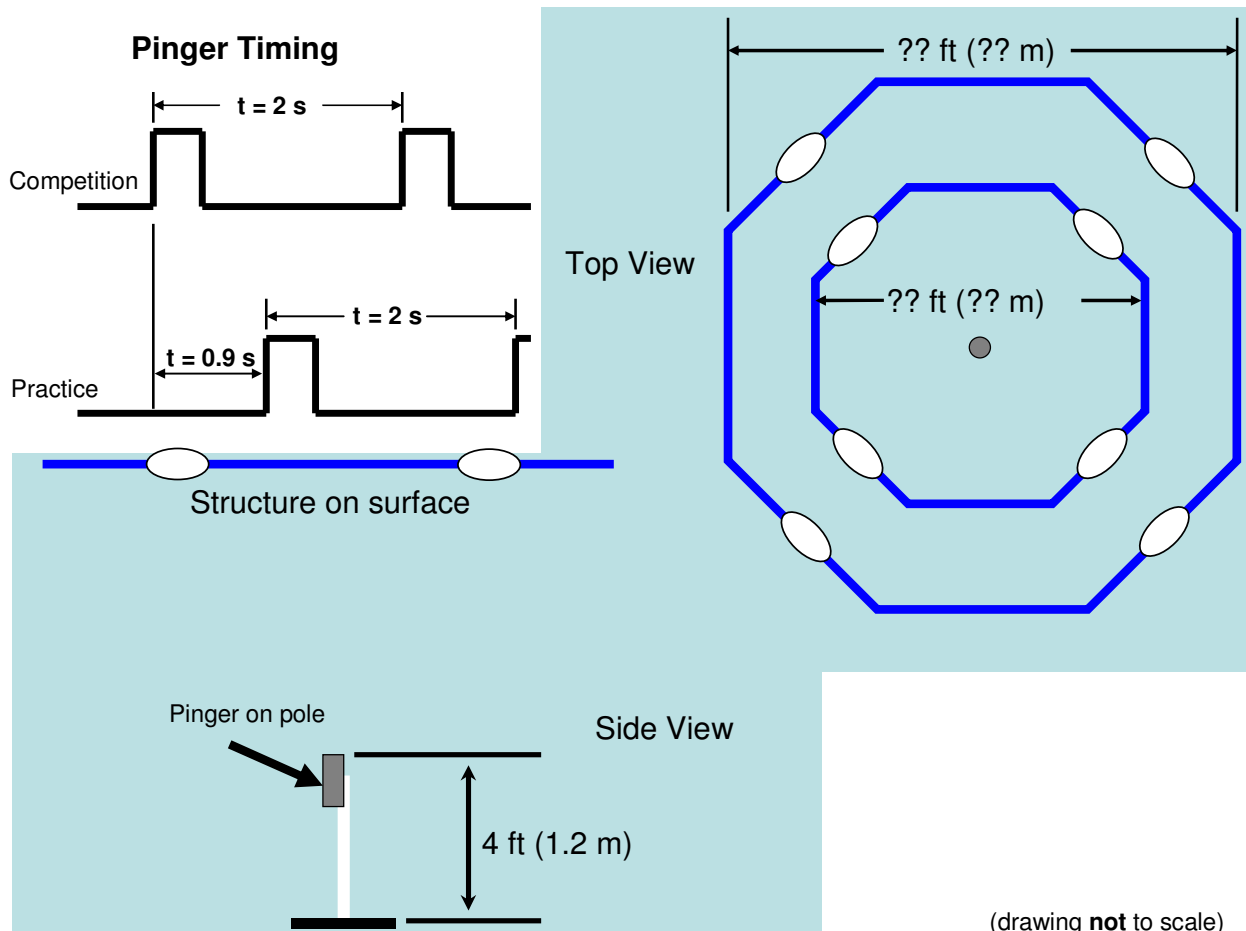


Figure 4: Recovery zone octagons

Scoring: Each of the three tasks has a point value associated with it. There are two different methods to score points. For both of these, you must first pass through the validation gate.

- **Method 1 (Your pipeline bin choice)** – Choose to drop your markers in any of the four bins.
- **Method 2 (Random pipeline bin choice)** – Read the random order light and attempt to drop the markers in the specified order bin.

For either method, the three tasks can be completed in any order.

Determining the random bin: A light box just beyond the gate will be used to display the random choice for the mission. When the vehicle starts on its autonomous run, the random selection is chosen and displayed on the light box.

The Information for the random order is shown in a light box and is encoded in color of the light and its dual modulation flash rate, similar to the “Docking Station”.

Red light with flash rates of	5 kHz flashed on/off @ 5 Hz = No hatch
Red light with flash rates of	2 kHz flashed on/off @ 2 Hz = Short length hatch
Green light with flash rates of	5 kHz flashed on/off @ 5 Hz = 45° hatch
Green light with flash rates of	2 kHz flashed on/off @ 2 Hz = Long length hatch

(**Do we need the higher frequency rate (5 KHz and 2 kHz)?**)

Breaching: When completing the sequence of tasks, station C may not be the last task to complete. In this case (and this case only) you will have to breach the surface (hopefully within the octagon) and then submerge again to complete the remaining tasks.

Interference: Vehicles that interfere with competition elements may be disqualified at the judges' discretion. "Interference" does not include cases where, in the opinion of the judges, a vehicle is attempting to complete one of the three tasks (e.g., brushing against the gate; nosing aside the docking station; brushing against the floating rings of the recovery zone). If a vehicle becomes entangled on the gate, docking station, or recovery zone floats, the run will be declared completed. Teams may keep the points earned on that run, or may have the AUV returned to the launching platform and start another new run. If a new run is begun, all points from the previous run are lost.