# ROV ENGINEERING STATION - QUICK GUIDE

**ROV Engineer & Explorer Program**
**Inland Seas Education Association**

PREPARE TO TEACH

**SET UP STATION MATERIALS**

- ☐ Meet with the Lead for information about today's program (e.g. grade/ages, group, or time changes).
- ☐ Set up ROV kits (bins), 4 on main cabintop, 1 on starboard aft cabin top. Place extras bin on aft cabin top.
- ☐ Set vertical buoy ~6-8 feet from dock in the water; set up testing zone; gather diving rings, balls, etc.
- ☐ Place battery packs near the testing docks. Ensure all are plugged in and charged between programs.
- ☐ Gather colored prompt cards for the students. Smile!

**PURPOSE**

Students will work in teams to **design**, **build**, and **test** their own ROV design to accomplish a series of 3 missions. This is meant to be hands-on, exploratory, and a bit challenging. There is time for students to explore designs (even ones that you know will not work well) and then **modify** and **re-test**.
Allow them the chance to attempt a poor design. They will learn best by doing.

**YOUR ROLE AS A GUIDE**

Students will need your help to define "the problem" (the mission) and with the actual testing (staying safe). DO NOT BUILD FOR THEM. It's your job to *guide* the students through critical-thinking of their design.

## GUIDING THE STATION

DEFINE

### ❶ Scaffold challenges from easy to hard

**What will you have to do?**

Ask each team to define the problem to you.

→ *Do they understand what they are being asked to do?*

**Rotate among the teams; check with each at their workstation**

**Create a SOLUTION to the problem with a Remotely Operated Vehicle**

DESIGN

### ❷What will your ROV need to do?

- Navigate around an object?
- Stay on the surface?
- Gather or scoop objects?
- Sink to the bottom and rise?

**Explore the Kits!**

**Encourage:**

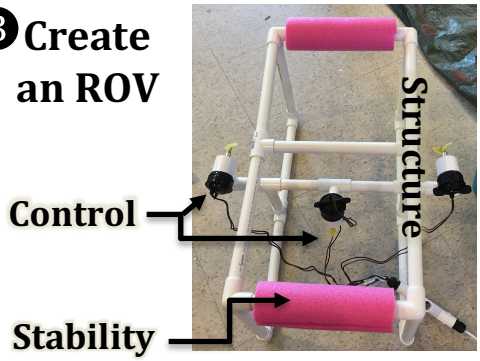
- everyone to *listen* to each other's ideas
- Incorporating *multiple ideas* into one design
- All hands a part of building

***(Many solutions exist)***

BUILD

**BUILD an ROV**

### ❸Create an ROV




**Critical Thinking**

What will the ROV do if we drop it in the water right now?

***Sink, roll over, fall apart?***

**SAFETY**

Wires NEED to be:

→ Untangled

→ Gathered, secured with Velcro straps to ROV

TEST

## ❹ TEST YOUR ROV

Attempt to complete your mission at the testing dock!

→ *Everyone helps carry ROV*

→ *A GUIDE must accompany each team at the dock*

**Pre-Launch Checklist @ Testing Dock**

- ☐ **Power ON?** Plug into battery
- ☐ **All Clear?** Clear propellers from obstructions (wires, hands)
- ☐ **TESTING** Test all motors
- ☐ **Ready to Launch?** Place into water, **DO NOT THROW**

**ASSIGN JOBS:**
*Rotate students through jobs*

**Pilot** ↻ **Tether** ↻ **Spotters**

**CONNECTION: Can you think of a real world problem this mission mimics?**

ASSESS

*While ROV is in the water* **- Assess the EFFECTIVENESS of the design**

❺ After all groups have tested at least one design, ask each group to name their ROV and present. Share a) something that works well and b) something they plan to change. Encourage teacher to take group picture at this time.

## ❻ Did the design accomplish the mission?

☹ not at all
*Did it do what you thought it would do?*
What do you <u>need</u> the ROV to do that it cannot do? *Turn? Float? Sink?*

↓ go to step **7: Modify** ↓

😐 sort of…
*Did you accomplish by luck, or accident?*

How can you improve upon ROV design?

↓ go to step **7: Modify** ↓

☺ YES! Nice Job!
***As a team:***
- Move on to next mission

↑ return to **step 1** ↑
OR Begin Wrap-UP

MODIFY

**IMPROVE the design with *Trial* and *Error***

**❼Identify** an **issue** with the current design
➢ *Control? Bouyancy?*

→ **Modify** to affect the **issue** → **RE-TEST**

+/-

↑ **Return to step ④** ↑

❽**When 20 min remain**, host challenge game! 7-10 min to rescue as many objects as possible. Assign points (e.g. floating objects 2pts, sinking 50pts). After game, **Wrap-Up** ↓

WRAP UP

→ **ASK:** How did your team do today? What successful strategies did you notice?

→ What are some "real world" problems an ROV could be used to help solve? What are some problems that you know about on the Great Lakes?

CLEAN UP

- ☐ **<u>Students</u>** dis-assemble ROVs, LOOSELY coil tether, put all components back in bins.
- ☐ Gather notebooks, colored mission cards, Velcro, and floats.
- ☐ Bring all batteries back to a central location away from water. Keep batteries dry!
- ☐ Plug in batteries! Alert Lead if broken, missing, or wet.
- ☐ Inventory bins for next group, begin packing up if end of day.