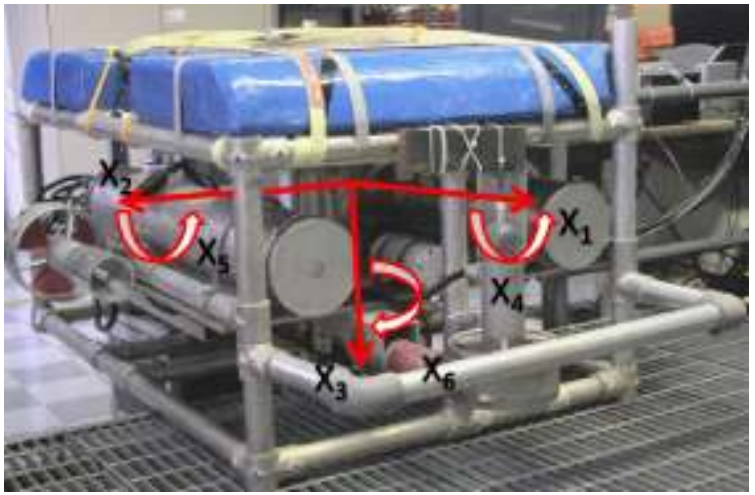
Test Tank Development Platform
Abstract Presentation

Test Tank Development Platform

We propose to design and build a test-tank capable tethered platform to enable testing of instruments and algorithms destined for MBARI's ROVs and AUVs.

Motivation

- The miniROV provides some of this utility but is often unavailable
- Accelerate development cycle
- Instrument development/calibration
- Algorithm development
- Increase likelihood of success at sea - makes better use of sea time



Johns Hopkins University test tank ROV

Alignment with MBARI's Goals

- This enabling technology is relevant to all the themes of our Strategic Plan. In particular, many of the initial use cases fall into the categories of Ocean Visualization and Ecosystem Dynamics
- This project also aligns with the engineering opportunities outlined in the Tech Roadmap, especially taking the lab into the ocean and advancing persistent presence.

What is it

- A tethered platform that:
  - Reuses of the MiniROV technology
  - Is only test tank capable
  - Has interfaces compatible with MBARI's ROVs
  - Is capable of carrying large instrument payloads
  - Operable by scientists and engineers

What capabilities will it have

- Multiple HD video channels
- Standard MBARI ROV interfaces:
  - Science ports
  - Fiber multiplexer
  - Common bus voltages
- Configurable tool skid
- Subset of MiniROV Labview control software
  - Hooks available for direct control
- Open frame concept
  - Configurable thrusters
- GigE
- Auxiliary video cameras
- Spare fibers
- DVL (Optional)
- BYO sensor/payload

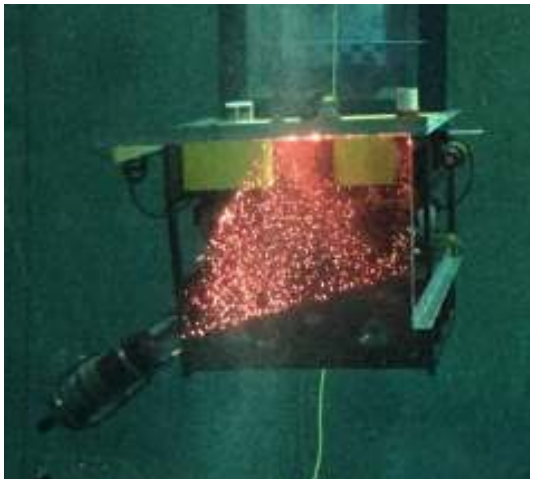
Use Case

- Kakani Katija
- Kelly Benoit-Bird
- Matt Kemp
- Steve Rock

Use Cases - Katija

Kakani Katija proposes to use the TTDP to develop instrumentation that will:

1. Allow for fluid visualizations of reflective surfaces
2. Expand the utility of DeepPIV to measure three-dimensional fluid interactions
3. Quantify temporally varying, shape-shifting surfaces for bio-inspired design applications.



Each of these instrument packages will benefit from the use of TTDP as a test bed and calibration platform prior to cruise deployments.

Use Cases – Benoit-Bird

Kelly Benoit Bird would use the TTDP as a development platform for new acoustic sensors, allowing her to experiment with :

1. Sensor placement
2. Integration with imaging systems
3. Coordinate movement, lighting, calibration and intercomparison
4. Facilitate the development of in situ methods including calibration approaches

“I will tell you that a test tank vehicle would have been very helpful to work out bugs! We spent a couple of hours of our cruise diagnosing cabling issues that only became clear when the ROV was in the water and had one other problem that couldn't be dealt with at sea but was easily fixed in the tank once we replicated the conditions correctly.” – KBB

Use Cases - Kemp

Matt Kemp could make use of TTDP for testing the docking capability of his “sea hive”, which would require thousands of test docks to ensure reliability.

Traditional ship-based approaches would be cost-prohibitive (5,000 hours of testing @ 8 hours per ship day = 62 days at sea = $5M+)

A low-logistic, flexible platform in a controlled environment like the test tank, could achieve cost-realism through testing automation.

Use Cases - Rock

Steve Rock could use the TTDP to aid the development of all of the vision-based control algorithms required in the Precision Control Project.

This includes algorithms for tracking midwater targets (e.g. jellies) as well as advanced control approaches for performing benthic transects using both ROVs and AUVs.

Currently, the only means of validating these control laws is to perform sea trials. The test tank platform would enable a much more time-efficient and much less costly means of performing all the preliminary tests.

Resource required- Estimated Expense

MiniROV Material Costs (see following worksheets)		
	MiniROV	TTDP
ROV	$247,700.00	$63,000.00
Winch	$118,800.00	
Top side gear	$62,800.00	$26,500.00
Smart Clump (2018)	$96,250.00	
Additional items	$85,000.00	
Total	$610,550.00	$89,500.00

< 5 Ventana Days

Estimated continued annual maintenance cost is ~ $5000.

Resources required- Estimated Labor

- Machine Shop
- Technicians
  - Etechs: 240
  - Mtechs: 480
- Engineering time
  - ME: 400
  - EE: 300
  - SE: 280

Other issues

- Who takes care of it: Dale
- Where does it live:
  - Topside controls: ME lab previously used for miniROV
  - Vehicle could sit where nitrogen tanks were previously stored
- If needed this project can be split over two years to lessen financial and labor impact