

BOS OPERATIONAL DESIGN REVIEW

MBARI PROJECT 901704

ERIC MARTIN

OVERVIEW

- Operational Requirements
- BOS Gen I Design Overview
- Test Platforms
- Operational Scenarios
- Required Components
- Cost Estimates
- Future Considerations

OPERATIONAL REQUIREMENTS

(FROM MARCH 2017 PDR)

- Must operate tethered
- Must be depth rated to 300 meters
- Must operate in a benthic environment
- Must be able to land on or hover above rocky outcroppings
- Must capture stereo video
- Must have near 360 degrees of stereo video coverage
- Must be able to collect data from up to 30 sites within a normal operational ship day
- Must be able to be deployed from various vessels of opportunity
- Must provide real time telemetry data for positioning including video, depth, and heading

OPERATIONAL REQUIREMENTS

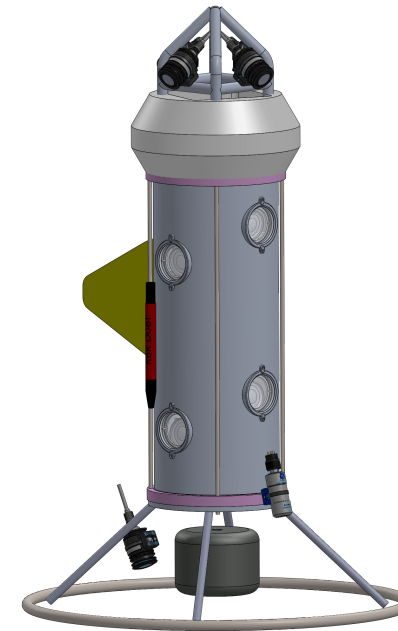
(FOR 2017 FROM THE RV JOHN MARTIN AND RV SHEARWATER)

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- ~~• Must have near 360 degrees of stereo video coverage~~
- ~~• Must be able to collect data from up to 30 sites within a normal operational ship day~~
- Must be able to be deployed from **R/V John Martin and R/V Shearwater**
- Must provide real time telemetry data for positioning including video, depth, and heading

BOS CURRENT DESIGN

- Height: ~60" ,Weight: 250lbs (air)*
- Components:
 - Stereo Camera Pair
 - Lights (5)
 - Downward Video Camera
 - T.D. Sensor
 - Compass
 - Coaxial PU Tether w/o strength member.
 - Tow & Current Vane

*pending review on 6/2/2017



CONSIDERATIONS FOR SEAGOING INSTALLATIONS (UPDATED FROM PDR MARCH 2017)

- Max system weight (including clump): 500 lbs
- Allowing for dynamic loading a tether must have an SWL of 875lbf, and via CFR189 the NBL of the tether must be greater than 2,665 lbf.
- The tether must be the weakest link.
- The winch must have a brake rated above 2,665 lbf.

TEST PLATFORMS

R/V John Martin and R/V Shearwater

R/V JOHN MARTIN

INITIAL TESTING



Winch



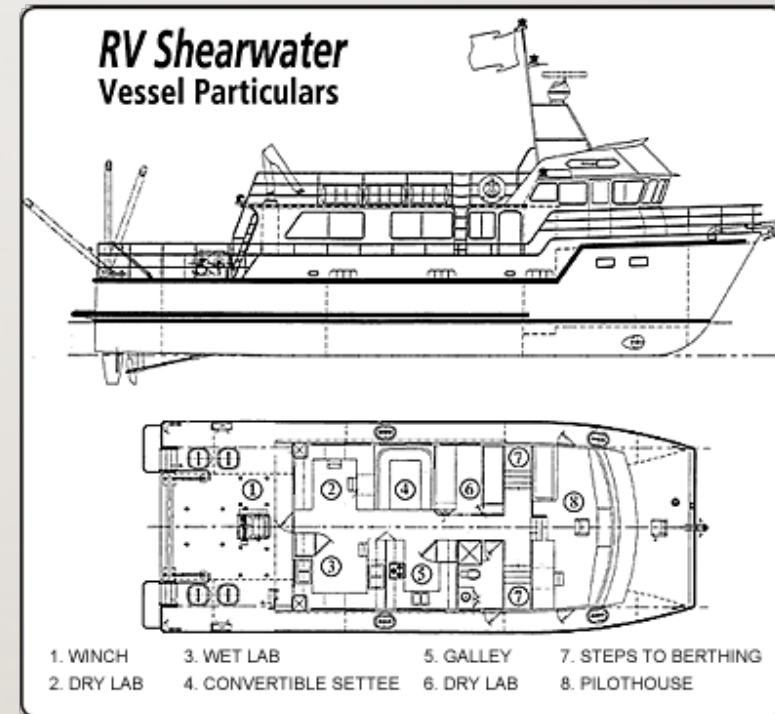
Aft Deck

- A-Frame: H: 116" W: 102"
- Winch: 1,500m 1/4"SC
- SWL: 1,000 lbs
- Deck Space: > 10'x10'
- Powered Capstan: Yes

R/V SHEARWATER

IMPACT STUDY

- A-Frame: H: ~14' W: 10'
- Winch: 1,800m of 0.322"Ø CTD MC
- SWL: 800 lbs
- Deck Space:
 - F/A 7'
 - P/S 10'



OPERATIONAL SCENARIOS

For evaluation on R/V John Martin testing days

- Using the winch wire, directly shackle it to the BOS and secure it to the coax using cable straps until the clump and then the line hooks to marry the two after that. Football Float in the middle of section b/t clump and BOS. Clump wrapped on with Yale Grip.

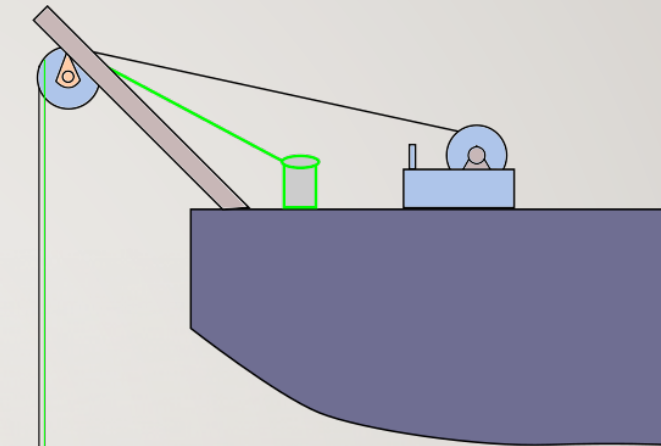
- **Pros:**

- Payout monitored.
- Familiar operation for equipment handlers.

- **Cons:**

- Requires over the side marrying operations.
- Heaviest cable for floated section.

DIRECT WINCH CTD WIRE



STRENGTH: CTD WIRE

PWR/TEL: COAX

Deploy using only a synthetic strength member such as Spectra, using a hydraulic capstan to lift and drop the lander. The clump is attached using a shackle, and the coax is married over the side. It's possible to premarry the cable to the spectra, but the capstans can be too small for this in some uses

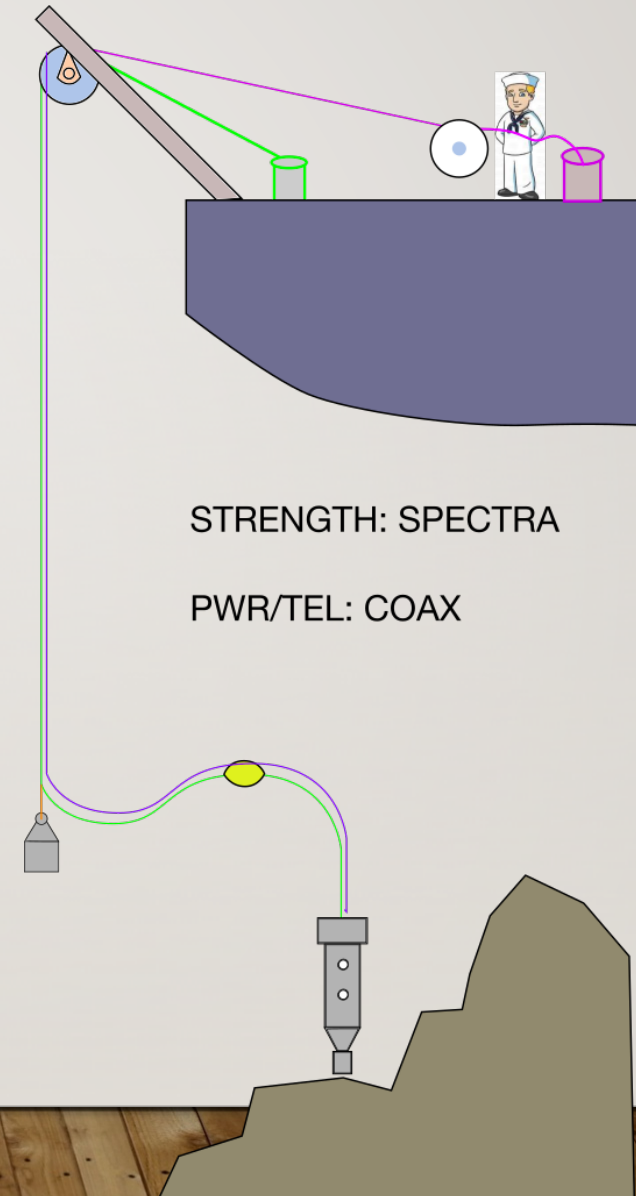
- **Pros:**

- Float may be unnecessary, but is still recommended.
- No Yale Grip for clump attachment. Likely put a bite in the line.

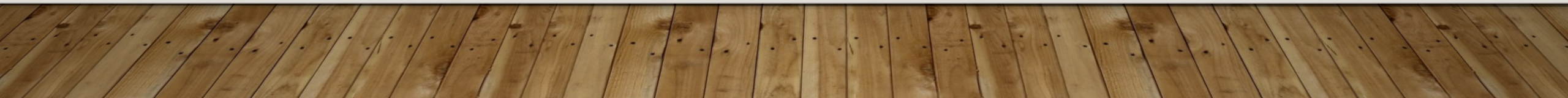
- **Cons:**

- Slightly more dangerous operation, since the line must be handled by hand.
- Requires over the side marrying.
- Manual payout counting.

SYNTHETIC ROPE



REQUIRED COMPONENTS



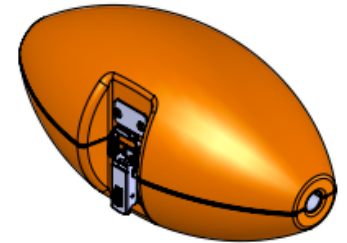
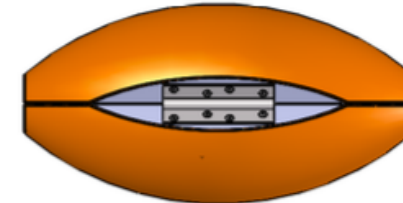
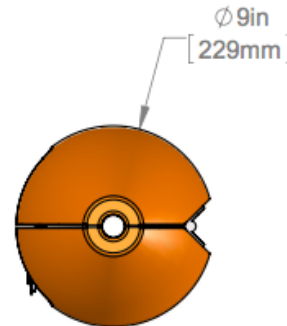
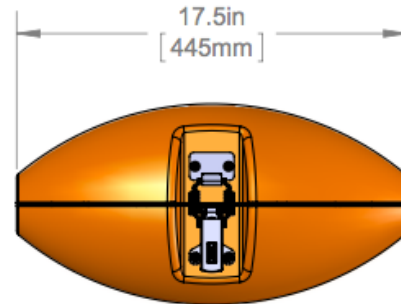
CABLE FLOAT

DEEPWATER BUOYANCY 9" CABLE FLOAT

- Wraps w/ latch around tether
- Widely used in ROVs
- Offers least fouling opportunities

Notes:

1. Exterior Surface: ABS
2. Hardware: Stainless Steel
3. Cable / Pipe size: Per Customer Specification



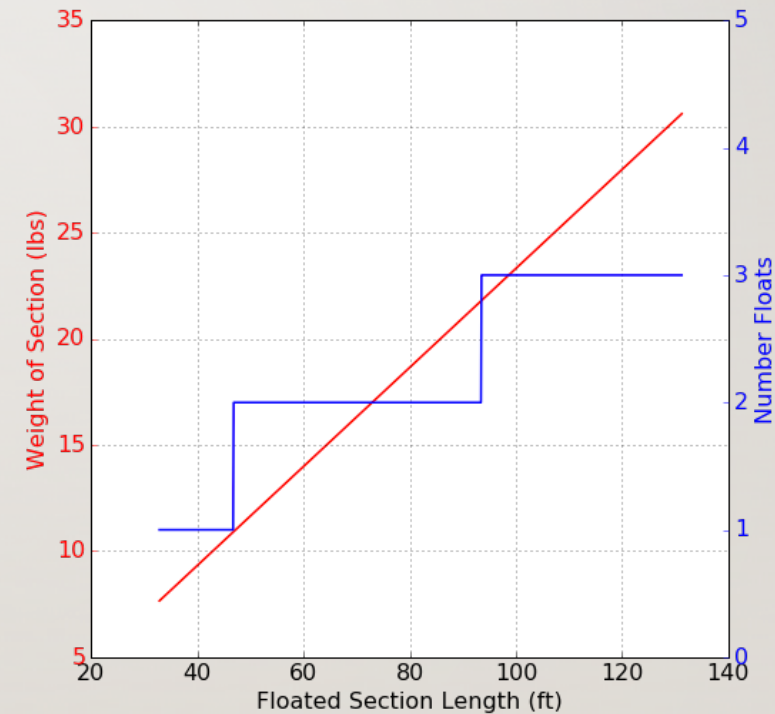
SALES DRAWING ONLY
NOT FOR PRODUCTION
SUBJECT TO CHANGE
PROPRIETARY

- Seawater Buoyancy 11.7 lb (5.3 kg)

FLOAT REQUIREMENT FOR SECTION LENGTH

- Estimate for Worst Case Weight + 10%
- R/V Shearwater CTD Wire
 - 0.322"Ø
 - 149 lbs/kft
- Falmat FM030115-2
 - 0.304"Ø
 - 63 lbs/kft
- Each float 11.7 ± 0.8 lbs

Floated Section w/ 0.322" Ø MC Wire



STRENGTH MEMBERS

Description	Location	Wet Weight / Length	Diameter	Breaking Strength
SC Steel	R/V John Martin	??	0.257" Ø	6,300 lbf
MC Steel	R/V Shearwater	143 lb/kft	0.322" Ø	10,000 lbf
Spectra	Lander	< 0 lb/kft	0.250" Ø	6,050 lbf

BOS ATTACHMENT

- A breakaway component will be added at the top and base of the Lander, so that a line break can be avoided.
- As pictured this style maxes at 4,000 lbs NBL, a larger version is 6,000 lbs. All proposed strength members exceed 6,050 lbf NBL.
- If final weight is below 500 lbs, the lower unit is acceptable.
- There is some hazard to monitor from the gear locally falling back onto the frame.



TETHER MARRYING

- Surface to Clump
 - Continue to use long line clips
- Floated Section
 - Use Hook and Loop Cable Ties
 - Will help prevent fouling, as float will engulf the pair.
 - Lighter Weight



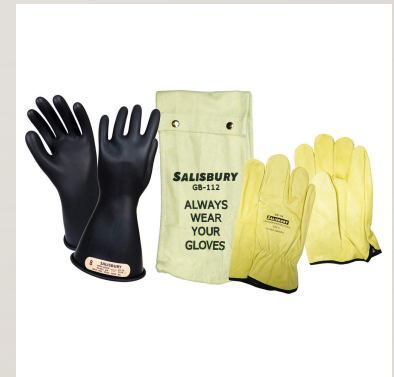
CLUMP APPLICATION

- Clump weight is mandatory for keeping the tether safe during stern operations on both platforms.
- The clump is also mandated >50lbs on the R/V John Martin for safe drum storage.
- CTD Wire Deployment:
 - Use Yale Grip to attach.
- Spectra Line Deployment:
 - Put a bite in the line that passes through the block



SAFETY EQUIPMENT

- Tether will be energized at 480VAC, appropriate safety gloves for all handling the cable is appropriate.
- Class 00 Electrical Glove Kits Recommended
- Other standard ship rules apply, hardhats, steel-toes etc.



Component	Part Ref	Part Link	Unit Cost	Quantity	Total Cost
Tether	Shallow RG6 19 AWG 0.304" ø	Falmat	\$2.50	500	\$1,250.00
Floats	9" Cable Float, Hinge and Latch, 750m	DeepWater	\$425.00	3	\$1,275.00
Long Line Clips	TBD		\$-	0	\$-
Clump Weight	Borrow		\$-	0	\$-
Yale Grip	YALE GRIP: 7/16" x 04.5' w/ 6"Eye Color RED Cable Diameter of Cable- (3/16"-1/2") WLL - 1,200 Breaking Strength-6,000 lbs	YaleGrips	\$112.00	2	\$224.00
Spectra Line	HTS 75 3/16" Red, 6,050lb. Breaking Strength	Port Supply	\$0.58	820	\$475.60
Buckets	TBD		\$-		\$-
Velcro Cable Ties	Velcro ties, orange pack of 10	McMaster	\$6.15	10	\$61.50
Tether Block	TBD		\$-	0	\$-
Shackles	TBD		\$-	0	\$-
Weak Link	DCD Breakaway Series 00560 or 00530	DCD Design	\$288.84	1	\$288.84
Safety Gloves	Salisbury Class 00 Saftey Gloves	Grainger	\$151.00	2	\$302.00
Total:					\$3,876.94

ESTIMATED COSTS

NEXT STEPS

- Orders wait until after mechanical review completed and tether ordered.
- Order float (4 weeks ARO)
- Finalize other components selections

QUESTIONS?
