Multibeam Test Plan

April 6, 2004

1 Tail Section Lab Tests

1. Verify Ethernet operation.
   (a) MVC to shore on cable.
   (b) MVC to shore on Freewave.
   (c) MVC to PLC.
2. Test Argos and strobe overnight using backup alkaline batteries. (Replace the pack before sea trials).
3. Test Argos operation with Sib's ham radio, and possibly with other (Pickirell) receiver.
4. Test Drop weight and Acomms backup Li battery overnight. Recharge the battery before the sea trials.
5. Verify rudder, elevator and propeller motion using tailConeTest.
6. Test the drop weight using the test program dropWeightTest; verify that the LED switches on when the operator commands a drop.
7. Kearfott wiring test. Verify new wiring is correct.
8. Move vehicle outside for Kearfott Nav/GPS test. Verify it aligns correctly. Verify GPS is receiving and logging correctly.
9. USBL test. (How can we exercise it in the lab? Bucket test?)
10. Test Environmental sensors on the fan card. Recheck pressure sensor calibration when the sphere is sealed.
11. Perform a heading control test. Run a heading set point mission. While the mission is executing, yaw the tail section and verify that the rudder opposes the motion.
12. (Optional) Acomms/LBL test. Verify operation. Test the acoustic abort and drop-weight commands in air. (Rich).
13. Test MVC-to-PLC sonar behavior. Simulator?

2 Pool Tests, Whole Vehicle in the Water

1. Ballast the vehicle; ensure correct trim and buoyancy.
2. Verify that the strobe shuts off when the vehicle is underwater.
3. Verify Argos operation with Ham radio or other receiver.
4. Test USBL as much as is feasible in the pool.
5. Verify Dvl operation (may not be conclusive in the pool).
6. Perform a pitch control test. Run a zero pitch set point mission. While the mission is executing, pitch the vehicle and verify that the elevator opposes the motion.
7. Turn on side-scan; verify that it is running and logging.
8. Turn on sub-bottom; verify that it is running and logging.
9. Verify that the Sonar Behavior can operate the Edgetek sonars through the PLC.
10. Drop weight test that actually releases the weight.
11. Run a long mission with propulsion.
12. Remove tether; verify Freewave operation.

3 AUV on Zephyr at the Dock

Note: At least a day is required to reconfigure the L&R system for this vehicle versus the DMO vehicle due to the increased mass and length (327 to 497 cm).

1. Verify that the AUV will fit in the DMO cradle (may require modifications to the cradle supports due to hull shape). Check antenna/transducer clearances. Cradle may require modifications because of the LBL shroud. Ship tie-down bolt holes in the cradle may have to be relocated to shift the cradle position on deck.
2. Have Lance inspect the AUV so he can anticipate L&R winch strap locations.
3. Inspect vehicle in L&R system; ensure that antennas, LBL shroud, Receive Ring, etc. have appropriate clearances and will not be damaged by L&R.
4. Verify that the tow cable fits in the tow hook on the nose.
5. Verify that the necessary support electronics are present on the Zephyr for operation:

   (a) Laptops networked and working.
   (b) Mount Acomms transducer on the starboard (not USBL) pole.
   (c) Setup the Acomms deck box; verify that the transducer is working.
   (d) Ensure that the charging/data tether fits and works, and we don't have to run a new cable.

6. Test the Freewave.
7. Test the operations software, scripts and GUIs. Run a test mission on deck and plot the data; verify end-to-end data flow.
8. Verify tail cone and prop motion.
9. Kearfott Nav/GPS test. Verify the Kearfott/Ashteck receives GPS while in the L&R system.
10. Verify the Zephyr's Argos locater is working. (Eric Nelson). Test it with the AUV's Argos transmitter.
11. Test the shipboard USBL transmitter. Ensure the head is working and the pole is ready to be deployed.

4 Sea Trials

4.1 Vehicle on the Surface, Propulsion Off

1. Verify at-sea GPS operation.
2. Verify Kearfott Navigation is working and correct. (Wait for the alignment to complete.)
3. Measure the range of the Freewave by driving away from the AUV until loss of signal.
4. Measure the range of the Argos Transmitter similarly.
5. Test USBL on the surface, bearing in mind that no signal is inconclusive.
6. (Optional) Turn on side-scan; verify that it is running and logging.
7. (Optional) Turn on sub-bottom; verify that it is running and logging.

4.2 Vehicle Underway

1. Test heading control/navigation on the surface with a set point. Adjust control gains if necessary (Rob).

2. Test depth envelope. Run it into the limit and verify that the mission aborts, using only a simple set point.

3. Test pitch control and dive ability. Constant pitch set point at 10 degrees to 15 meters. Adjust control gains if necessary (Rob).

4. Test depth control. Several straight-and-level flights at 5-30 meters depth under set point control. Test depth changes.

5. Verify that Kearfott/Dvl navigation is not corrupted by sonic interference from the side-scan or sub-bottom sonars. Beware that the Kearfott heading does not involve the Dvl, so corrupted Dvl data will not affect set point operation, but will affect way-point operation.

6. Take sub-bottom and side-scan sonar data. Turn on the sonars on while on deck if necessary.

7. (Optional for first Sea Trials) Verify that way-point control works properly. In this case the control system uses the Kearfott's position estimate, and will move accordingly.

8. (Optional for first Sea Trials) Verify that CTD data is passing correctly into the PLC.

9. (Optional for first Sea Trials) Test yo-yo behavior.

10. (Optional for first Sea Trials) Speed steps; determine maximum and minimum AUV speed.

11. (Optional for first Sea Trials) Verify validity of the sonar data (Dave).

12. (Optional for first Sea Trials) Measure rudder-fixed turn rate.

Other:
Prepare a set of mission scripts before going out on the Zephyr. Beware that we must always leave sufficient time for the ship to find and contact the AUV BEFORE the abort script ends or the AUV will DROP THE WEIGHT.

Rob to check control gains for 497 cm.

Notes:
Today's junction box problems will probably prevent the PSA916 from operating until a new junction box is made.

We know that the Edgetek (side-scan and sub-bottom) sonars work and log data in the pool, through their respective stand-alone GUIs. Reson interface goes through the PLC and operates all 3 sonars. Separate Edgetek GUI that directly operates the two side scans Edgeteks.

Reson built the PLC.

Need to test that Rich's behavior succeeds in controlling the sonars through it's commands to the PLC.