

Project Number: 200107

Project START year: 2001

Project END year: 2003

Project Manager: David Caress

Seafloor Mapping

1) Abstract

We propose to continue a three-year project to accomplish the following:

- 1) Develop a capability for high resolution mapping of the deep ocean seafloor from the AUV Dorado and ROV Ventana.
- 2) Continue development of software for the processing and display of swath mapping sonar data (the MB-System package) through an NSF funded collaboration with the Lamont-Doherty Earth Observatory.
- 3) Continue development of tools for incorporating seafloor mapping data into MBARI's GIS tools.

2) Proposal

b) Approach to the problem

AUV Mapping System

The status of the AUV mapping system development may be summarized as follows:

- MBARI signed a contract with Reson in April 2001 for a Seabat 7100 multibeam sonar.
- We have recently received a draft Interface Control Document (ICD) from Reson detailing the mechanical, electrical, and network interfaces between the AUV and the sonar. We reviewed this document in a meeting with Reson on September 18, 2001.
- The expected delivery date for the sonar has slipped to **May 1, 2002**. This means that the ROV and AUV sea trials will now be planned for July and August of 2002, with more testing in September. This delivery depends on the success of an ASIC chip (pressure tolerant A/D + filtering in the receive array) to be delivered to Reson in mid-January. Should this new chip prove faulty, the schedule will slip a further four months. Reson informs us that the likelihood of success is 85% (15% risk of further schedule slip).
- We have determined that the Ventana cable laying toolsled can also serve as a host for the Dorado mapping midbody, facilitating the planned ROV based sea trials without requiring the design and fabrication of a new toolsled. The ROV pilots assure us they can handle the mechanical integration of the midbody into this toolsled without assistance from engineering.
- We are currently designing the sonar electronics pressure housing (altered from the Bluefin design to achieve a 6000 m depth rating). The titanium and conductors will be ordered in the coming week and the housing design will be finalized by Shane and Kirkwood during the Altex expedition. We are working to deliver the housing to Reson in December.
- We now have a preliminary data format specification for the Reson 7100 data, and Reson will be supplying us with a simulator for the sonar in October. We will develop the MB-System i/o modules required for working with the AUV multibeam data late this year and early in 2002.
- Although much of the design and fabrication work will be complete by the delivery of the sonar, Kirkwood and McGill think that the integration effort will require two months. Consequently, we have shifted the ship time requests back by one month, with 6 days Ventana time in July and 10 days Zephyr time in August and September.
- The mapping system tests will be conducted so as to provide data relevant to the Canyon Dynamics and Margins projects. Gary Greene and Charlie Paull will help select the multibeam test sites.
- We will consider proposing the addition of a chirp subbottom profiler system to the AUV mapping system in 2003.

Mapping Software Development

NSF has funded continued development of the MB-System software by David Caress of MBARI and Dale Chayes of L-DEO for five years. This software will continue to serve as the primary means for processing swath mapping sonar data at MBARI, including data obtained by other projects and data collected with the AUV deployed sonar. The NSF funding supports 1.5 months/year of Caress' time (budgeted in project 701107), which will be matched by MBARI through an additional 1.5 months/year. During 2001 so far, we have moved through seven increments of beta testing a substantially new MB-System release (version 5.0.0).

GIS Software Development

The high end data products from the seafloor mapping effort are generally used in either GIS (e.g. ArcView) or visualization (e.g. Fledermaus and VRML players) packages. We include some IAG effort (10 days of Brian Schlining) to support transparent use of mapping data products in the GIS and visualization packages.

c) Specific deliverables

- A working 200 kHz multibeam sonar package configured for use as a Dorado midbody or on a Ventana toolsled.
- Software to process and use the multibeam data (MB-System)

d) Project team

- David Caress (Project Manager, Lead Scientist)
- Paul McGill (Lead Engineer)
- Bill Kirkwood (Dorado Lead Engineer)
- Dorado Team (all the AUV folks will be involved to some degree)
- TC Dawe (Head Ventana Pilot)
- Tony Ramirez (data processing technician)

e) Project Lab Space

- We will use the existing AUV lab space by the test tank.

3) Budget (new and continuing projects)

The phase II budget entries have been made using the following assumptions:

- We have not entered hardware and fabrication expenses for 2002 because we think the money allocated for 2001 will suffice if the unused portion is rolled over to 2002.
- We expect the engineering effort to mostly involve the Dorado development group, excepting for 25 days of Paul McGill (project lead engineer).
- We request 5 days of ROV pilot/DMO tech time in 2002 to facilitate integration of the midbody package with the cable laying toolsled and Ventana.

- We request ME, EE, SE and engineering tech time for the design, fabrication, and assembly of the midbody package and its integration with the core vehicle.
 - ME – 17 days
 - EE – 30 days (including 15 days McGill)
 - SE – 15 days
 - Mech tech – 6 days
 - Elec tech – 10 days
- We request ME, EE, and SE time for the testing of the system. As noted above, the amounts of time requested will change for the phase II proposal according to the results of the September 10, 2001 meeting. We expect this engineering effort to mostly involve the Dorado development group.
 - ME – 16 days
 - EE – 26 days (including 10 days McGill)
 - SE – 16 days
- We request 152 days of Caress for this project:
 - Project management – 20 days
 - Assembly and integration of the midbody – 20 days
 - Sea trials – 16 days
 - Data processing – 30 days (increase of 10 days over phase I proposal)
 - MB-System development – 33 days
 - MB-System development (NSF grant) – 33 days
- We request 6 days of Ventana time in July 2002 to perform the ROV based sea trials.
- We request 10 days of Zephyr time in August and September 2002 for AUV base sea trials.
- We request travel to one meeting for Caress and miscellaneous supplies.
- We request 10 days of Brian Schlining (IAG) for GIS support.

4) Milestones

	Milestone 1	Milestone 2	Milestone 3	Milestone 4	Total Resources ¹ for each resource category for all milestones listed here
Milestone date	5/1/02	7/1/02	8/1/02	10/1/02	
Milestone description	Delivery of Seabat 7100 multibeam sonar	Completion of midbody integration and tank testing	Completion of ROV based testing	Completion of AUV testing	
EE	20 days (inc. 10 days McGill)	10 days (inc. 5 days McGill)	12 days (inc. 6 days McGill)	14 days (inc. 4 days McGill)	56
SE	10 days	5 days	6 days	10 days	31
ME	7 days	10 days	6 days	10 days	33
IAG	5 days			5 days	10
ME Technician	4 days	2 days			6
EE Technician	5 days	5 days			10

¹ This number should be same as the number you entered on the resource requests for this particular resource