2004 Proposal Form – Internal-only Projects
Submission Deadlines: Phase I: 8:00 a.m. on August 11th, Phase II: TBD

Project Number: 900403

Project START: Jan 1, 2004 Project Duration (in years): 1

Project Manager/PI: Drew Gashler

Project Title: AUV Gulper

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1) Abstract (new and continuing projects)

The ability to take a water sample aboard the AUV represents a major advancement in the science possible from the AUV platform. This capability has been explored and sought at MBARI for years. G. Friederich has evaluated various designs and tested some. F. Shane and J. Erikson have done related water sampler engineering. C. Scholin has recently participated in a meeting that included strong emphasis on this frontier in marine ecology and has begun assembling knowledge of existing systems. J. Ryan has begun interviewing scientists to understand the desired science applications within MBARI. We propose a scoping & feasibility effort to define science uses and engineering functional requirements of this cutting-edge capability and to more fully evaluate existing technologies. The work in 2004 will allow us to determine whether this capability at MBARI will best be realized by modification of an off-the-shelf system or design and build of a system in-house.

2) Proposal

a) The problem addressed (for new projects only)

The spectrum of measurements being made from the MBARI AUV is outstanding, and the science enabled by this spectrum is thus broad and multidisciplinary. However, important science remains inaccessible by underway instrument readings alone. Many important applications require a sample of water for analysis; for example plankton populations (phyto, zoo, bacterial) and materials transported into the coastal ocean from estuarine and fresh water systems, or from deep shelf waters into the euphotic zone. AUV onboard intelligence provides a unique opportunity to strategically acquire water samples within the interpretive context and real-time decision matrix of AUV sensor measurements and computational resources. Intelligent water sampling with the AUV would "open the fairing" to many applied coastal water quality concerns (HABs, biological and chemical contaminants, nutrients). Indeed, MBARI's leadership in AUV development and application is emphasized in responding to Prop. 40 RFP (Coastal Ocean Currents Monitoring Program, California State Coastal Conservancy) which has a water quality emphasis.

The state of the art in this area has recently been assessed by Chris Scholin based on his experiences with potential system components and participation in a very recent meeting that hilighted the importance of this capability at the forefront of marine ecology. Chris has made interested individuals at MBARI aware of the various commercial systems as well as community interests. Water sampler systems for moorings and submarines are being actively explored by other research groups, and various approaches are commercially available for a limited subset of platforms.

b) Approach to the problem (new and continuing projects)

We propose to approach this scoping and feasibility project in three stages:

1) clearly and thoroughly define science uses
2) establish functional requirements from science use definition
3) evaluate existing technologies to determine whether this capability on the Dorado AUV will best be realized by modification of a commercial system or design and build of a system in-house

c) Specific deliverables (new and continuing projects)

A thoroughly informed document and decision about how MBARI may best lead the scientific application of a novel capability: intelligent acquisition of water samples from an AUV for multidisciplinary marine science.

d) Project team (new and continuing projects)

Drew Gashler: project manager, analysis of water sampling systems in context of Dorado mid-body design

Gernot Friederich: evaluation of existing technologies and solutions investigated and tested already at MBARI

John Ryan & Chris Scholin: lead scientists, Ryan will interview scientists and document science uses, distill functional requirements working with engineering, operations, and science personnel on project. Scholin will lead evaluation of existing commercial solutions relative to science uses.

Farley Shane: lead engineer: For scoping and feasibility study, Farley will provide mechanical design expertise in evaluating existing systems relative to the functional requirements and Dorado engineering constraints.

e) Project Lab Space (new and continuing projects)

Lab space of Ryan, Friederich, and Gashler available and sufficient.

3) Budget Justification (new and continuing projects)

The key labor request is for 5 days of Farley Shane's time to provide mechanical design expertise in evaluating existing systems relative to the functional requirements (3rd quarter).

For adequate scoping and feasibility, we believe that in addition to in-house investigation (science uses and functional requirements), some effort would be well placed in:

1) Hands-on evaluation of key components. For example, application for studies of bacterial populations will require a sampler that can rapidly capture water without contamination from previous samples. For this we request $3000 to acquire supplies for essential lab and tank testing.

2) First-hand contact with other groups exploring/developing systems for mooring or submarines: For this we request travel funds for two people to travel to two locations: one for submarine and one for mooring. The total cost is estimated at $10,000. This should fund one domestic and one European trip (the UK Autosub group is probably the group currently working most parallel to what MBARI would seek to develop).

4) Milestones (new and continuing projects)

	Milestone 1	Milestone 2	Milestone 3	Milestone 4	Milestone 5	**Total Resources** [1] for each resource category for all milestones listed here
Milestone date	First quarter	Second quarter	Third-fourth quarter			
Milestone description	Science use case interviews	Functional requirements definition Evaluation of existing systems	Production of document summarizing science use cases, functional requirements, and solutions			
EE						
SE						
ME		5				5
IAG						
Machine Shop						

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