Deep Glider Development

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LONG-TERM GOALS

Our long-term goal is to make routine full-depth hydrographic surveys of the ocean orders of magnitude less expensive than they now are so that mesoscale, seasonal, and interannual evolution of ocean structure can be described much more completely than is presently affordable. Higher space-time resolution description of oceanic processes will lead directly to their fuller understanding and prediction.

OBJECTIVES

The objective of this project is to design, construct, and test a long range autonomous underwater glider capable of operating at depths as deep as 6000m while retaining the characteristics of the Seaglider.

APPROACH

The approach is to mimic the successful Seaglider design, but incorporate a hull and buoyancy engine that is capable of operating at full ocean depth. Seaglider (Eriksen et al, 2001) is small and light enough to be launched by hand while having several thousand kilometer range and multi-month mission duration. The vehicle developed in this project, dubbed Deepglider, is expected to have similar characteristics.

WORK COMPLETED

Deepglider development is in the design phase and is being carried out by T. J. Osse, the designer of Seaglider. The principal challenge is to develop a hull that is strong enough to withstand 6000 dbar pressure while being light enough to be neutrally buoyant in seawater. Three hull materials were considered: ceramic (alumina), structural amorphous ('liquid') metal, and composite. None of these materials is widely used for pressure hulls, but each shares the characteristic that hulls fabricated from them can be made buoyant, in contrast to using conventional metals (e.g. aluminum, steel, titanium). Vendors for hulls in these materials are comparatively few. Performance, price, and availability considerations have led to the selection of carbon or boron fiber. We are in the process of identifying vendors who have the facility to fabricate a composite hull.

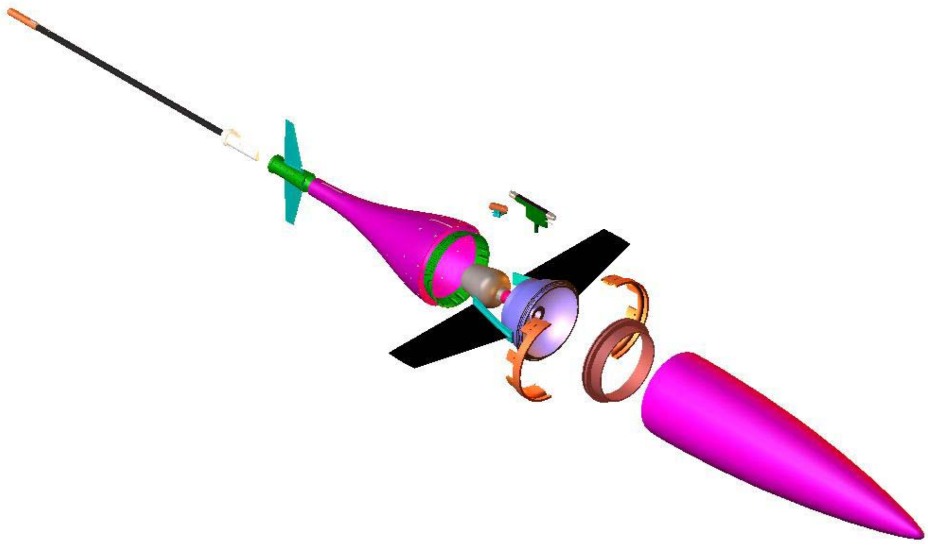

Figure 1. Deepglider schematic, exploded view, illustrating a composite hull with the shape of the Seaglider forward fairing.

RESULTS

This project is not sufficiently complete to have results.

IMPACT/APPLICATIONS

Ships have been used for over a century to make deep hydrographic measurements, but at considerable monetary cost. The development of Deepglider will make possible fully autonomous open ocean hydrographic surveys of basic oceanographic fields (temperature, salinity, dissolved oxygen, current) at a small fraction of the cost of using ships. Deepglider is expected to operate for a year for roughly the cost equivalent of one day of oceanographic research vessel time.

RELATED PROJECTS

Subpolar Atlantic Glider Surveys (N00014-02-1-0791) – A project to deploy Seaglider AUVs in the Labrador Sea for several months starting in autumn 2003.

REFERENCES

Eriksen, C. C., T. J. Osse, R. D. Light, T. Wen, T. W. Lehman, P. L. Sabin, J. W. Ballard, and A. M. Chiodi (2001) Seaglider: A long range autonomous underwater vehicle for oceanographic research. IEEE J. Oceanic Engineering, 26, 424-436.