UNIVERSITY - NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

UNOLS NEWS

Vol. 3 No. 1 March, 1986

HIGHLIGHTS

FLEET REPLACEMENT COMMITTEE NEARS END OF WORK

The UNOLS Fleet Replacement Committee is completing its work on planning for the orderly replacement of the UNOLS Fleet. Its goals are to: (1) Recommend the numbers and types of new ships and replacement dates; (2) Prepare a set of science mission requirements for the various classes of ships; and (3) Undertake representative conceptual designs.

The principal findings upon which its report is based are:

1. The average age of the UNOLS fleet is 19 years, and by the mid-1990's most of the seven large ships (over 200-feet) will have exceeded their generally recognized 30 year service life. Furthermore, many, if not most of the existing ships are mission obsolete and are marginally capable of meeting the requirements of ongoing science of sea. The need to plan for new, more capable research ships has become a matter of urgency.

2. The numbers of future ships will not differ significantly from the existing fleet.

3. The mix of ships should be about evenly divided between the size classes, i.e., large ships, intermediate and small ships.

4. New ships should have improved seakeeping and station keeping characteristics; and should have upgraded laboratory, overside handling, and scientific outfitting. Consequently, new ships inevitably will be larger than existing ships.

5. Several of the new ships in addition to providing for regular multi-disciplinary research, should have an enhanced capability for a particular discipline or field of work. These include Marine Geology and Geophysics; Submersible and Polar Research.

6. Up to one-third of the existing ships, mostly the larger ones, are approaching obsolescence; some already are mission obsolete. Replacement should start in the near term - 1987-1990.

7. The existing fleet should be totally replaced by the year 2015.

The proposed new fleet according to the UNOLS Committee is recommended to be eight large ships (200-300 ft LOA); six intermediate ships (150-200 ft); and six small ships (100-150 ft). Because they are older and are demonstrably incapable of meeting modern science requirements, priority attention has been focused on the larger ships.

In looking to the new ships the first step has been to describe the science mission requirements to which the new ships will be expected to respond. In accomplishing this the UNOLS Committee took on a massive campaign of meetings, interviews and questionnaires in order to gain the views of the scientific community. The most overriding requirement upon which all oceanographers agreed was seakeeping, that is for a ship which will allow both overside and laboratory work to proceed in higher sea states than is now available. Other requirements include overside and deck handling arrangements to allow work in greater capacity and sizes than is now possible; larger and improved scientific laboratories; increased scientific complement (up to 35 scientific and technical personnel); reduced noise and vibration; greater speeds (up to 15 knots) and cruising range. Endurance should provide for cruising to any part of the world ocean and working there for 3-4 weeks before returning.

In describing new ships for the future, the UNOLS Committee sought innovative new designs with an emphasis on seakeeping. With support from the National Science Foundation and the Office of Naval Research, eight conceptual ship designs were undertaken for the purpose of fitting the science requirements into a real hull. The conceptual designs included two each of the following types of ships.

. **SWATH Ships.** The SWATH or semi-submerged ship is a relatively recent development in ship design. SWATH Ships, in theory and performance, demonstrate a remarkably stable environment. Additionally, they have a platform configuration which is highly attractive for science and engineering operations at sea. It is time for the oceanographic community to take a hard look at what SWATH can offer.

. **High Endurance Ships.** Ships 250-300 ft LOA are not now available in the UNOLS fleet. They are intended to meet requirements for extended worldwide cruising including high latitudes with larger scientific parties and to permit both overside and laboratory work to proceed in higher sea states than is now possible.

. **Medium Endurance Ships.** Ships of a 200-500 ft size range are intended to have the highest capability commensurate with this size range. In effect they are a direct replacement of existing vessels where the cost of construction and economy of operation is an important factor.

. **Ships With Enhanced Geology & Geophysics Capability.** These are ships intended to have the same multi-disciplinary capability as the above ships, but in addition are to carry a full scale configuration for geology and geophysics investigations. Such ships are inevitably larger than their corresponding general purpose type class.

The eight designs forming part of the UNOLS Study are depicted in the appended figures.

The Fleet Replacement Committee considers that whatever plan emerges at this time will need continuing review and updating in order to keep up with changing times and requirements. In addition, selected designs might be further developed; and new concept designs started on smaller ships and innovative platforms. This calls upon UNOLS to provide for continuing efforts in the fleet replacement process.

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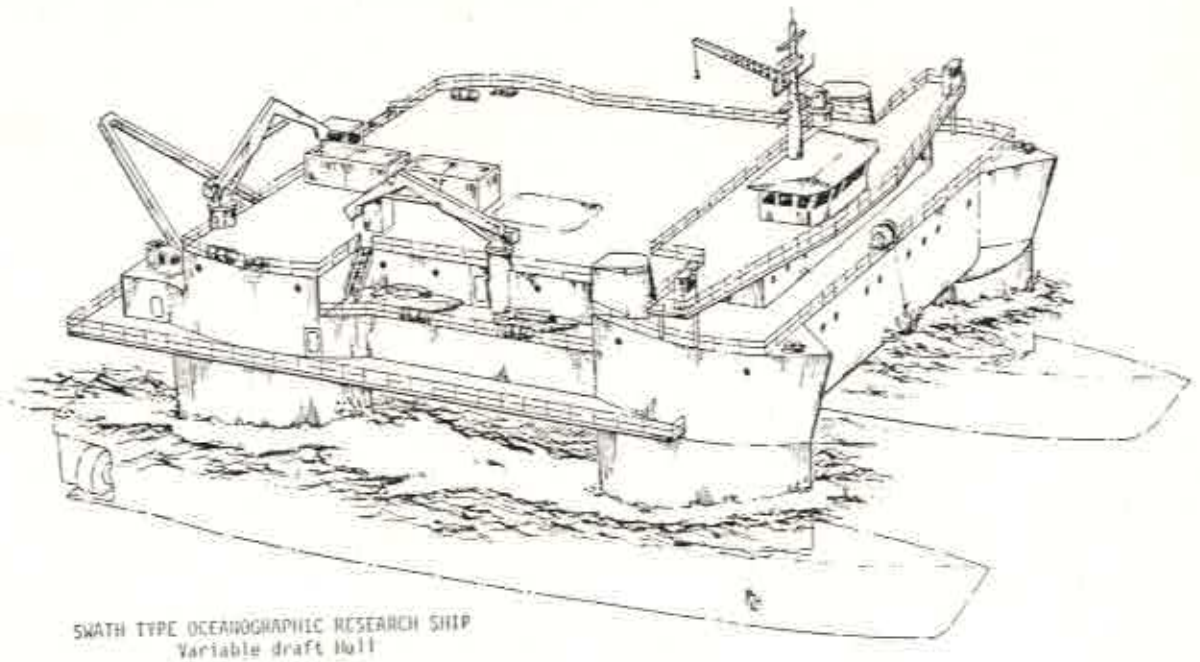


SWATH TYPE OCEANOGRAPHIC RESEARCH SHIP
Variable draft Hull

Length:	Upper Hull	147 ft
	Lower Hull	202 ft
Beam:		104 ft.
Draft:	Operating	26 ft.
	Transit	15 ft.
Displacement:		3220 L.Tons

Cruise Speed: Transit - 15 knots
Operating - 10 knots
Power: Diesel Electric 6000 SHP
Complement: 30 Scientists

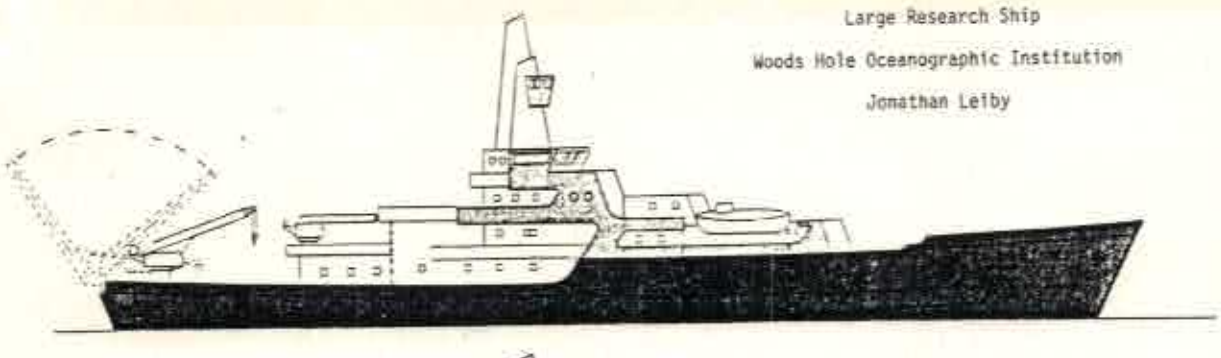
Blue Sea McClure
Houston, Texas

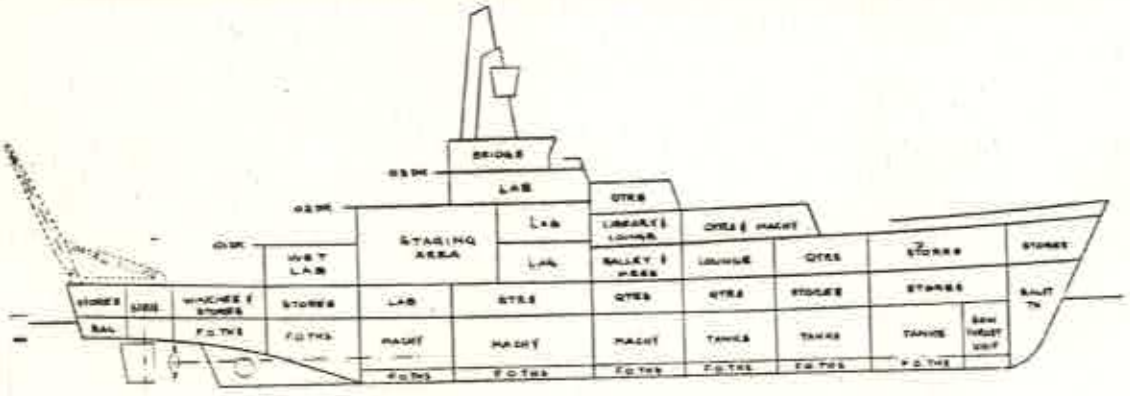
Fig. 1 SWATH with interior center well area. Variable draft allows ballasting working deck close to water. Transits in catamaran mode.

Large Research Ship

Woods Hole Oceanographic Institution

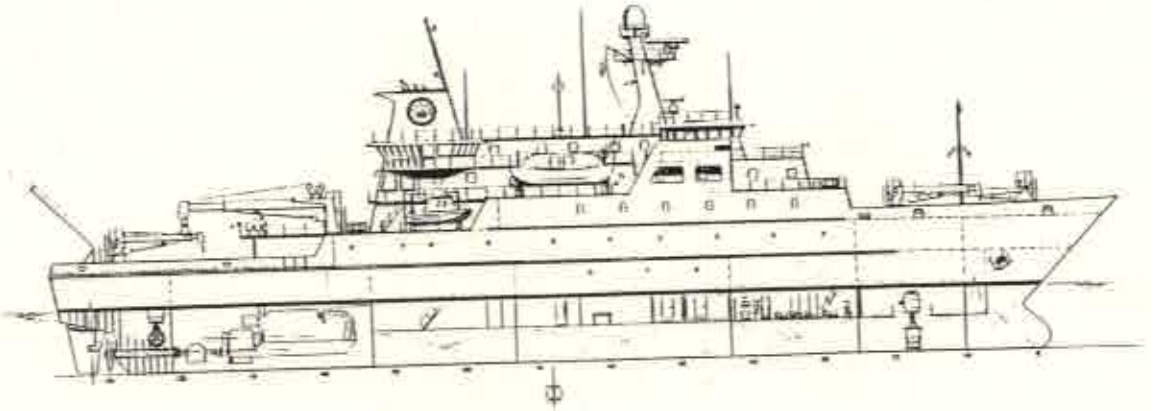
Jonathan Leiby





Length	275 L.B.P.	310 L.O.A.
Beam		68 Feet
Draft		21 Feet
Displacement		3,668 L Tons
Cruising Speed		16 Knots
Range	12,000 mi. @ 15 Knots	
Power (Diesel Elec. SCR)		6,800 S.H.P.
Complement		35 Scientific

Fig. 2 Large High Endurance R/V where primary attention has been given to seakeeping and deck working area.



LARGE GENERAL PURPOSE OCEANOGRAPHIC RESEARCH SHIP

Length	273 LBP	300 LOA	Cruise Speed	14 knots	
Beam		54 Ft.	Range	10,000 nm	
Draft		18 Ft.	Power	4,000 SHP	
Displ.		LT	Complement	33 Science	

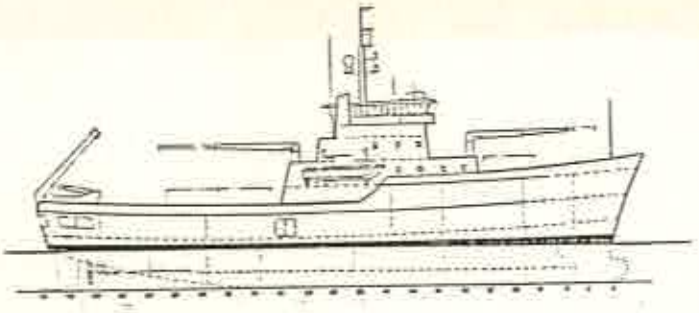
RODNEY F. LAY & ASSOCIATES

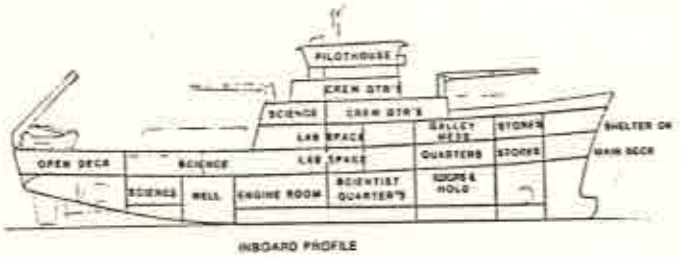
OUTBOARD PROFILE

300'-0" x 54'-0" x 28'-0"

RESEARCH VESSEL

Fig. 3 Large High Endurance R/V where emphasis is on laboratory space and economy of operation.





INBOARD PROFILE

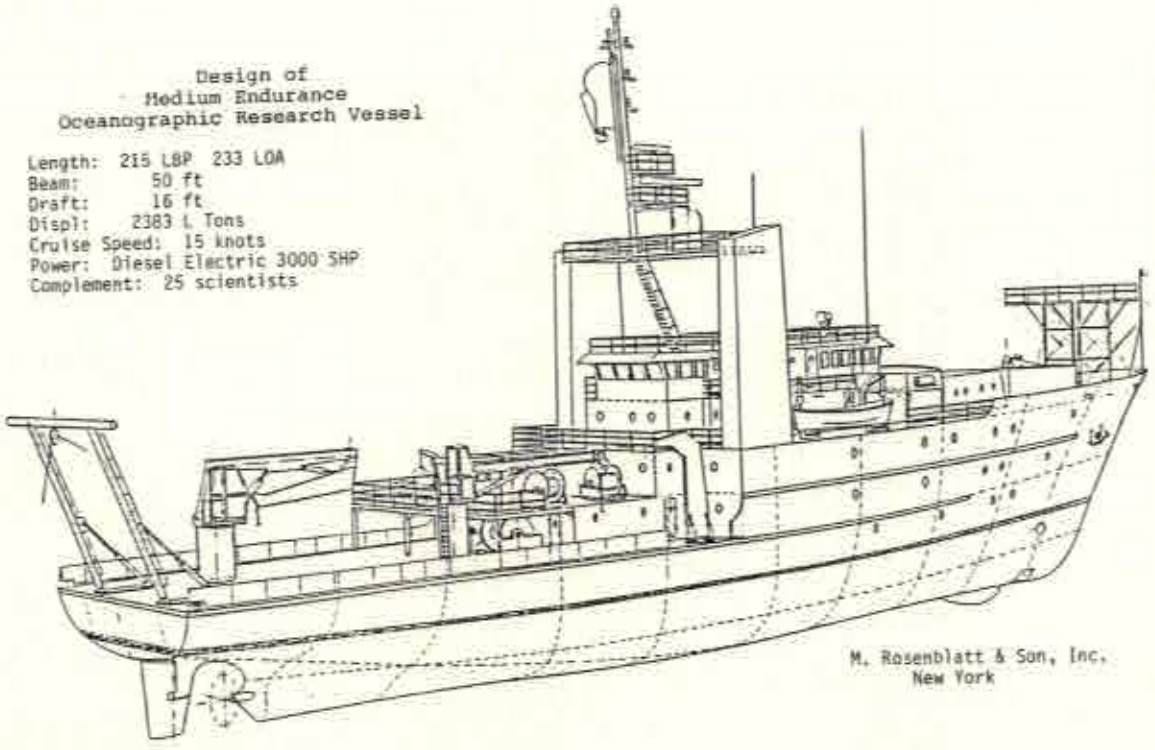
Length	212 LWL 228 LOA	Cruise Speed	14 knots
Beam	64 ft.	Range	10,500 nm
Draft	15 ft.	Power	3,000 SHP
Displ.	2,468 LT	Complement	25 Scientific

SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO	
212' LWL RESEACH VESSEL DESIGN CONCEPT- ARRANGEMENTS	
THE GLOSTEN ASSOCIATES, INC.	
DRAWN:	NO SCALE
OCT 1985	8524-2 (1 of 2)

Fig. 4 Medium Endurance R/V. Shelter deck design allows two working decks and good interaction with laboratories. Wide beam permits sizeable center well not ordinarily found on monohull.

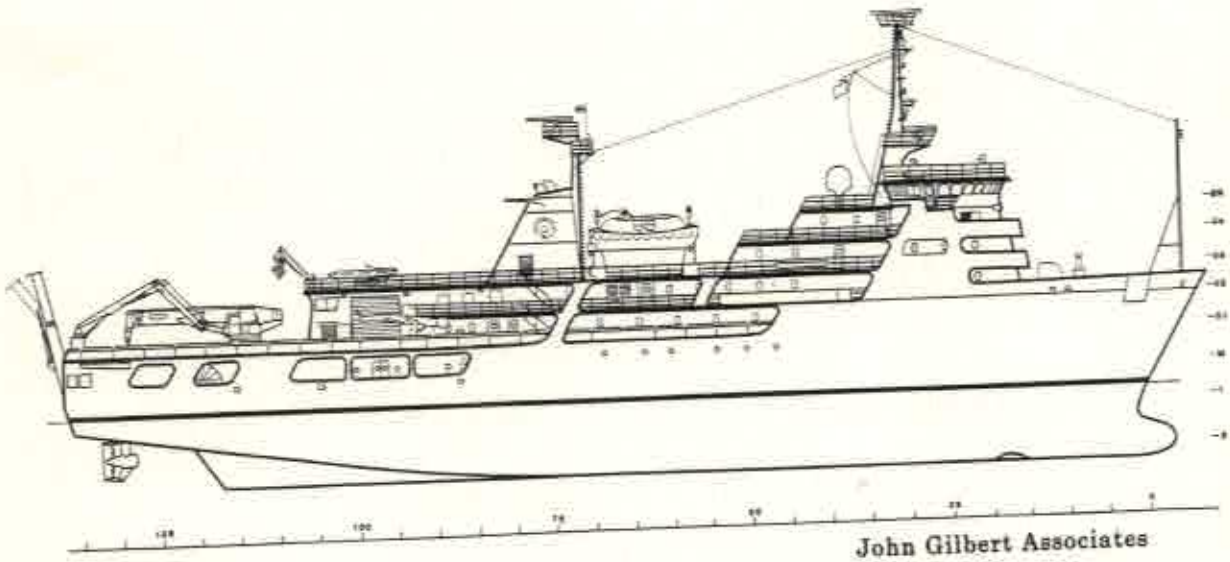
Design of
Medium Endurance
Oceanographic Research Vessel

Length: 215 LBP 233 LOA
Beam: 50 ft
Draft: 16 ft
Displ: 2383 L Tons
Cruise Speed: 15 knots
Power: Diesel Electric 3000 SHP
Complement: 25 scientists



M. Rosenblatt & Son, Inc.
New York

Fig. 5 Medium Endurance R/V. Attention has been given to overside handling and economy of operation.

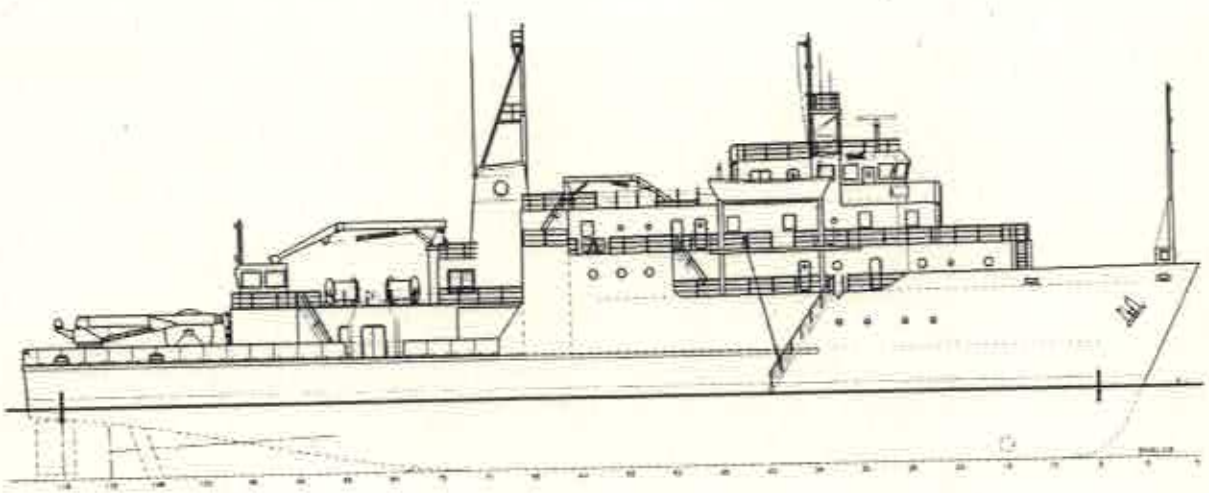


John Gilbert Associates

LARGE GENERAL PURPOSE RESEARCH AND GEOPHYSICAL SHIP

LOA:	291 Feet	Displacement:	4,997 L Tons
LBP:	275 Feet	Cruising Speed:	14.5 Knots
Beam:	58 Feet	Range:	24,000 N Miles
Draft:	19 Feet	Power:	5,000 SHP

Fig. 6 High Endurance R/V with enhanced ecology and geophysics capability. HCS Streamer and air-guns are handled from lower deck. Upper deck is for general purpose activity. This results in a very large ship.



MARINETTE MARINE CORPORATION

OUTBOARD PROFILE

GENERAL PURPOSE RESEARCH SHIP WITH GEOPHYSICS CAPABILITY

Length:	238 LBP 250 LOA	Power:	Diesel Elec. 3000 SHP
Beam:	52 ft	Cruise Speed:	14 knots
Draft:	15 ft	Range:	13,700 miles
Disp:	2,790 LT	Complement:	28 Scientists

Fig. 7 Medium Endurance R/V with enhanced geology and geophysics capability. HCS and other outfitting share the same working deck posing difficulties for this size ship.

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DEEP-SEA RESEARCH

SEA CLIFF and TURTLE are available to the scientific community and ONR is receptive to requests for 1986-87. At present, study sites must be within ca. 150 miles of a major U.S. port on the west coast. This gives the community 6,000 m capability for the first time. Contact Mr. Keith Kaulum (ONR) for more information, Telephone (202) 696-4531.

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ALVIN OVERHAUL

The ALVIN submersible is presently undergoing an overhaul which includes major modifications intended to improve capability and reliability, and to allow a longer period of time between major overhauls. Initial planning was centered on correcting a problem involving the two main electric motors which has plagued operations since conversion to a 4000m depth capability in 1973. These specially constructed brush type DC motors mounted in an oil filled, pressure compensated box are used to drive hydraulic pumps which in turn provide power to the main and side propellers, rudder ram, mercury trim system and one manipulator. At depths between 3000 and 4000 meters, the increased viscosity of the compensation oil frequently cased excessive brush arcing, destroying the motor's commutator. Repairs have been both costly and time consuming.

Various solutions exist but the best appeared to be replacement of the entire hydraulic propulsion system with thrusters directly driven by brushless DC motors. This approach would improve system efficiency and greatly reduce complexity thereby increasing reliability. Unfortunately, although fractional horsepower motors and controllers of this type were readily available, the multi-horsepower size required for ALVIN was not.

After months of discussions with vendors and experimenting with prototypes, a decision was made to change the primary DC voltage used on the submarine in order to ease the motor procurement problem. This has advantages in itself but most importantly, it allowed selection of a motor vendor and therefore commitment to the propulsion system change.

As overhaul planning and engineering proceeded, it became obvious that modifications beyond those of the power and propulsion systems could be desirable to amplify the benefits of the required changes. As a result, the total replacement of the submersible's two primary systems will be accompanied by major improvements in many other areas. A brief summary follows:

BATTERY SYSTEMS

Replace batteries, racks, boxes, guides, release mechanisms and power control systems. Convert from 30/60 VDC to 30/120 VDC.

EXPECTED RESULTS:

Capacity Improvement -
Double existing propulsion and lighting power.

Provide additional 30V system for special applications.

Improved Safety -
Increased release system reliability.
Double battery systems droppable weight.

Increased reliability -
Additional battery monitoring sensors.
Elimination of series/parallel charging requirement.

PROPULSION SYSTEM

Replace stern and lift propellers plus associated hydraulic system (main propulsion box) with six thrusters directly driven by 3HP brushless DC motors.

EXPECTED RESULTS:

Increased Reliability

Increased Efficiency

Increased Performance
Speed Increase -

Horizontal	1.4 Kts	to 1.9 Kts
Vertical	0.6 Kts	to 1.3 Kts
Lateral	None	to 0.5 Kts

HYDRAULIC SYSTEMS

Replace with simpler version using brushless DC motor driving a load sensing pump.

Total capacity -
1500 - 2500 PSI
3 - 4 GPM

EXPECTED RESULTS:

Increased Efficiency

Improved Capability -
Provides 5 sets of hydraulic power connections at the science basket.

CABLING/WIRING SYSTEMS

Provide two forebody to afterbody penetrator cables (with explosive cutter) which bypasses the hull disconnect in order to decrease resistance and electrical noise problems in selected release, monitoring and instrumentation circuits.

Rewire personnel sphere to decrease electrical noise problems in data systems and provide clean power circuits.

COMPENSATION SYSTEMS

Redesign to improve intersystem separation, provide capacity monitoring and insure positive oil pressure on all compensated boxes.

DATA LOGGING/DISPLAY SYSTEM

Replace prototype data logger with finalized version which will incorporate self-diagnostics. Hardware will be configured for system replacement rather than board or component replacement for trouble shooting and/or repair.

PAYLOAD

Double existing normal payload to provide approximately 1,000 pounds for science basket, sphere equipment and reserve buoyancy. NOTE: Science basket payload will not change since foundations cannot be modified at this time.

Provide an additional 1,000 pound payload capacity for special operations.

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NSF REQUESTS "EARLY" IDENTIFICATION OF SHIPS TO BE LAYED-UP IN 1987

Optimistic projections for 1987 show a budget shortfall for UNOLS fleet operations that is at least as serious as the 1986 shortfall. Thus, 2 to 4 ships will be layed up for the year and a few ships will operate with light schedules. Consequently, NSF has asked UNOLS to recommend which ships should be layed up at the June, 1986 UNOLS meeting. It is anticipated that UNOLS' members will be working together to develop the most cost-effective schedules to support funded science.

In this context, scientists expecting ship-time in 1987 must submit their requests to UNOLS prior to the June meeting.

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CRUISE ASSESSMENT FORMS

The cruise assessment procedure will not be changed as stated in the last issue of UNOLS News. However, encourage PIs who have particularly positive or negative criticisms to communicate these directly to the UNOLS Advisory Council (Captain Bill Barbee, UNOLS, WB-15, School of Oceanography, University of Washington, Seattle, WA 98195).

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GOVERNMENT TRENDS IN FUNDING

The 1986 budget for Ocean Science in NSF is likely to be equal to or less than (by ca. 3%) the 1985 budget. One consequence of this may be that some field work will be delayed until 1987. On a more positive note, the 1987 budget may show an increase of 10% over 1986.

On the dark side, it appears that ONR funding will continue to fall by as much as 10% in 1986 and potentially by a greater amount in 1987.

It is time for the oceanographic community to organize an effective lobbying effort.

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A/C ELECTIONS

Nominations are now being considered for 3 positions on the UNOLS Advisory Council. Two must be from member institutions and one from an associate member institution. Send nominations to Charlie Miller before June, 1986.

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OCEAN RESEARCH IN VENEZUELAN WATERS

Contrary to information which has been circulated discouraging marine scientific research in Venezuelan waters, the Office of Marine Science and Technology Affairs states that U. S. research is being approved by Venezuela, and the Department of State is confident that approvals will continue. One requirement, however, is that internal support for each individual project be established within the Venezuelan scientific community six months prior to proposed start of research. Questions on this subject should be directed to: Tom Cocke, OES/OMS, Room 5801, U. S. Department of State, Washington, D.C. 20520, Telephone (202) 647-7789.

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IMPACT OF GRAMM-RUDMANN-HOLLINGS ACT

The Director, National Science Foundation, has issued an Important Notice to Presidents of Universities and Colleges and Heads of Other National Science Foundation Grantee Organizations (Notice No. 100 dated February 13, 1986). In part, the Notice states:

The March 1, 1986 Sequestration Order under the Balanced Budget and Emergency Deficit Control Act of 1985 (i.e., the Gramm-Rudmann-Hollings Act) reduces NSF's FY1986 appropriations by 4.3%. Because the law takes effect mid-year, its impact is somewhat greater than it might otherwise be. NSF intends to make the reductions with as little disruption and as equitably as possible, maintaining carefully established priorities. Program officers are authorized to use the following means to achieve the necessary reductions in their programs:

- Amendments and renewals for continuing grants, contracts, etc. may be decreased by up to 10% of the original commitment.
- New awards may also be reduced by as much as 10%.
- Awards made earlier in the year may be reopened, if necessary, to avoid inequitably large reductions in the size and number of awards made after March 1.

- In making reductions, support for students and post-docs and for instrumentation and equipment is to be protected.
- The cap on institutional cost-of-education allowances in the Graduate Fellowship program will be reduced from $6,000 to $5,250, to maintain the full stipend and number of awards.

The President's budget for FY1987 achieves the deficit reduction required by the Gramm-Rudmann-Hollings Act. If that budget passes, NSF would receive an 8-1/2% increase over FY1986. If the President's budget does not pass, budgets achieved through Congressional action or sequestering under the Gramm-Rudmann-Hollings Act could result in reductions to NSF appropriations much greater than this year. In that case increments on continuing grants would have to be renegotiated. A number of additional actions would be considered such as elimination of Principal Investigator salary support, limits on indirect cost rates or on some components of indirect cost, and longer cost-sharing requirements.

NSF Grantees are urged to review the full text of Important Notice No. 100.

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FIRST CLASS