UNIVERSITY - NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

UNOLS FLEET IMPROVEMENT COMMITTEE

MEETING REPORT

April 28-29, 1993
Stouffer Madison Hotel
515 Madison Street
Seattle, Washington

Meeting Report
UNOLS Fleet Improvement Committee

April 28-29, 1993
Seattle, Washington

The UNOLS Fleet Improvement Committee (FIC) met at the Stouffer Madison Hotel, Seattle, Washington on 28 and 29 April 1993. The meeting was called to order by the FIC Chair, Marcus Langseth. The agenda is enclosed as Appendix I.

Attendees

FIC Members:	**Participants:**
Marcus Langseth, FIC Chair	Bill Barbee, Retired UNOLS
Teresa Chereskin	Jack Bash, UNOLS
Eric Firing	Garry Brass, UNOLS Chair
Charlie Miller	LCDR Bill Davis, USCG
Tom Royer	Annette DeSilva, UNOLS
Joe Coburn (ex-officio)	Dolly Dieter, NSF
	Keith Kaulum, ONR
	Dirk Kristensen, Glosten Assoc.
	Capt. Martin Mulhern, NOAA
	Capt. Robert Roush, NOAA PMEL
	Neal Thayer, USCG
	John Tuttle, USCG

APPENDICES

I. FIC Agenda
II. STRI Ship Design Specifications
III. NSF Budget Slides
IV. Arctic Submarine Opportunity
V. FIC Annex to UNOLS Charter
VI. ARV Profile
VII. USCG Icebreaker Slides
VIII. ENDEAVOR Mid-Life Refit Update
IX. Coastal Workshop Overview
X. WHOI Small SWATH Proposal
XI. Outline of Fleet Improvement Plan update

APPROVAL OF MINUTES. The minutes of the October FIC meeting were approved. The agenda was approved with the addition of a report on ship motion by Eric Firing.

UNOLS COUNCIL REPORT. Jack Bash reported on the activities of the UNOLS Council and Committees. At the Council January meeting, the Research Vessel Operators Committee (RVOC) requested that an RVOC member sit on the FIC to serve as a liaison between the two committees. Joe Coburn has been designated as the RVOC representative to FIC.

The DEep Submergence Science Committee (DESSC) has received over 1000 notices of interest to use ALVIN in 1994 and 1995. This is over double the normal response, with the interest being divided between the traditional research regions and those in more remote global arenas. Woods Hole Oceanographic Institution (WHOI) has added a science liaison position this year with the intent of linking the interests of scientific community with their Deep Submergence Operations groups. Dan Fornari is presently serving as the liaison. With the upcoming conversion of KNORR to a support ship for ALVIN and ROVs, Marcus recommended that a FIC member be named to serve as a liaison to the DESSC.

The Ship Scheduling meeting for operations in 1994 is scheduled for June 23rd in Washington, DC.

The Research Vessel Technical Enhancement Committee (RVTEC) had their first organizational meeting in October. The group has been effectively networking over telemail to discuss various shipboard equipment and instrumentation issues. Their 1993 meeting is scheduled to be held in San Diego in September.

The NOAA/NURP coordinated SEA CLIFF scientific operations off Hawaii were reported to be largely unsuccessful. Keith Kaulum reported that the Navy OP-23 has indicated that it is unlikely that a scientific research opportunity will be offered in 1993. This year will be used to assess last year's problems.

In January, Vivianne Solis Weiss of Mexico had encouraged UNOLS to consider using their vessels for US oceanographic research. At that time NSF indicated that since funding was tight it was unlikely that they would be funding US scientists to work on Mexican vessels. Every effort would be made to first fully utilize our own ships. The issue is now dead; however, Vivianne has left her position.

The Smithsonian Tropical Research Institute has applied for UNOLS membership and was accepted by the Council. Their application will be presented to the UNOLS membership at the Annual Meeting. They have plans to build a vessel for operation in the Panama region. The specifications for the vessel are included as Appendix II.

The January Council meeting was dominated by a discussion of a letter from Don Heinrichs, NSF, regarding future shortages of ship operating funds. The Council has recommended that the agencies form a Blue Ribbon Panel (BRP) to assess the UNOLS fleet in regard to size, capabilities, distribution, and funding requirements. Garry Brass is sending a letter to NSF, ONR, and NOAA recommending tasking for the panel along with suggestions for nominations to the panel. Dolly Dieter reported that NSF would like to see the 1994 budget before

determining whether or not now is the time to form a BRP. The purpose of the panel will be to provide recommendations when long-term funding shortfalls exist.

In other news, the TURTLE/JASON operations were educationally a success and a step forward for science.

AGENCY REPORTS

National Science Foundation (NSF) - Dolly Dieter provided the report for NSF. The current budget scenario along with the requested budgets for the NSF Ocean Sciences Division were presented, Appendix III. The FY 1994 budget request for Ocean Sciences is $209.78 million, an increase of $13.54 million above the FY 1993 revised current plan of $196.24 million. The actual FY 1992 budget for Centers and Facilities was $51.2 million. In FY 1993, the requested budget was for $59.3 million, however, the current plan was reduced to $50.26 million. This cut in 1993 was mostly felt in ship operations. The FY 1993 funds will have to cover some of the mid-life refit costs for the OCEANUS class. Since two payments for NSF's purchase of EWING were made in 1992, the next (and last) payment of $600,000 is not due until 1994. The 1994 request for Centers and Facilities is up by $6.5M. This $6.5M would fund the initial steps of the Arctic Research Vessel (ARV) procurement. If the $6.5M is subtracted from the 1994 request, the request would be for level funding from 1993.

On a separate note, NSF's move from Washington, D.C. to Arlington, VA has been pushed back until the January/February '94 time frame.

Office of Naval Research (ONR) - Keith Kaulum reported for ONR that the ship facilities budget is not expecting any cuts. In fact, the Research Development Program actually got an increase in funding; however, the increase will most likely not be felt in ship programs. A President's Environmental Initiative is providing funds for a $6 million program. A solicitation has been announced and the Navy is going forth with awards.

After two and a half years, the Navy and WHOI have arrived at a mediated agreement on April 1 for KNORR/MELVILLE. All final payments have been made to Woods Hole, the shipyard, and subcontractors. Credit goes out to Dick Pittenger and Joe Coburn for their efforts in facilitating this agreement. The agreement states that settlement price is not to be disclosed. A ballpark figure for the cost of the KNORR/MELVILLE refit is approximately $40M.

The KNORR/MELVILLE operations have been going fine with the exception of MELVILLE losing one of its four thrusters. The ship has been operating without the thruster for about two months. MELVILLE is currently entering drydock for repair and the cause of the problem will be investigated. With the lost thruster, MELVILLE had been operating at 7-8 knots. The ship was able to complete planned survey work at 8 knots before going into the yard. On a separate note, the SEABEAM on KNORR has been reported to be operating very well.

The slamming problem experienced by KNORR/MELVILLE has been analyzed by ABS and determined not to be a structural issue. The plate buckling has also been analyzed and determined not to be a problem.

The KNORR conversion to support ALVIN operations is in the plans, but WHOI will wait until funding for construction of AGOR 25 is confirmed before proceeding. ATLANTIS II has been put on the market for sale. Any sale agreement will honor all planned science operations. The ALVIN handling system will only be sold with ATLANTIS II if the price is right. Once KNORR is converted, it will continue to be maintained as a general purpose vessel. All agreed that now is the time for UNOLS, FIC, DESSC and WHOI to start planning for the KNORR conversion. Marcus recommended the formation of a joint sub-committee of 2-3 FIC members and 2-3 DESSC members to oversee the design effort. WHOI has done a preliminary study to determine the feasibility of converting KNORR to a support ship. It is feasible.

Keith reported that the contract for construction of AGOR 24 was awarded in early January to Halter Marine, the builder of AGOR 23. The construction of AGOR 25 and 26 are options in this contract. Presently, change orders to the AGOR 24 design are being reviewed. WHOI and Scripps are being represented in these reviews. NAVSEA has agreed to a few major changes, one of which will add nine additional berths to the ship. An extensive study of multibeam systems is being performed. AGOR 24 will require a flush mounted system (as opposed to a pod design) due to the shallow water depth at the Scripps pier. A noise test has been recently completed for AGOR 23 and will be sent to the potential vendors for the AGOR 24 systems.

AGOR 23 has reported a severe corrosion problem with their black iron salt water piping resulting in the clogging of the ship's heat exchangers along with a number of other complications. NAVSEA has analyzed the situation, but cannot explain why the problem is so severe on AGOR 23. There are many ships with black iron piping that experience little to no problems. One theory is that a fresh water micro-organism might be getting into THOMPSON's system and eating away at the pipes. The vessel is home ported in freshwater. It is planned to convert the sea water piping to copper nickle. AGOR 24/25 will also most likely shift to a copper nickle system. An attempt will be made to incorporate all AGOR 23 improvements on AGOR 24/25. NAVSEA has been receptive to WHOI's and SIO's suggestions. SIO has a shipyard representative onsight at Halter Marine to oversee the construction project. Delivery is expected three years from January 1993. AGOR 25 is still in the budget and a decision should be made by January on whether or not to proceed.

In other ONR in-house news, Fred Saalfield has been selected to fill the Deputy Position which was nationally advertised. The Deputy position is second in command, directly below Admiral Miller.

National Oceanic and Atmospheric Administrator (NOAA) - Marty Mulhern reported on the latest personnel appointments to NOAA. Jim Baker has been selected as Director, with Tim Hall appointed as second in command. Katherine Sullivan has been selected to serve as

the Science Advisor. None of these appointees have been confirmed to date. NOAA is continuing with their plans to consolidate their offices in Silver Springs, Md.

NOAA held their 1994 Fleet Allocation Meeting in January. Jack Bash was invited to attend to represent UNOLS. Marty reported that everything stands as left in January. NOAA continues to experience the effects of an aging fleet. DISCOVERER is in the shipyard to repair damage incurred during a hurricane while in Manzanillo, Mexico two years ago.

NOAA has been assigned two more TAGOs vessels, one is for NOAA and the other is for USGS. This brings the total to three: WORTHY, RELENTLESS, and ADVENTUROUS.

NOAA's Operations Funding comes out of their Marine Sciences budget. For 1994, their request is basically for level funding which is approximately $60 million to $62 million. the President's request is also indicating level funding.

NOAA's Fleet Modernization Program has been appropriated $30 million for 1993. Additionally, there is an additional $21 million in 1992 carryover funds. This funding is to cover the TAGOS conversions which are estimated at $12 million each. The President's Request for 1994 is approximately $23 million of which $8.7 to $9 million will be spent on routine and critical maintenance. This will leave approximately $14 million for fleet modernization. A portion of this funding will be used to cover the costs for repair-to-extend (RTE) the life of the vessel DELAWARE.

Fleet Modernization Plans through 1993 include:

- conversion of TAGOS for TOGA TOA
- ALBATROSS RTE (maintenance of fisheries boat)
- $8.7M for routine and critical maintenance
- purchase of an intermediate depth multibeam system
- conduct a host of design studies.

The design of an 80 foot vessel for Great Lakes operation is in process, but delayed.

MISCELLANEOUS ITEMS:

Liaisons to RVOC and DESSC. Joe Coburn, of the RVOC, has been appointed to serve as a liaison between RVOC and FIC. Marcus will ask FIC member Ken Johnson if he would be willing to serve as a liaison between the FIC and DESSC.

SOONS Update (Arctic Science '93) - Marcus Langseth reported on the recent activities and opportunities for using nuclear submarines for scientific research. The Russians have advertised the availability of two submarines. The USGS has shown an interest in their use and is communicating with them. Additionally, in January the US Navy presented an opportunity to the scientific community for Arctic research aboard one of their submarines. A

meeting was held at Scripps in San Diego to begin organization of an Arctic cruise under ice in a US Navy nuclear submarine. The Navy is inviting the community to collect data from a 637 Class attack submarine. The cruise will take place in the August/September 1993 time-frame and last approximately 42 days, 19 of which will be under ice. Data from the cruise will be released within 90 days from completion of the cruise. The Navy has indicated that space will be available for approximately five scientists on the sub. Plenty of scientists have stepped forward to fill these spaces. See Appendix IV for details.

A science steering committee has been formed under UNOLS to organize this effort. The committee is chaired by Marcus Langseth and includes Terry Tucker, Jamie Morison, Ted Delaca and Bill Smethie. Announcements have gone out on telemail and EOS with information regarding the opportunity. Data collection will be limited to the instrumentation and equipment already on the sub, or systems that can be easily installed. The Science Plan includes the disciplines of ice dynamics, geology, physical oceanography, chemical oceanography and meteorology. The UNOLS Committee has recommended a cruise track, see Appendix IV.

The Navy has made no commitment for further operations; however, if they were to continue perhaps through-the-hull installations (during drydock) of equipment would be allowed. This year's opportunity is at no cost to ONR.

FIC Annex. Every three years Annexes to the UNOLS Charter must be revised and/or readopted. After review of the current FIC Annex with the committee, the annex was accepted with one revision to the organization section to reflect the addition of the RVOC liaison to the committee (Appendix V). The Annex will be sent to the UNOLS Council for readoption.

FIC Membership. The first terms for Tom Royer, Ken Johnson and Marcus Langseth have expired. Tom and Ken have all been asked, and have agreed to serve for another three year term.

ARCTIC RESEARCH VESSEL (ARV) PRELIMINARY DESIGN STUDY:

Dirk Kristensen of Glosten Associates and Tom Royer reported on the design progress of the ARV. A new conceptual design of the ARV has been prepared by Glosten and has been distributed to Arctic Community. From a distribution of approximately 400, only 3 responses have been received. The new design features call for a vessel to address the scientific mission requirements that specify the ability to carry 36 scientists for up to 90 days with an ice capability of ABS A3. The designed ship is 343 feet LOA, with an 84' beam, and 28' draft, see Appendix VI. A modern bow form similar to that of the Swedish vessel ODEN is planned. Dirk reported that Glosten is investigating ways to possibly reduce the ship's size. They are looking at machinery and propeller configuration changes to achieve this. Glosten will try to determine what the impact of installing propeller nozzles will be on noise and ice capability. A nozzle can offer considerable savings in power consumption; however, it has

been claimed that SWATH mapping works much better with ducts as opposed to nozzles. Even with modifications, Glosten does not feel that the size can be reduced much more than 10 feet and still maintain the vessel's designed ice capability. The ARV design will be modeled and tested for seakeeping and performance in ridges and level ice.

Tom Royer reported that the Science Plan for the ARV was presented on March 8 in Washington D.C. It was made clear that NATHANIEL PALMER does not have the maneuverability and capability needed for ARCTIC research. Alaska's Governor Walter Hickle has been requested to fund half of the construction costs for the new vessel and provide a loan for the remaining half. The preliminary ARV design should be completed by the end of 1993. Construction is anticipated to take 2-3 years. Funds for the continuation of the design process and initial stages of construction are contained in the FY94 NSF budget plans.

NSF's OCF will be provided with additional funding each year for operations. In the FY94 budget request this addition is $6.5 million to cover initial construction costs. Garry Brass reiterated that UNOLS will only support the construction of the ARV if additional funds to cover the costs of operating such a vessel are to be provided each year.

COAST GUARD PLANS FOR A RESEARCH ICEBREAKER:

LCDR Bill Davis provided the committee with the Coast Guard plans for a research icebreaker. Funds for this icebreaker are in an approved Navy shipbuilding budget. NAVSEA, with Coast Guard assistance, is responsible for this construction. At present NAVSEA and the Coast Guard are evaluating two baseline design studies from Avondale and Ingalls shipyards. This evaluation is expected to be completed by early summer and the construction contract let in July of this year. The ship is expected to be ready for service in 1997 or before.

Although the actual design will not be published until the contract is let, there are some specifics available. A crew of approximately 60 is planned which is a considerably less than normal USCG crewing plans. The ship will have accommodations for 30 to 35 scientists with a surge to 50. Military requirements have been eliminated from the original design. This ship will not be initially outfitted with a multibeam bottom mapping system. Up to eight vans could be placed onboard. The ship will have a shaft horse power of not less than 30,000 and will be capable of breaking 4.5 feet of ice at 3 knots. A conventional icebreaker hull is planned. The ship is expected to be about 400 feet length overall with a beam of about 80 feet. Draft is planned at between 29 and 32 feet. The ship will have a sustained speed is 12.5 knots. Appendix VII provides more details of this ship's design plans.

MID-LIFE REFIT OF INTERMEDIATE SHIPS:

Jack Bash and Joe Coburn provided an update on the current status of the plans for the mid-life refits for the three OCEANUS Class ships. ENDEAVOR is scheduled first for the shipyard.

Each ship is planning for a refit costing about $2 million. ENDEAVOR's overhaul bid package has been sent to six pre-qualified shipyards. These yards are: Peterson Builder, American, Norfolk Shipbuilding and Drydock, Atlantic Drydock, Bender and Avondale. It was reported that Avondale has withdrawn from the competition. Bids are due to be received in early May '93 and ENDEAVOR is expected to enter the shipyard soon thereafter. The overhaul is scheduled to take between 120 and 150 days. Details of the work planned for the overhaul are included in Appendix VIII.

All three OCEANUS ships were involved in the planning and studies associated with the overhauls. Two studies were contracted because of the planned stack and bridge changes. The first was a smoke study that used a model to determine the smoke dispersion patterns result from the new stack configuration. This study revealed that the design would cause significant smoke to be directed to the working decks. As a result the designs were changed to improved this condition. The second study evaluated ship motion and how this would effect persons operating on the bridge with its new configuration (moved forward and up). This was a computer analysis that evaluated movement and correlated this movement with a persons ability to perform work. Specific criteria was established for the tolerance of the body to accept movement and the ability to do various tasks. The new bridge configuration on all three ships passed this motion study. Copies of the criteria and/or the study are available in the UNOLS Office.

The refits for WECOMA and OCEANUS are scheduled to begin in the fall provided that funding is in place from NSF.

GPS DISCUSSION:

Joe Coburn lead a discussion on the community's efforts to work around the GPS "P" code, which causes dithering to the GPS signal. The U.S.C.G. has been installing Differential GPS stations along the US coast that defeats the dither. MARSAT is now providing satellite signals to do the same at sea (at $10/min). WHOI, ONR and the Department of Defense are working to install a government furnished decoder aboard KNORR for the Tucholke cruise this summer that removes the dither from the "P" code. This will require security clearances and special coordination. Both Magnavox and Trimble have developed a commercial decoder box that costs $10K to $14K. The decoding part of the system is retained by the Federal Government. DOD is considering permitting such decoder boxes for all UNOLS ships.

COASTAL OCEAN WORKSHOP:

Mark Langseth provided a status report on the Coastal Ocean Workshop held in Williamsburg, Virginia on 21-24 February 1993. Don Wright, the chair of the FIC subcommittee on Coastal Oceanography, was unable to attend our FIC meeting; however, provided a first draft of the workshop report which included an overview, summary and recommendations. This overview is included as Appendix IX.

The workshop brought together over 75 scientists and funding managers involved in the broad spectrum of coastal oceanography. The first morning was devoted to a plenary session with presentations by five scientists with broad experience in interdisciplinary field research and representing the perspectives of different subdisciplines of coastal oceanography. After the initial session the assemblage was divided into four working groups that focused on the following themes: (1) synoptic observations; (2) time series; (3) multidisciplinary studies; and (4) information management and communication. These working groups presented their findings at a plenary session on the following morning. A second set of working groups then got together to address facilities. These groups were divide into (1) large research ships; (2) small research ships; (3) aircraft, satellites, moorings and fixed platforms; and (4) shipboard instrumentation. A synopses of their work was presented at yet a third plenary session on the last day.

A summary of the recommendations and needs for the various groups was provided and include:

- Vessel and Non vessel specific recommendations.
- Increased ability to operate inshore in heavy weather.
- More effective data transmission techniques.
- An inventory of small research vessels.
- A need for more interdisciplinary work.

WHOI'S PLANS FOR A SMALL SWATH:

Joe Coburn presented the WHOI plans for a small SWATH vessel. A study at WHOI, chaired by Susumu Honjo, concluded that there is a need for both a large and small SWATH vessel in the oceanographic community. The large SWATH would permit research at times of marginal weather conditions opening up vast ocean areas presently inaccessible to researchers. A small SWATH could provide quick response for special oceanographic and atmospheric events (oil spills, plankton blooms, etc.) as well as equipment testing at a modest cost during weather conditions that would not permit operations by a vessel of equivalent daily rate. WHOI is planning to pursue the small SWATH option at this time.

The WHOI small SWATH would be operated outside the UNOLS model. It is envisioned to be 80 to 100 feet in length and cruise up to 10 days at distances no further than Bermuda (650 nautical miles). Seakeeping will be of paramount importance and the science outfitting highly flexible. Accommodations for six scientists and two to four crew members will be planned. A $3000 daily rate is the target.

Two conceptual designs, one by SAIC and the other by BSM, have been selected that fulfill the WHOI requirements. The next step will be to select one of the two designs when funding permits. Additional details of the WHOI specifications and drawings of the two conceptual designs are included as Appendix X.

SHIP MOTION STUDY:

Eric Firing has been working on ways to measure ship motion to provide corrections for Acoustic Doppler Current Profiler (ADCP) signals. Eric has contacted Professor Bruce Adee at the University of Washington on this little studied effort. Adee's work has been focused on fishing boat survivability. Eric has been studying a 3-D GPS navigation system made by ASHTECH with 24 channels arranged in 4 sets of 6 channels each. He is getting a 1 Hz update rate with a 5-10 Hz update rate in the planning. A short base line of 2-3 meters seems to work best. The algorithms provide both pitch and roll. Accelerometers will be necessary to provide acceleration and heave if these measurements are deemed important. Real time measurements are not yet reliable enough. The ASHTECH system costs $30,000. A Trimble system for $17,000 is being discussed but the receiver system is presently not available commercially.

UPDATE OF THE FLEET IMPROVEMENT PLAN:

The second day of the FIC meeting was primarily devoted to an update of the Fleet Improvement Plan. Marcus provided first an outline, Appendix XI, consisting of:

I. Introduction
II. Background
III. What academic fleet is required in the next 20 years
IV. Funding for the fleet
V. Recommendations.

Considerable discussion followed as to the details needed in each of these headings. The Committee was in general agreement with the outline as presented except for the sub-item, "modes of operation" in the recommendations section. It was decided that a study on the modes of operation was beyond the scope of this report but that this area should include information on the importance of UNOLS and reasons for using UNOLS ships. Garry Brass said that he would again bring the "Modes study" up with the Council and deal with it in that forum.

A first draft of the Introduction and Background was provided by Marcus and the committee was asked to review it and forward comments to Marcus. Included in this draft are two tables; one listing the 1993 UNOLS fleet and the second listing the fleet as it is perceived for 1998. In these listings Marcus has divided the fleet into: Large High-Endurance General Purpose Ships; Large Medium Endurance Ships; Intermediate Ships; Small Ships; and Special Ships. The 1998 table reflected the introduction of AGOR 24, AGOR 25 and the Arctic Research Ship. Missing from the list are ATLANTIS II and ALPHA HELIX. A discussion followed as to when Moana Wave is expected to be retired. Keith Kaulum stated that ONR has not set a date for WAVE's retirement.

Marcus also provided a series of charts and tables reflecting the comparative cost of the fleet by class. The first chart, a pie chart, illustrates proportionally the 1992 cost of each class of

ships. Class I/II costs nearly 50% of the whole. Class III ships cost approximately 35% with Classes IV and V completing the total. Ship costs are then shown in bar charts illustrating the cost for each Class of ship from 1985 through 1992. The costs are shown in real dollars and with a 4% inflation factor. When the inflation factor is applied, Class I/II ships become relatively less expensive over the years while Class III ships have tended to increase slightly. The overall cost of the fleet is roughly the same through the years when applying this inflation factor. A final chart plots the Daily Rate versus the Percent of Use for Class I/II and Class III ships. Contrary to common wisdom the cost does not seem to rise with a declining use factor. It should be noted that the lowest "use factor" represented was 73%.

Peter Betzer and Marty Mulhern provided a draft for the Fleet Improvement Plan on "Improving Fleet Efficiency through Interagency Cooperation". The Committee was asked to review and submit comments.

The remainder of the meeting was devoted to compiling a list of questions that the updated Fleet Improvement Plan should tackle. Assignments were made to each of the questions and are as follows:

1. By what means and to what degree should agencies increase cooperation? -- Betzer, Langseth and Brass

    a. Role of non-US research vessels in the future (cooperation, specialization, competition)?

2. How will trends in research over the next 5-10 years affect the requirements for sea going facilities?

    a. What do we perceive as the trends in research (different disciplines)? -- Langseth, Miller, Firing and Wright

    b. What will the new technologies, communications impact the requirement for seagoing platforms? -- Chereskin, Firing and Wright

    c. How do the research plans (big programs etc.) affect the need for ships in the next 5-10 years? -- Miller, Firing

    d. What recommendations should be made in view of these trends? --

    e. Will new data acquisition technologies supplant ships? -- Chereskin, Firing

3. Are the SMR's for large ships too general? Have we gone to far with General Purpose Ships (GPS)? FIC to write at next meeting.

    a. Is the current inventory of specialized facilities sufficient to meet future needs? -- FIC to write at next meeting

Recommendations:

- Proceed with ARV?
- Proceed with Submersible Support Ship?
- Upgrade FLIP or MLR and eventually a replacement?
- Jack-up Rig
- Semi submersible
- A small SWATH
- Keep large SWATH on the horizon
- Nuclear submarine
- Deep Submersible upgrade

4. What developments and improvements in technical support do we hope for on the UNOLS vessels?

   a. Standardization (what and how much)?
      (1.) Data acquisition?
      (2.) Communication?

   b. Common standards and formats? C-NET?
      -- Findley, Chereskin, Johnson, Firing and Royer

5. Future regional distribution of the fleet assets?

   a. Recommendation:

      In the context of future retirements and acquisition evaluate the geographic distribution of ships, and consider reassignment if necessary.
      -- Royer, Firing, Miller, Langseth

6. History of the Fleet.-- Miller and Bash

The UNOLS Office will review their files for potential figures and pictures for the final update report.

Writing assignments are due by 1 June 1993.

CALENDAR:

The Committee decided to have the next FIC meeting in Corvallis, Oregon on 19-20 July 1993.

The meeting was adjourned at 3:00 p.m.

APPENDIX I

UNOLS FLEET IMPROVEMENT COMMITTEE

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April 28 & 29
Stouffer Madison Hotel, Seattle Washington

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Convene April 28 at 9:00 am

1. **Greetings and meeting logistics** - Jack Bash
2. **Approval of minutes of October meeting and agenda**-Mark Langseth
3. **UNOLS Council report (January 93 meeting)** - Jack Bash
4. **Agency Reports**
   NSF - Dick West
   ONR - Keith Kaulum
   NOAA - Martin Mulhern
5. **Miscellaneous items-** Mark Langseth
   - SOONS update (Arctic Science 93)
   - Liaisons to the RVOC and the DSSC (Deep Submergence Science Comm.)
   - Fleet Improvement Committee Annex to the UNOLS Charter
   - Extended appointments for Royer and Johnson
6. **Mid-life refit of intermediate-sized ships** - Dick West/Jack Bash
7. **Arctic Research Ship Preliminary Design Study** - Tom Royer
   Status of design study and response to conceptual design study
8. **Coast Guard plans for a Research Icebreaker** - Jack Bash/Garry Brass
9. **Coastal Ocean Workshop** - Peter Betzer/ Mark Langseth
10. **Briefing on WHOI's plans for a small swath** - Joe Coburn

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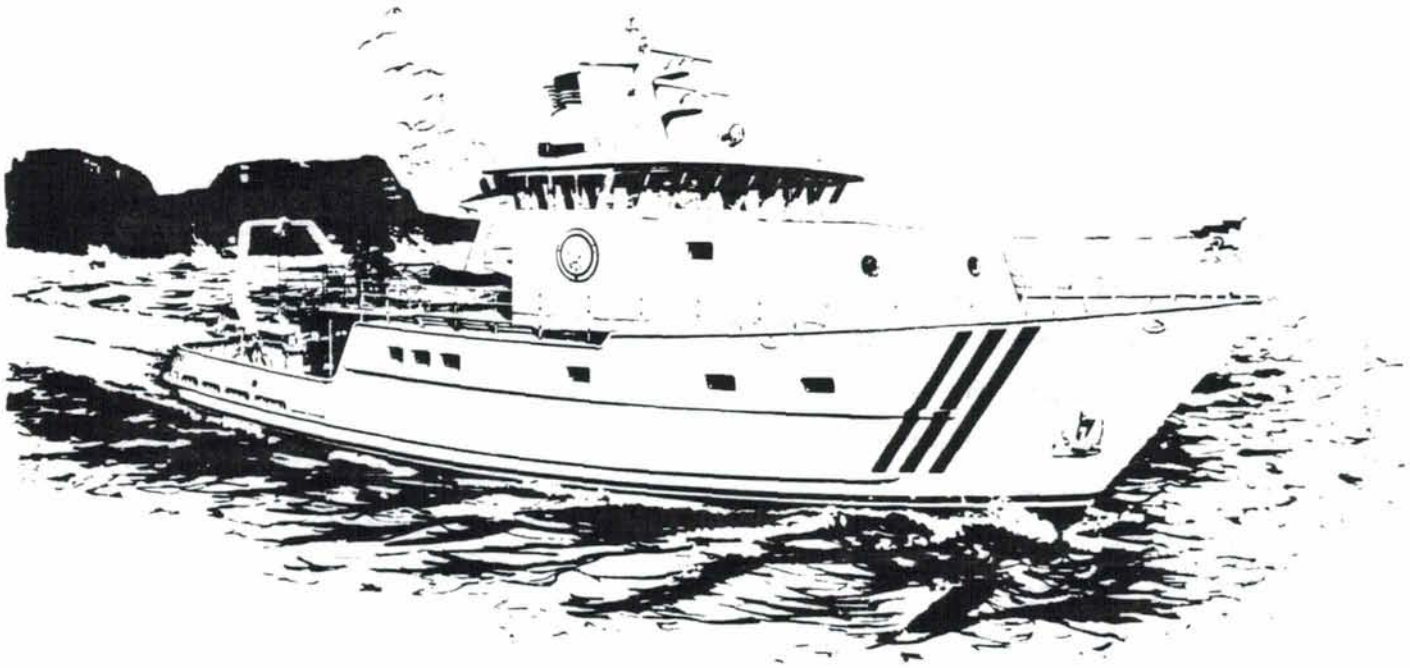
Tuesday April 29, 9:00 am

11. **Update of the Fleet Improvement Plan-Mark Langseth**
    Mark Langseth- Introduction, background, purpose etc.
    Reports from subgroups (focus on what should appear in Update)
    Charles Miller/Firing- Facility needs of major programs
    Don Wright/Betzer-Facility needs for Coastal Ocean Science
    Peter Betzer/Mulhern-Cooperation amongst federal Fleet
    Tom Royer- Arctic Research Vessel
    Ken Johnson et al.- Sources of funding; traditional and non-traditional
    Discussion of Update themes-What do we want to highlight?
12. **Sub Groups work on update sections:** Please plan to spend the remainder of the working day on developing text for the update.

APPENDIX II



Concept Design of a

90 FT. RESEARCH VESSEL

for

Smithsonian Tropical Research Institute

2.0 NARRATIVE DESCRIPTION OF VESSEL

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2.0 NARRATIVE DESCRIPTION OF VESSEL

INTRODUCTION

This preliminary design was prepared under the funding and direction of the Smithsonian Tropical Research Institute.

The design is based on experience with several types of successful oceanographic research vessels, of which the naval architect has thusfar designed ten (10).

The new vessel is developed to fulfill the requirements of the Smithsonian Tropical Research Institute as a multi-use research vessel.

The General Arrangement, jointly developed by REL&A and STRI, has resulted in a vessel with more useful space than most research vessels of comparable size.

2.1 GENERAL

2.1.1 Purpose

The vessel is primarily to be used as a working platform for biological oceanography and marine paleoecology. The vessel is equipped for launch and retrieval of buoys and sampling equipment, operation of towed sampling equipment, and support of underwater diving operations.

2.1.2 Operation Area

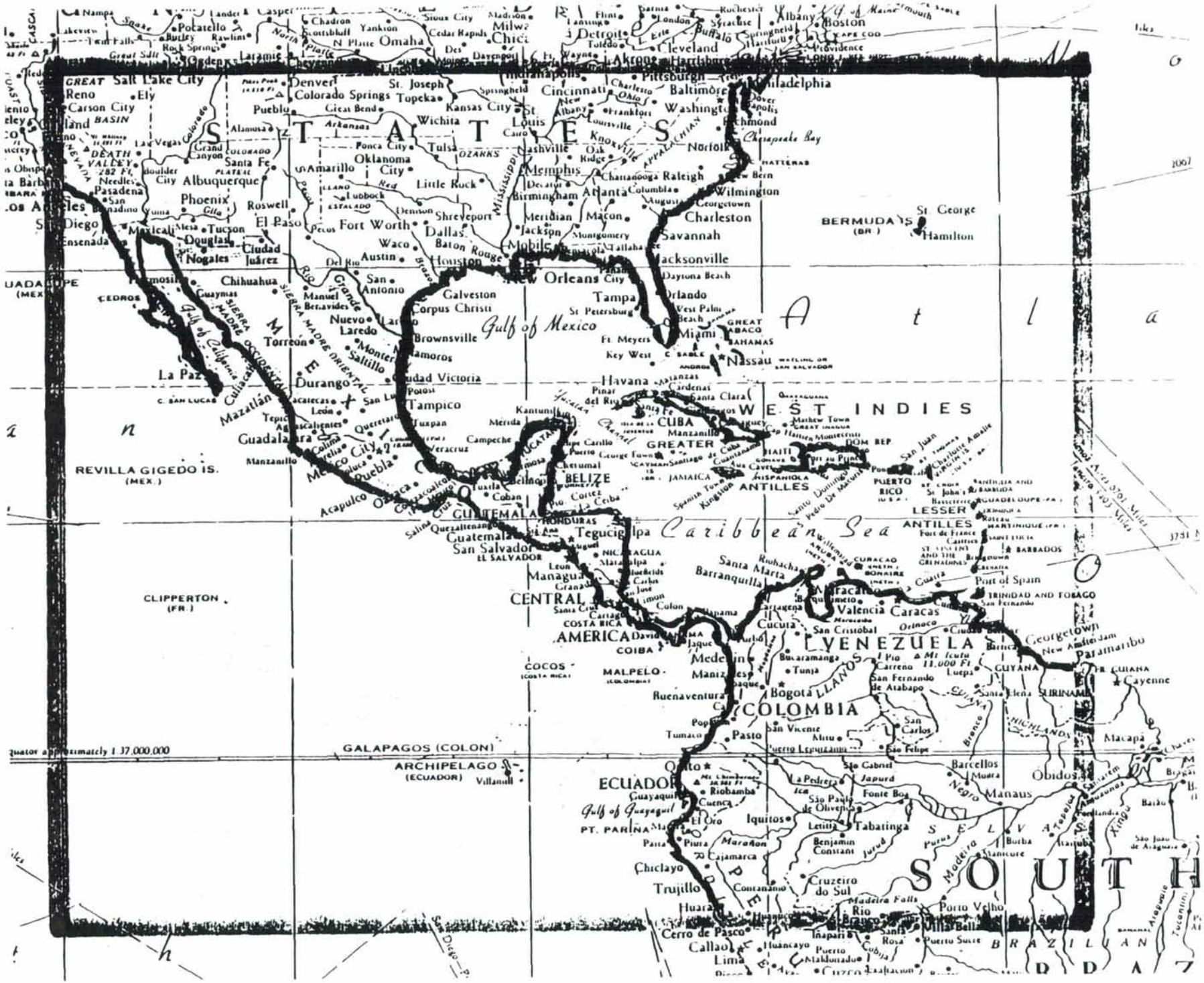
The vessel is to operate primarily in tropical and sub-tropical waters (see map, page 2-3). The vessel is classed for full ocean service.

2.1.3 Operation Considerations

Due to the frequency of operation planned for coral reef and estuarine areas, the vessel will have excellent Pilot House visibility and relatively shallow draft. As a multi-disciplinary research vessel, the emphasis has been on flexibility. The laboratories are kept general, without sacrificing function and allowing to accommodate new tasks in the future.

Similarly, the aft deck is kept as uncluttered as possible, leaving ample space for scientists to work. A grid of tie-downs is arranged in the deck to permit efficient attachment and removal of deck equipment.

Interior noise and vibration levels are kept at a minimum, in order to reduce personnel fatigue and facilitate operation of scientific instruments. Habitability and comfort features are designed to promote a good working atmosphere while at sea, for scientists and shipboard crew.



2-3

PRIMARY AREA OF OPERATIONS

(55°W - 120°W Longitude and 40°N - 10°S Latitude)

2.1.4 Description of Vessel

The vessel is basically a raised focsle with a low freeboard weatherdeck aft. The Main Deck aft is utilized for scientific work and gathering samples. The midship area is occupied with labs, and the forward Main Deck houses the Galley, Mess and Lounge.

The staterooms are located on the Focsle Deck for the Chief Scientist and Captain, with remainder of accommodations on the Tank Top level.

The Bridge is located on a raised focsle deck to enhance visibility yet lessen motions. The Bridge contains an after control console for excellent visibility aft. The main engines, rudders, bow thruster and winches will be controlled from this station, enhancing visibility, control and safety of operations.

2.1.5 Principal Dimensions

Overall length	100'- 0"
Waterline length	84'- 6"
Breadth	25'- 0"
Depth to Main Deck	12'- 0"
Design draft	8'- 0"
Displacement at full load	246 L.Tons

2.1.6 Endurance

The design will support crew and scientists for a minimum of forty (40) days without replenishment of stores and consumables.

2.1.7 Range

Operating range at the designed draft, with one generator operating at 80% capacity and 10% fuel margin:

Shaft HP	Speed	Range (N.Mi.)	Days	Gal/Hr.
1013.0	12 kt.	1965.72	7	55
703.0	11 kt.	2691.26	10	37
500.6	10 kt.	3427.10	14	27
327.2	9 kt.	4673.79	22	18

2.1.8 Complement

The vessel is designed for the following complement:

Crew

(1) Captain
(1) First Mate
(1) Second Mate
(1) Engineer
(1) Cook

Scientists

(2) Chief Scientists
(8) Scientists

2.1.9 Capacities

Fuel Oil . . . . . 10,176 gallons
Fresh Water . . . . . 3,162 gallons
Anti-Roll Tank . . . . . 1,962 gallons

2.2 HULL

2.2.1 General

The hull is designed with emphasis on good seakeeping capability while maintaining an efficient and economical multi-chine hull form. The multi-chine hull is chosen for ease of construction, increasing competition among shipyards. The hull will have a deep raked keel and bilge keels to improve seakeeping.

2.2.2 Construction

The hull is fully welded aluminum construction according to the rules of the U.S. Coast Guard and the American Bureau of Shipping.

The hull is longitudinally framed with a complete double bottom forward of the Engine Room and protective Engine Room wing tanks.

2.2.3 Anti-Roll Tank

A passive anti-roll tank is incorporated into the design to provide a stabilized work platform while underway and stationary.

2.2.4 Coatings

A modern epoxy system, chosen with emphasis on easy maintenance, is utilized. All paints, coatings, and anti-foulants shall meet or exceed the most current EPA standards.

2.2.5 Structural Fire Protection

The vessel is outfitted with a combination of non-combustible and fire retardant materials. The joiner system, free-standing bulkheads, ceilings, and wall coverings are constructed of TNF Panel System (Thermal/Noise/Fire) as manufactured by Rockment A/S.

The vessel is equipped with a smoke detection and alarm system. Fire stations are located throughout the vessel, each equipped with 50 feet of fire hose, and pressurized by two Engine Room fire pumps. The Engine Room is protected by a CO_2 smothering system. Individual hand-held fire bottles will be arranged throughout the vessel, in accordance with U.S. Coast Guard.

2.3 MACHINERY

2.3.1 General

The propulsion machinery consists of two (2) medium speed diesel engines, driving fixed pitch propellers through reversing reduction gears.

Electric power is provided by two (2) diesel driven generator sets.

An electric motor driven bow thruster is installed to enhance maneuverability and stationkeeping.

Main engines and bow thruster will normally be controlled from the Bridge and Aft Control Station. Machinery will be started and stopped in the Engine Room.

2.3.2 Main Engine

Main propulsion engines are Caterpillar marine diesels model 3408TA, producing 470 horsepower at 1800 RPM, or Detroit Diesel model 12V-71TA, producing 420 horsepower at 1800 RPM.

2.3.3 Gears

Each reduction gear unit is a Twin Disc model MG516 with 4.04:1 reduction.

2.3.4 Generator

The two ship's service generator sets are Caterpillar Marine model 3304, producing 90 kilowatts at 460 volt, 3 phase power, or Detroit Diesel model 4.71, producing 90 kilowatts at 460 volt, 3 phase power.

2.3.5 Bow Thruster

The bow thruster, a Schottel or equal, is a transverse tunnel, fixed pitch propeller, rated 125 horsepower. It is powered by a three-speed AC reversing motor. The AC motor is supplied with low voltage starter and current limiting alarms. The thruster is controlled from the Bridge and Aft Control Console.

2.3.6 Rudders

The steering system is comprised of two (2) airfoil shaped balanced rudders. The rudders are connected through the tiller arms by a jockey bar, with a hydraulic cylinder connected to each tiller arm. The rudders and steering system are designed for rudder movement of 40° either Port or Starboard. The system shall be powered by two (2) (one standby) hydraulic power units, sized for a rapid response time of 15 seconds hard-over to hard-over.

2.4 DECK EQUIPMENT

2.4.1 General

Deck equipment, winches, cranes, A-frames, and capstans will be powered by two (2) electric motor driven hydraulic power packs.

2.4.2 Deck Crane

One extendable hydraulic crane is mounted on the Main Deck. Capacity while retracted is 10,000 pounds at 10 feet and 3,500 pounds at 25 feet. This crane will be used for launching and recovering the small work boats. It is also capable of handling the oceanographic winch wire cable drums and launch/retrieval of over-the-side sampling equipment, data buoys, etc., and is therefore able to reach close to the sea surface. It will also be furnished with bulwark crutch for light duty over-the-side tows.

2.4.3 Stern A-Frame

A stern A-frame is installed to assist in launcn and retrieval of scientific instruments over the vessel's stern. The A-frame has a clear opening of 15'-6" in height and 9'-0" in width. The A-frame is rotated over the transom via two hydraulic cylinders operated from a local control station.

2.4.4 Oceanographic Winches

Two oceanographic winches, Markey or equal, are installed on the 01-Deck. One is designated as a deep water conductor winch with precision level wind and a capacity of 5000 meters of 0.322 conductor wire. The winch will operate at a speed of 60 meters per minute at mid-drum. This winch is used for in situ sampling, such as CDT work.

The second winch is a deep water trawl winch with a capacity of 8,000 meters of 3 x 19 torque balanced $\frac{1}{4}$" wire. This winch is used for towing acoustic devices, small sampling nets, and over the side sampling.

The winches' speed and direction is controlled from the aft control/steering console. Emergency override kill switches are located locally at each winch.

2.4.5 Capstans

Two (2) 3 horsepower warping capstans are installed Port and Starboard on the stern quarters to assist in navigating the canal locks, and also handling scientific instruments and trawl nets.

2.4.6 Anchor Windlass

A 15 horsepower anchor windlass with double chain wildcats is located forward on the 01-Deck. The electro-hydraulic windlass is controlled locally and will raise and lower Port and Starboard high holding capacity Danforth anchors.

2.5 LABORATORIES

2.5.1 Wet Sample Laboratory (225 square feet)

This is a wet lab for water sampling and for rough work with fish samples, plankton, and geological and biological samples.

This laboratory has a stainless steel sample table with sea water supply and ample drains which enable fine grain sands and mud to be washed overboard.

The lab contains 115 volt electric power, hot and cold fresh water, sea water, and compressed air.

The outer bulkheads (under counter tops) contain large 50 gallon sample containers with fresh uncontaminated sea water supplies. The containers will be used to keep specimens alive for detailed investigation.

The lab contains a freezer and refrigerator to store and protect collected specimens.

2.5.2 Dry Laboratory (200 square feet)

This is a laboratory designed for relatively clean operations, general in nature, and will be used for various purposes depending on the type of cruise.

The laboratory has ample workbench space and cabinets and drawers. The lab contains 220 volt and 115 volt electric power, hot and cold fresh water, uncontaminated sea water, and compressed air.

2.5.3 Dive Locker

The dive locker contains a workbench, hot and cold fresh water, 110 volt electric power, general service compressed air, and high pressure Mako Breathing Air System, model 9400, rated 13 CFM at 5000 PSI, for refilling SCUBA tanks.

2.5.4 Transducer Housing

This is a small compartment within the double bottom used exclusively for transducers and sonar equipment.

2.5.5 Scientific Stores

This is a spacious compartment built below the Main Deck, aft of the Engine Room, and accessed through a 36" x 36" watertight hatch convenient to the work deck. It is an ideal location for storage of sampling equipment, buoys, lines, anchors, trawl nets, etc. A second large storage area (855 cubic feet) is located below the Pilot House and accessed from the Boat Deck.

2.6 ACCOMMODATIONS

2.6.1 General

The design is arranged to accommodate a total of fifteen (15) persons. The spaces are designed to provide a comfortable and healthy setting. Crew and scientist spaces are designed with semi-private heads, dormitory style to provide the most privacy available on a small vessel. The Captain and Chief Scientist each have private rooms and private heads and are located adjacent to the Pilot House for safety and convenience.

The crew and scientist compartments are insulated from the Engine Room noise via a lead-impregnated sound absorption insulation, sheathed with perforated aluminum plate.

2.6.2 Pilot House

The Bridge layout provides an excellent view in all directions and the Aft Control Station has a view of all aft deck operations as well as Starboard side trawling operations.

2.6.3 Mess and Galley

The Mess Lounge Area is arranged to accommodate seating twelve (12) persons. The Galley is outfitted with a day freezer/refrigerator, range, oven, and griddle top. A hood with CO_2 emergency release is provided over the range and griddle top.

Adequate space for provisions for forty (40) days operation is furnished in the step-in freezer and chiller and Dry Provision Pantry.

The Laundry is outfitted with one (1) washer and dryer and one (1) deep sink for utility purposes.

2.7 SHIP'S SERVICE SYSTEMS

2.7.1 Ventilation, Heating and Air Conditioning

All accommodation spaces are air conditioned. The laboratory spaces are air conditioned via a separate A/C ventilation system. The system is designed with four (4) zones, each having interchangeable compressor and parts.

2.7.2 Fresh Water Supply

The vessel is equipped with two (2) 1,581 gallon fresh water storage tanks. To supplement usage away from port and on extended voyages, a 1,000 gallon per day reverse osmosis watermaker is installed.

2.7.3 Sanitary System

A 720 gallon per day marine sanitation device (MSD) is installed to comply with USCG, EPA and international pollution laws. Gray water from lavatories, showers, galley, etc., will be maintained in a totally separate system and discharged overboard.

2.8 ELECTRICAL SYSTEM

2.8.1 General

The vessel's main electric supply is 460 volt, 3 phase, 60 hertz. This is supplied by two (2) diesel driven generator sets, each of approximately 90 KW capacity. The main switchboard is located in the machinery space with alarm readouts in the Chief Engineer's Stateroom and Pilot House.

For lighting and minor consumers, 208/120 volt power is supplied via transformers. 220 volt electricity is supplied by transformers as required. Clean power for sensitive scientific equipment is supplied via an uninterruptable power supply (UPS) system, as required. A shore power connection with a capacity of 100 amp, 208/120 volt, 60 hertz supply is available.

2.8.2 Electronics

Electronic equipment will be selected that conforms to NEMA 0183 interface standards. Navigational instrumentation is as listed below.

2.8.2.1 Radars

(1) Furuno FCR904, 48 mile range with 10" CRT display

(1) Furuno FCR1411, MK2 color radar

2.8.2.2 Gyro Compass and Autopilot

Complete gyro compass and autopilot installation, including bearing repeaters in remote stations as required

2.8.2.3 Global Positioning System (GPS) with Integrated Log and Compass

An integrated navigational system including (1) Magnavox 4400GPS Satellite Navigator.

2.8.2.4 Engine Alarm and Monitoring System

A 30-point engine monitoring system is installed to monitor engine functions and prevent engine damage.

2.8.2.5 Single Side Band Transceiver

(1) ICOM IC-M800 with coupler

2.8.2.6 Weather Fax

(1) Furuno FAX-208A with antenna

2.8.2.7 VHF Transceivers (2)

(2) ICOM M120 VHF radios

2.8.2.8 Inmarsat Type "C" Equipment

2.8.2.9 Depth Recorders (2)

(1) Furuno FCV-663 with transducer

(1) PDR Precision depth recorder

2.8.2.10 Other Navigational Equipment

(1) Magnetic compass

(1) Reserve magnetic compass

(2) Binoculars

(1) Sextant

(1) Chronometer

(2) Barometers

(1) Anemometer

2.8.2.11 Emergency Radio Equipment

(1) Lifeboat radio

(1) Emergency Position Indicating Radio Beacon (EPIRB)

2.8.3 Interior Communication System

(1) General alarm system in accordance with ABS and USCG

(1) Scientific intercom system with eight (8) stations

(1) Sound powered telephone system with four (4) stations

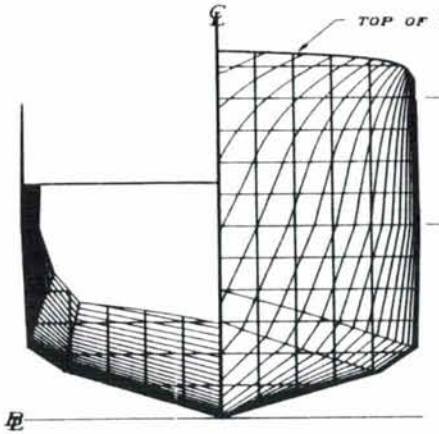
2.9 ENVIRONMENTAL IMPACT

The vessel is designed to meet or exceed all current U.S. Coast Guard and International Maritime Organization (IMO) pollution standards.

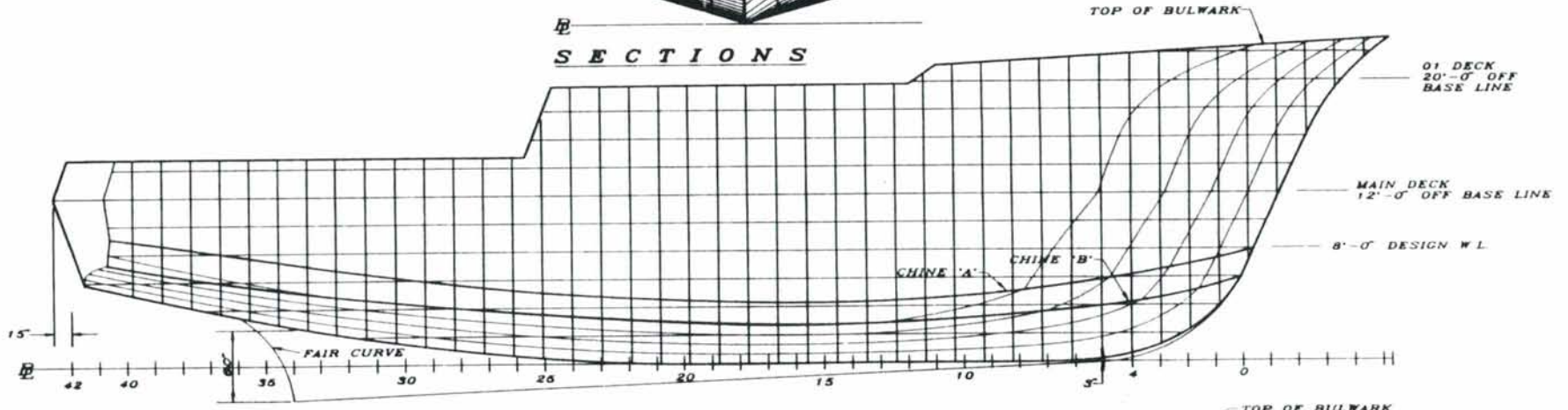
An oily water separator is installed to prevent oily water discharge. Drip pans are installed under each diesel, and shaft alley stuffing boxes are installed with return sumps to lessen the amount of oily bilge water. Spill containment boxes are located around all fuel oil vents and fuel oil fill stations.

NOTE:

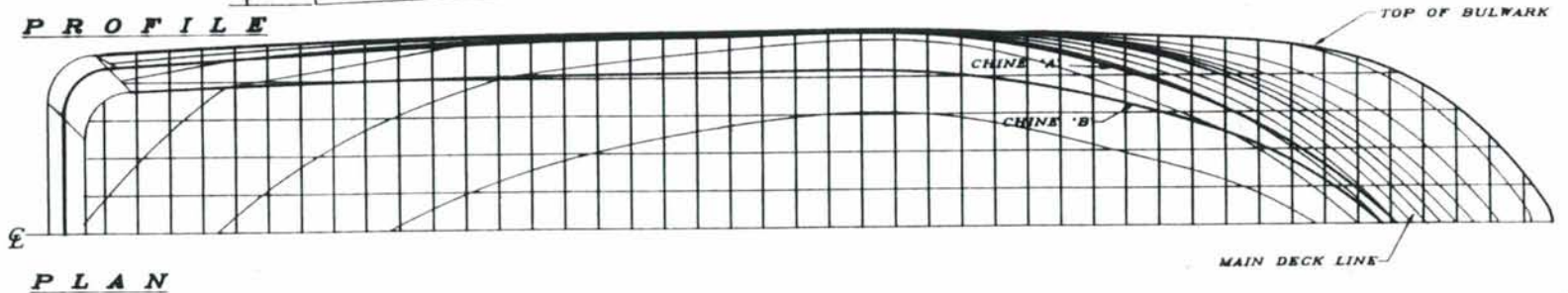
Certain items of machinery and other equipment are mentioned by specific manufacturer and noted model throughout this study. The purpose of this designation is to indicate quality and performance desired, and not to restrict competitiveness.



SECTIONS

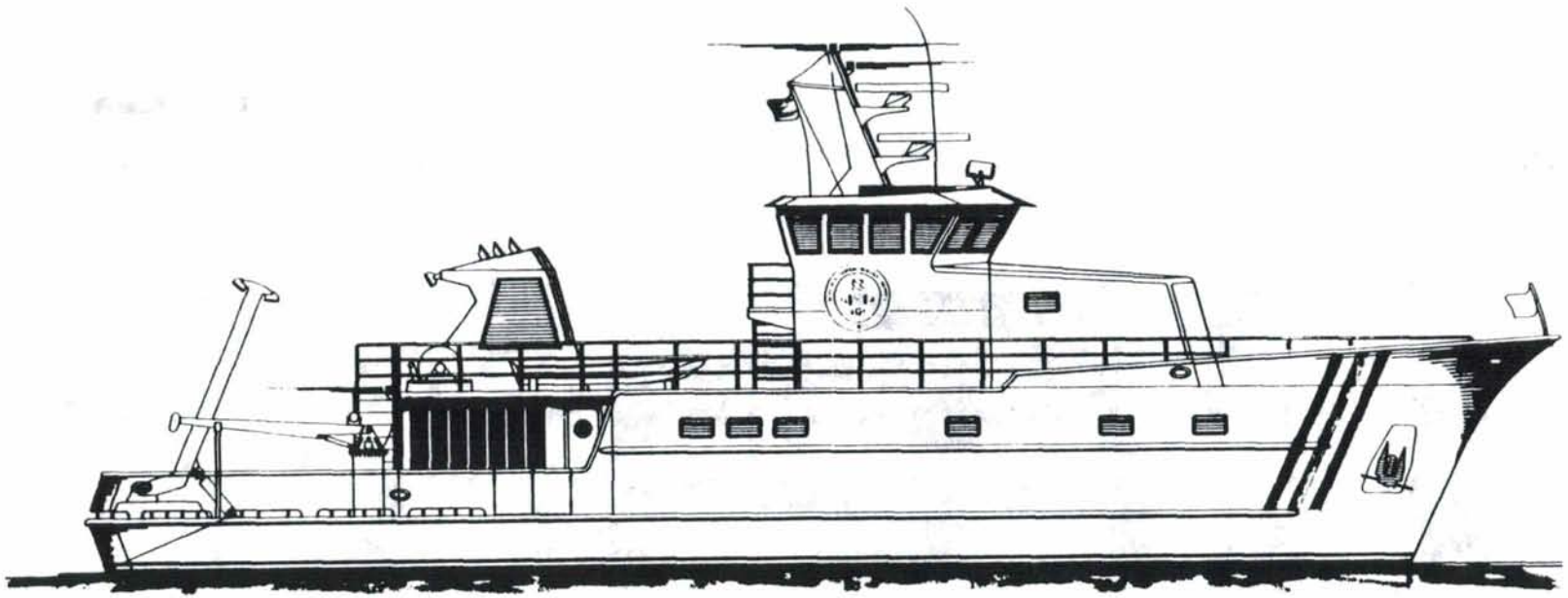


PROFILE



PLAN

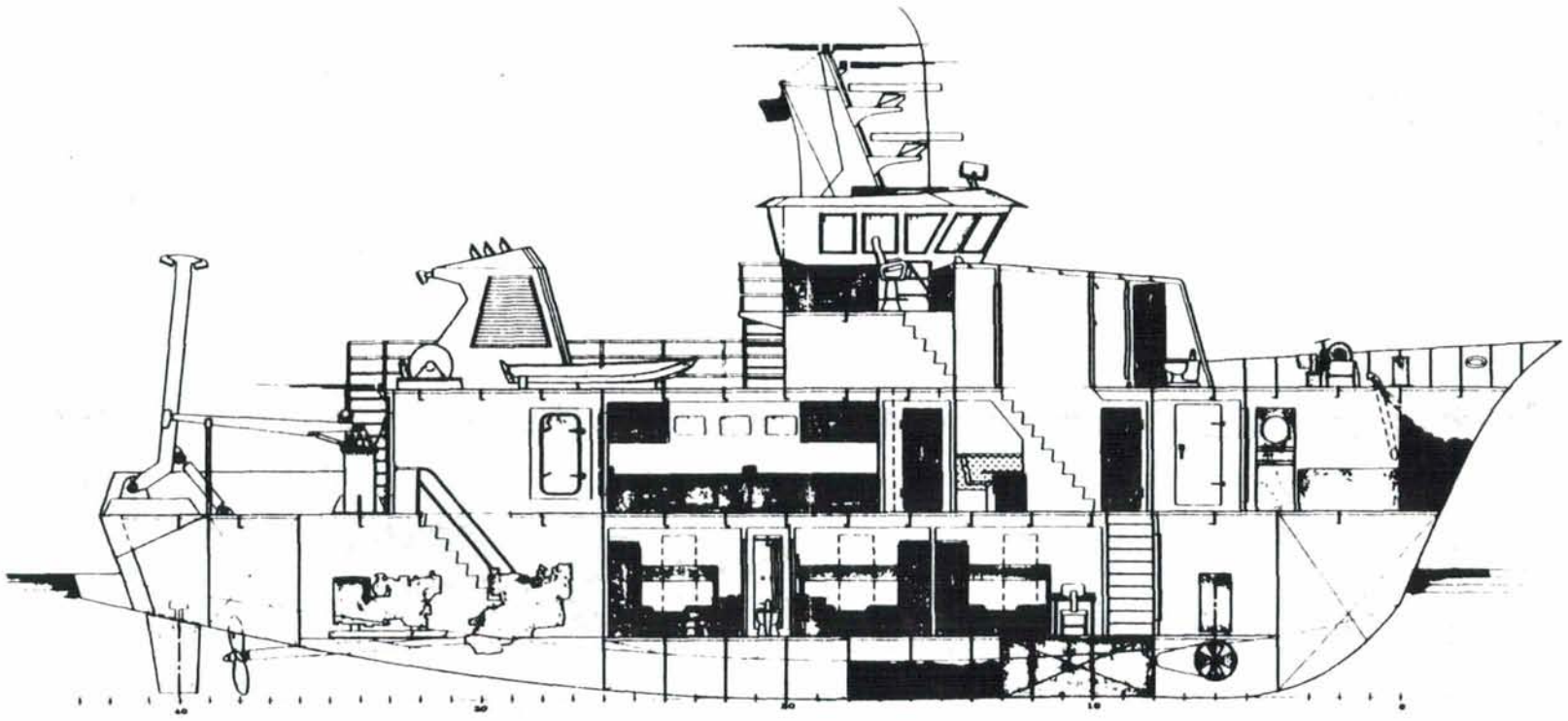
design by
RODNEY E. LAY & ASSOCIATES



OUTBOARD PROFILE 1/8"

1 5 10
SCALE

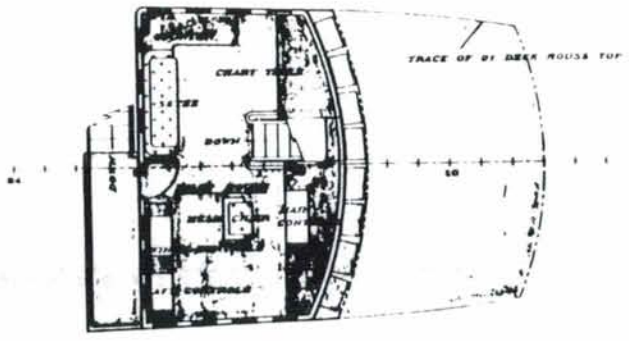
design by
RODNEY E. LAY & ASSOCIATES



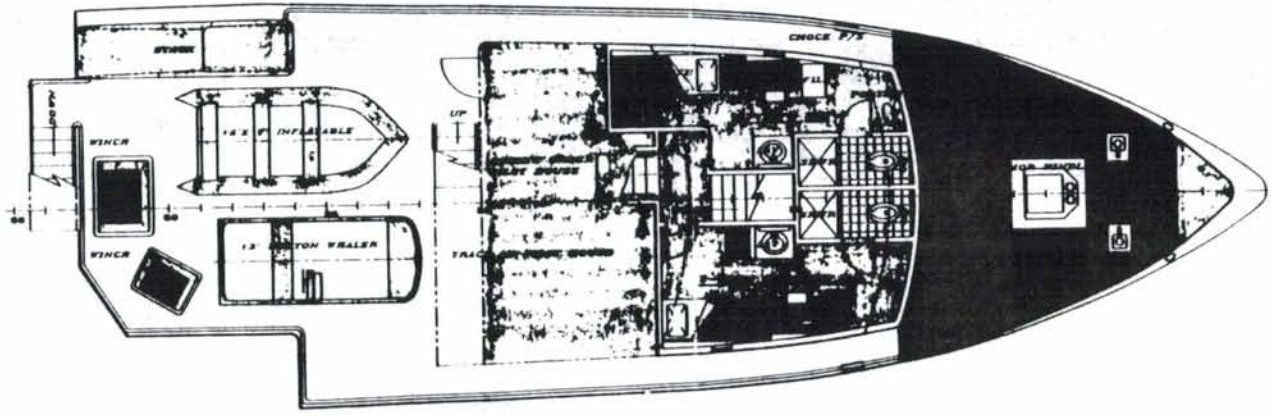
INBOARD PROFILE 1/8"

1 5 10
SCALE

RODNEY B. LAY & ASSOCIATES



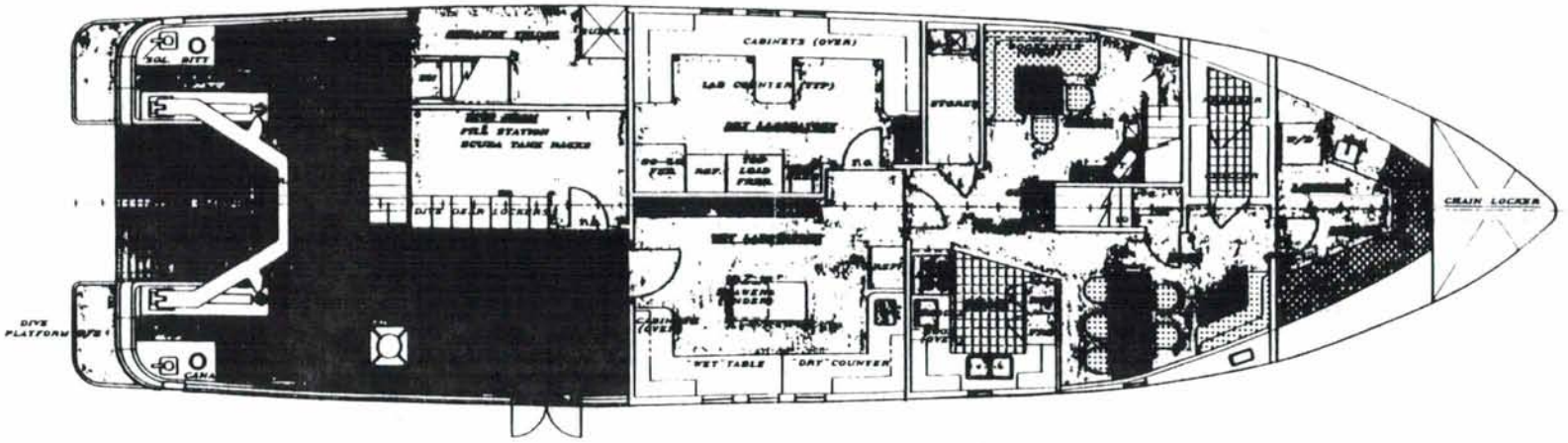
PILOT HOUSE ARRANGEMENT 1/8"



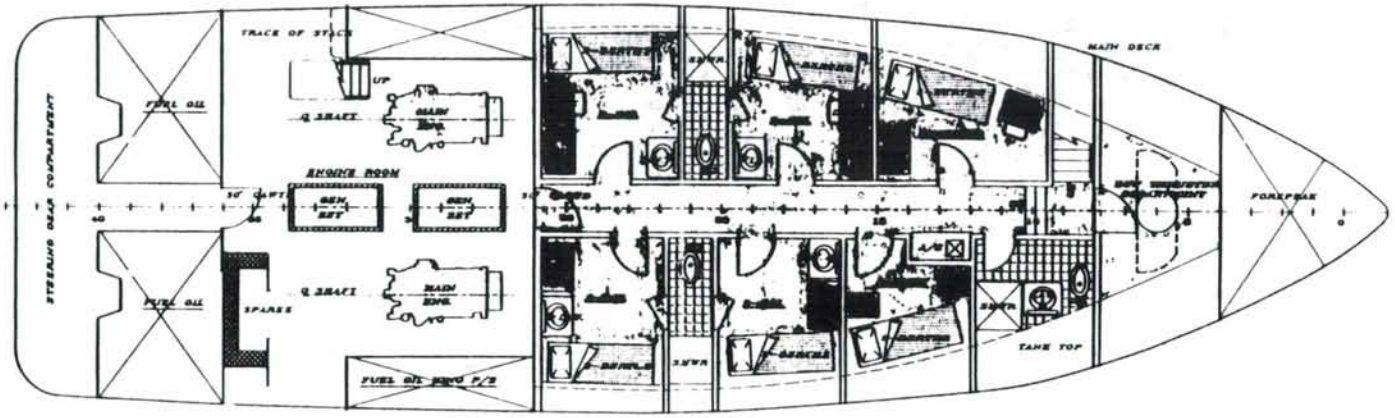
01 DECK ARRANGEMENT 1/8"

1 5 10
SCALE

design by
RODNEY E. LAY & ASSOCIATES



MAIN DECK ARRANGEMENT 1/8"



LOWER DECK ARRANGEMENT 1/8"

1 5 10
SCALE

design by:
RODNEY E. LAY & ASSOCIATES

APPENDIX III

OCEAN SCIENCES: $209,780,000

Research in the Ocean Sciences seeks to improve the understanding of the ocean from the coastlines to the deep-ocean basins. The Ocean Sciences Subactivity supports research and operations of the international Ocean Drilling Program. NSF provides approximately 75 percent of the funds required for academic fleet operations. Two-thirds of the Ocean Sciences funds are used to support individual and group research activities; and one-third goes for operation and maintenance of shared-used facilities, primarily ships. The National Science Foundation supports approximately 70 percent of the total Federal support for basic research in ocean sciences.

(Millions of Dollars)

Program Element	FY 1992 Actual	FY 1993 Request	FY 1993 Revised Current Plan	FY 1994 Request	Change FY 1994 vs. FY 1993
Ocean Sciences Research Support	$ 90.03	$109.24	$108.18	$112.57	$4.39
Oceanographic Center and Facilities	51.22	59.32	50.26	56.76	6.50
Ocean Drilling Program	36.25	37.80	37.80	40.45	2.65
Total, Subactivity	$177.50	$206.36	$196.24	$209.78	$13.54

FY 1994 BUDGET REQUEST

The FY 1994 Budget Request for Ocean Sciences is $209.78 million, an increase of $13.54 million or 6.9 percent above the FY 1993 Revised Current Plan of $196.24 million. Support for Global Change is increased by $2.13 million, to $66.23 million.

Explanation of Increases:

Ocean Sciences Research Support increase of $4.39 million, or 4.1 percent, provides:

- $2.13 million for augmentation of Global Change research programs, including the joint expedition to the Indian Ocean and Arabian Sea;
- $2.05 million for collaborative research in coastal oceanography and for oceanic ridge crest processes; and
- $210,000 for increased participation in the High Performance Computing and Communications initiative of adapting existing models to the massively parallel computing environment.

Oceanograhic Centers and Facilities will increase by $6.50 million, or 12.9 percent, provides:

- $6.50 million for the initial steps of the procurement of an Arctic Research Vessel, a part of the academic fleet in the Ocean Sciences Subactivity, through charter or purchase.

The NSF and interagency initiatives displayed in the above table increase a total of $6.75 million and consist of support for the following research activities:

- $4.58 million to augment Global Change research and facilities support across all Subactivities, including support for U.S. participation in large international field projects and climate modeling programs in the Atmospheric Sciences Subactivity and the joint expedition to the Indian Ocan and Arabian Sea in the Ocean Sciences;
- $2.07 million for High Performance Computing and Communications, including Grand Challenge activities in the Earth Sciences Subactivity and massively parallel processing at the National Center for Atmospheric Research; and
- $100,000 to begin interdisciplinary research on Advanced Materials.

Other Increases Include:

- $6.50 million for the initial steps of procurement of an Arctic research vessel in the Ocean Sciences Subactivity;
- $3.04 million for acquisition and deployment of digital seismographs in the Earth Sciences Subactivity to enhance capabilities of the Global Seismic Network;
- $2.65 million for covering the increased costs of international agreements in the Ocean Drilling Program in the Ocean Sciences Subactivity;
- $1.88 million for research on earthquake hazards and on the dynamics of the Earth's interior; and
- $500,000 for conversion of a surplus military C-130 aircraft into a research aircraft for the National Center for Atmospheric Sciences.

CHANGES BETWEEN FY 1993 REQUEST AND FY 1993 REVISED CURRENT PLAN

(Millions of Dollars)

Program Element	FY 1993 Request	FY 1993 Revised Current Plan	Change
Atmospheric Sciences	$151.93	$141.62	$ -10.31
Earth Sciences	88.14	83.18	-4.96
Ocean Sciences	206.36	196.24	-10.12
Total, Subactivity	$446.43	$421.04	$-25.39

The FY 1993 Revised Current Plan is $421.04 million, a decrease of $25.39 million, or 5.7 percent, from the FY 1993 Request but an increase of $40.21 million, or 10.6 percent over FY 1992. The change is due to unspecified Congressional reductions and will result in fewer awards being made. The FY 1993 Revised Current Plan includes the President's stimulus package for FY 1993 which is described in the section of the Foundation's FY 1994 Budget Request labeled "FY 1993 Supplemental Request". Global Change research, environmental research and High Performance Computing and Communications will be funded at the requested level.

Ocean Drilling Program (ODP) increase of $2.65 million, or 7.0 percent, provides:

- $2.65 million to meet the increased contribution in ODP support by the international partners.

CHANGES BETWEEN FY 1993 REQUEST AND FY 1993 REVISED CURRENT PLAN

(Millions of Dollars)

Program Element	FY 1993 Request	FY 1993 Revised Current Plan	Change
Ocean Sciences Research Support	$109.24	$108.18	$ -1.06
Oceanographic Center and Facilities	59.32	50.26	-9.06
Ocean Drilling Program	37.80	37.80	0.00
Total, Subactivity	$206.36	$196.24	$-10.12

The FY 1993 Revised Current Plan is $196.24 million, a decrease of $10.12 million or 4.9 percent from the FY 1993 Budget Request, but an increase of $18.74 million, or 10.6 percent, over FY 1992. The decrease is due to unspecified Congressional reductions. Global Change research will be funded at the requested level.

APPENDIX IV

ARCTIC CRUISE UNDER THE ICE IN A US NAVY NUCLEAR SUBMARINE

BOAT:- 637 (STURGEON) CLASS ATTACK SUBMARINE

AREA OF OPERATIONS: WIDE CORRIDOR FROM POLE TO ALASKA

TIME UNDER THE ICE: 19 DAYS

LENGTH OF CRUISE: 42 DAYS IN AUGUST/SEPTEMBER 93

DATA: RELEASED TO PUBLIC WITHIN 90 DAYS OF END OF CRUISE.

NO. OF SCIENTISTS: ≈5

ARCTIC CRUISE UNDER THE ICE IN A US NAVY NUCLEAR SUBMARINE

CRUISE IS COORDINATED BY ARCTIC SUBMARINE LABORATORY SAN DIEGO

SCIENCE STEERING COMMITTEE ORGANIZED UNDER UNOLS

STEERING COMMITTEE

MARK LANGSETH- (MG&G, L-DEO, CHAIR)

TERRY TUCKER- (ICE, CRREL)

JAMIE MORISON (PHYS. OCEANO., UNIV. WASH.)

TED DELACA (MAR. BIO., UNIV. ALASKA, FAIRBANKS)

BILL SMETHIE (CHEM. OCEANO., L-DEO)

THE SCIENCE PLAN

ICE DYNAMICS

SIDE SCAN AND AND PROFILES OF UNDERSIDE OF ICE CAP

ARGO BUOY ARRAY TO TRACK ICE MOVEMENT AND DEFORMATION

GEOLOGY

GRAVITY METER

12 KHZ SOUNDER

(MAGNETICS)

PHYSICAL OCEANOGRAPHY

UNDERWAY MEASURMENTS OF T AND S.

WATER SAMPLES THRU THE SUB'S SEA WATER SYSTEM

SURFACE STATIONS FOR CTD, CURRENT PROFILES AND WATER SAMPLES

HYDROGRAPHIC BUOY EMPLACEMENT

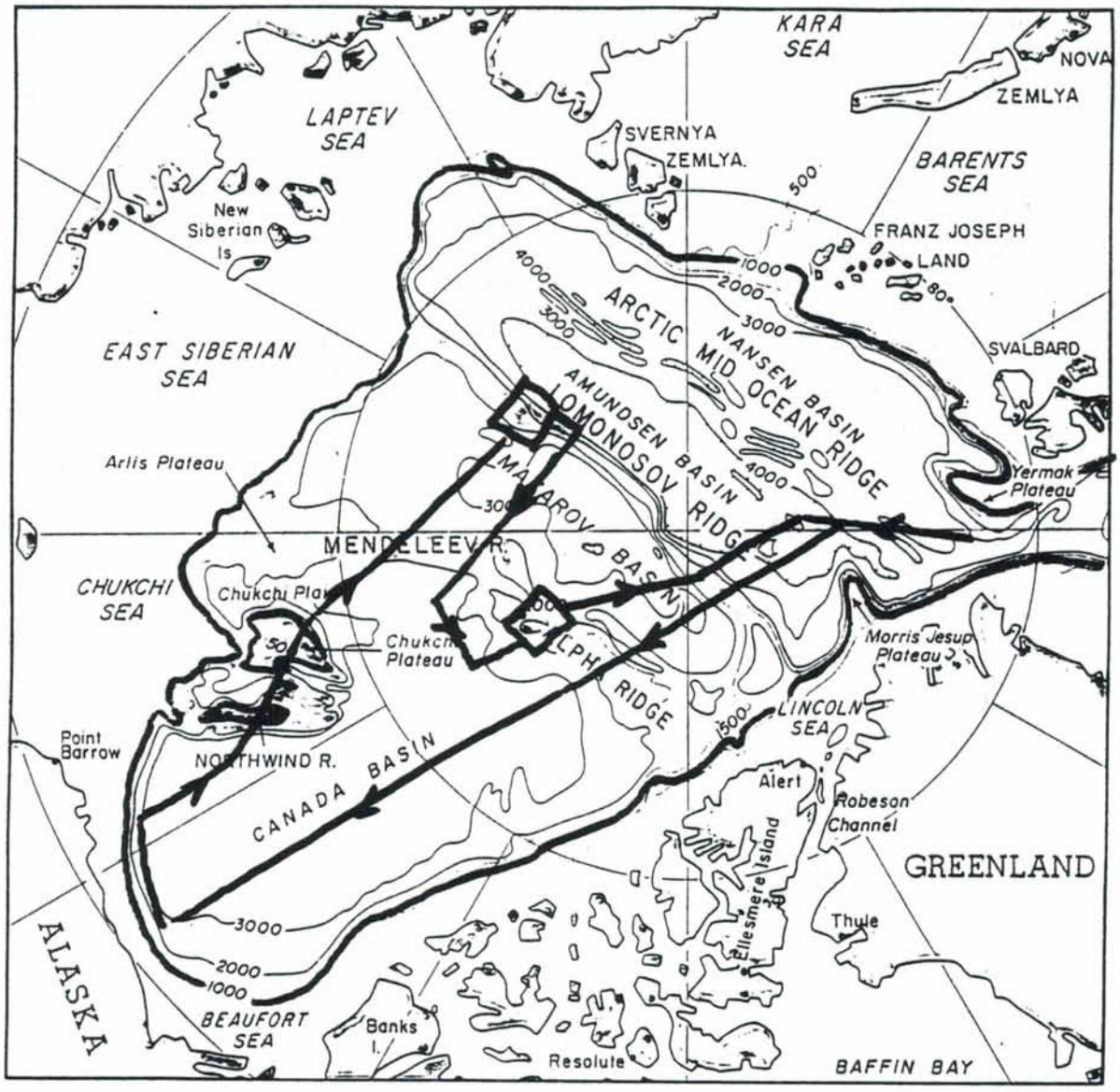
CHEMICAL OCEANOGRAPHY

5-LITER WATER BOTTLE CASTS FROM SURFACE

WATER SAMPLES THRU THE SUB'S SEA WATER SYSTEM

METEOROLGY

MET BUOYS AT TWO LOCATIONS.


KARA SEA
NOVA ZEMLYA
LAPTEV SEA
SVERNYA ZEMLYA.
BARENTS SEA
New Siberian Is
FRANZ JOSEPH LAND
ARCTIC
NANSEN BASIN
MID OCEAN RIDGE
EAST SIBERIAN SEA
SVALBARD
AMUNDSEN BASIN
LOMONOSOV RIDGE
Arlis Plateau
Yermak Plateau
MENDELEEV R.
MAKAROV BASIN
CHUKCHI SEA
Chukchi Plateau
ALPHA RIDGE
Morris Jesup Plateau
LINCOLN SEA
Point Barrow
NORTHWIND R.
CANADA BASIN
Alert
Robeson Channel
GREENLAND
Ellesmere Island
Thule
ALASKA
BEAUFORT SEA
Banks I.
Resolute
BAFFIN BAY
500
1000
2000
3000
4000
80

APPENDIX V

ANNEX IV
TO THE CHARTER

Fleet Improvement Committee

1. **Introduction.** One UNOLS objective is to assess the match between facilities to support academic oceanographic research and the oceanographic research program needs, and then to make recommendations for replacing, modifying or improving the number and mix of facilities. It has long been recognized that maintenance of a fleet of modern, capable research vessels is essential to the outstanding success of the U.S. program in academic oceanographic research. **A Fleet Improvement Committee (FIC), is established to address this UNOLS objective.**

2. **Purpose.** The Fleet Improvement Committee works to assure the continuing excellence of the UNOLS fleet, to improve the capability and effectiveness of individual ships and to assure that the number, mix and overall capability of ships in the UNOLS fleet match the science requirements of academic oceanography in the U.S. To this purpose, the Committee maintains the currency of a dynamic **UNOLS Fleet Improvement Plan.** The plan, updated periodically, includes:

- Assessment of the number and mix of ship capabilities needed in the UNOLS fleet,

- Development of science mission requirements for all size/capability-classes of research ships,

- Definition of roles and the need for innovative research platforms,

- Consideration of means for acquiring the needed vessels, including new construction, modification to existing UNOLS ships, conversions, private acquisition and leasing,

- Development of conceptual or preliminary plans for ships to fill the needs identified, and

- Development of a schedule for improvement and replacement of vessels so as to assure continuing fleet excellence.

The Fleet Improvement Committee will serve as a **liaison and planning activity as well as an information source** for federal agency representatives concerning long range planning, and funding for design, construction or renovation of vessels for the UNOLS fleet.

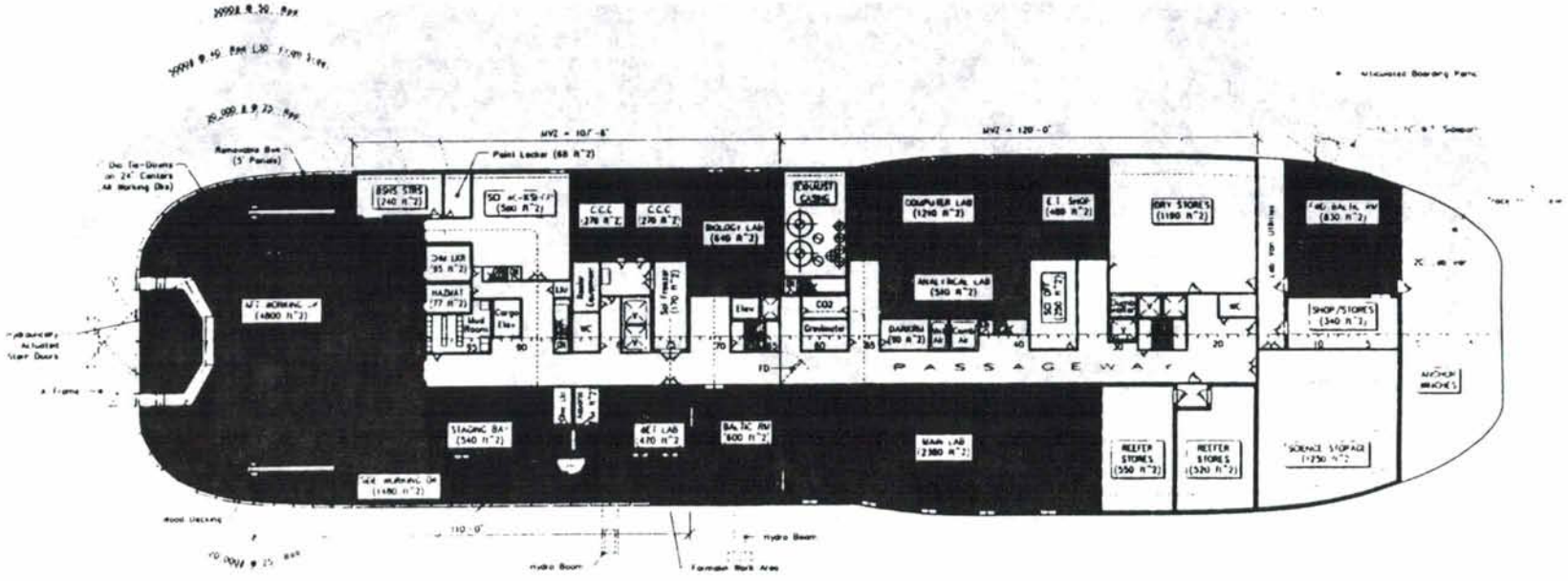
3. **Organization.** The Chair and eight additional members of the Fleet Improvement Committee are appointed by the UNOLS Chair with recommendations from the UNOLS Council, from UNOLS institutions. Those appointed should be experienced in ship operations and from institutions which are either operators or users of UNOLS research vessels. The Chair and at

least three other members will be from UNOLS operator institutions, at least two members will be from institutions other than operators, and two members may be from any UNOLS institution. The FIC Chair is, ex-officio, a member of the UNOLS Council. Terms for all members are three years, for no more than two consecutive terms.

Two members of the FIC will serve as liasons with two other standing committees of UNOLS: the Research Vessel Operators Committee and the Deep Submersible Science Committee.

Adopted:	Oct 28, 1988, Washington, DC
Readopted:	Sep 15, 1989, Washington, DC

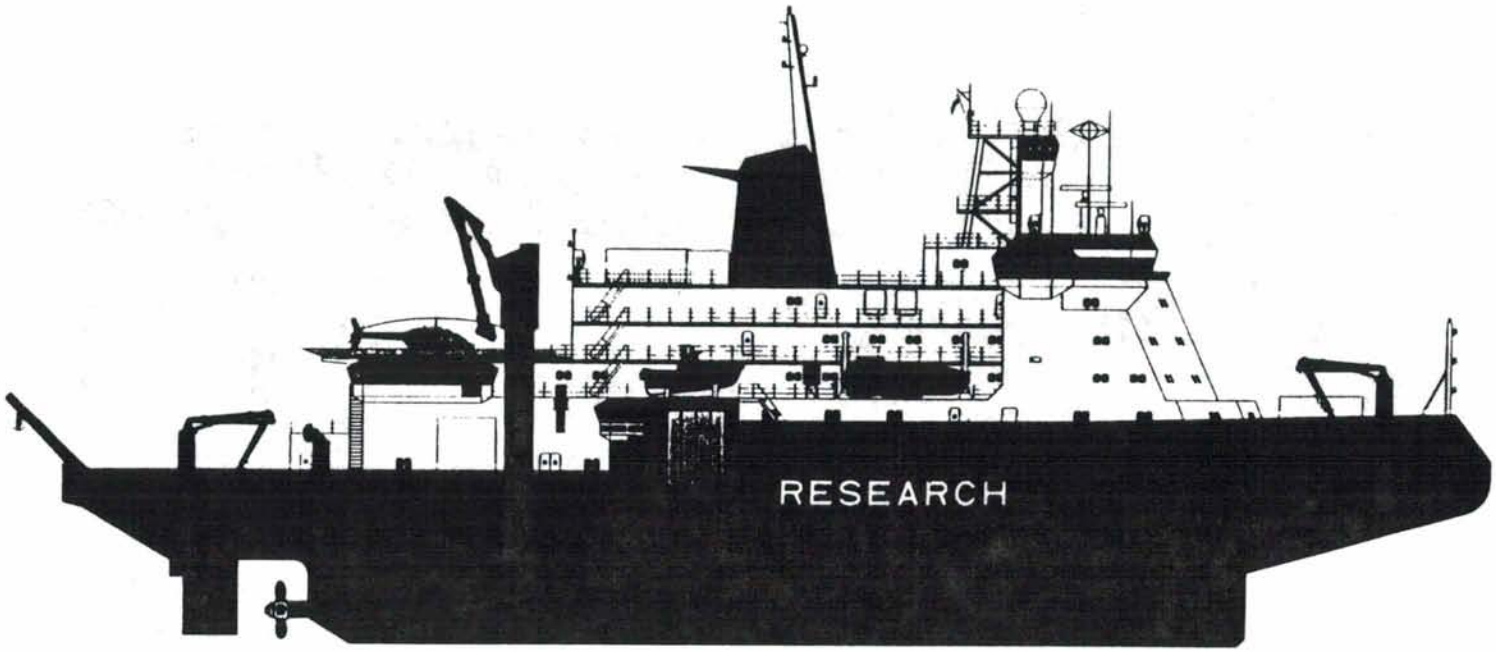
APPENDIX VI



MAIN DECK

LAB/WORK AREA EXPOSED TO WEATHER

LAB/WORK AREA PROTECTED FROM WEATHER


RESEARCH

APPENDIX VII

COAST GUARD
WAGB 20
POLAR ICEBREAKER
22 APRIL 1993

POLAR ICEBREAKER
WAGB 20
AGENDA

-BACKGROUND

-SCIENCE SPACES

-ADMIN PERSONAL SERVICES

-SCIENCE DATA NETWORK

-ICEBREAKING CAPABILITY

SEA/STATION KEEPING

-MISSION PROFILE

-BACKUP STUDIES

POLAR ICEBREAKER
WAGB 20
SRD/SOR CHANGES

- CREW REDUCED FROM 134 TO 60
+ SCIENTIST INCREASED FROM 30 TO 35 WITH SURGE TO 50
- LOGISTICS CARGO SPACE FORWARD ELIMINATED
+ LAB REQUIREMENTS INCREASED
- BOTTOM MAPPING SONAR ELIMINATED
- ELIMINATED MILITARY REQUIREMENTS
- MORE PRODUCIBLE
- EQUIPMENT SELECTION MORE COMPETITIVE

POLAR ICEBREAKER
WAGB 20
SCIENCE

- FOLLOWED UNOLS GUIDANCE

-SCIENCE OUTFIT & LAB ARRANGEMENT BASED ON
  - -T- AGOS 23
  - -T- OCEAN (ICE)
  - -T- AGS 60

-WORKING DECK

AFT ≥3000 SQFT CLEAR
CONTIGUOUS 12 X50 FT
60 FT UNOBSTRUCTED FOR CORES
ROOM FOR 2 SPECIAL PURPOSE WINCHES

BOW CLEAR DECK FOR BOOM & PACKAGES

POLAR ICEBREAKER
WAGB 20
SCIENCE

-LABORATORIES:

-NOT USED AS PASSAGES

-SERVICES

-MAIN ≥ 2000SQFT

-WET ≥ 400 SQFT, CONTIGUOUS TO STAGING BAY

-BIOCHEMICAL ≥ 300 SQFT, CONTIGUOUS TO FREEZER, CCC

-ELECTRONICS/ COMPUTER ≥ 600 SQFT CONTIGUOUS TO MAIN LAB

-STAGING AREA ≥ 300 SQFT ON WORKING DECK
ACCESS TO LABS / STORAGE

-METEOROGICAL / PHOTOGRAPHIC

POLAR ICEBREAKER
WAGB 20
SCIENCE

- VANS

  4 STANDARD VANS ACCESSIBLE FROM CUTTER INTERIOR
  SERVICES FOR LABS
  HANDLED BY CUTTER

  2 NON STANDARD VANS IN PLACE OF BOATS
  SERVICES FOR LABS
  HANDLED BY CUTTER

  2 STANDARD VANS FORWARD

- SCIENCE CARGO - 20000 CUFT ACCESS BELOW LAB SPACES
  - 500 CUFT HAZMAT

POLAR ICEBREAKER
WAGB 20
SCIENCE

-WINCHES
- -PROTECTED FROM ENVIRONMENT
- -ENCLOSED CONTROL

- -CABLE UPGRADES

- -OCEANOGRAPHIC - SIDE HANDLING SYSTEMS
  - -2 - 3/8 DIA WIRE OR CABLE

- - TRAWL/CORE - STERN HANDLING SYSTEMS
  - -1/2 - 3/4 DIA WIRE OR CABLE
  - - SPACE/WGT FOR TRACTION MACHINERY

-HOLD OVERBOARD DISCHARGES FOR 12 HOURS HOVE-TO / AT ANCHOR

-AIRCRAFT SUPPORT CONDUCT SCIENCE & FLIGHT OPS
- - HH65 OR HH60
- - DATA LINK

POLAR ICEBREAKER
WAGB 20
SERVICES

ACCOMMODATIONS

- **-ALL IN FORWARD SUPERSTRUCTURE**
- **-BLOCKS FOR ACCESS**

35 SCIENTISTS
15 SCIENTISTS (SURGE)
10 OFFICERS
12 CHIEF PETTY OFFICERS
40 ENLISTED

-SCIENCE LIBRARY CONFERENCE ROOM FOR 50

-COMMUNICATION ROOM

-MESSING SIMILAR TO NAVOCEANO SHIPS

POLAR ICEBREAKER
WAGB 20
SCIENCE DATA NETWORK

- LIKE PALMER BUT UPGRADES
- WORKING CLOSELY WITH ASA
- FIBER OPTIC
- PORTS IN STATEROOMS /LABS/ ON WORKING DECK

POLAR ICEBREAKER
WAGB 20
ICEBREAKING

-REQUIREMENTS:

- 4.5 FEET LEVEL ICE AT 3 KNOTS
- 8 FEET LEVEL ICE BACK AND RAM
- ICE FLECTURE STRENGTH 100PSI (706 KPA) ICE
- INSTALL NOT LESS THAN 30000 SHP
- CONVENTIONAL HULL FORM

- EXTENSIVE VALIDATION
  - METHODS OF KEINONNEN AND LEWIS
  - VALIDATED TIME SIMULATIONS

-CONSERVATIVE ASSUMPTIONS

POLAR ICEBREAKER
WAGB 20
SEA/STATION KEEPING

- SEAKEEPING

  -HIGH LATITUDES

  -UNOLS FOR GUIDANCE

  -NATO STANDARD SPECTRUM

- STATION KEEPING
  +/- 150 FT OR 3% OF DEPTH
  $H_{1/3}$ 4 FT, 1KNT CURRENT, 20 KT WIND

- PRECISION TRACK LINE

- INSTALLED EQUIPMENT

  -DPS
  -LARGE RUDDERS
  -THRUSTER WITH GOOD HP/DISPLACEMENT LENGTH

POLAR ICEBREAKER
WAGB 20
MISSION PROFILE

- ENDURANCE :

ICE FREE TRANSIT -	15 DAYS
FULL POWER ICEBREAKING -	12 DAYS
HALF POWER ICEBREAKING -	18 DAYS
HOVE TO OR ANCHOR -SCIENCE -	20 DAYS

-DOES NOT INCLUDE PORT TURN AROUND

- RANGE OF 16000NM AT 12.5 KTS

- STORES AND PROVISIONS FOR 180 DAYS
  - WINTER OVER
  - DESIGN CONSIDERATIONS

- DESIGN DEFINITIONS

POLAR ICEBREAKER
WAGB 20 CHARACTERISTICS
D&P POINT DESIGN

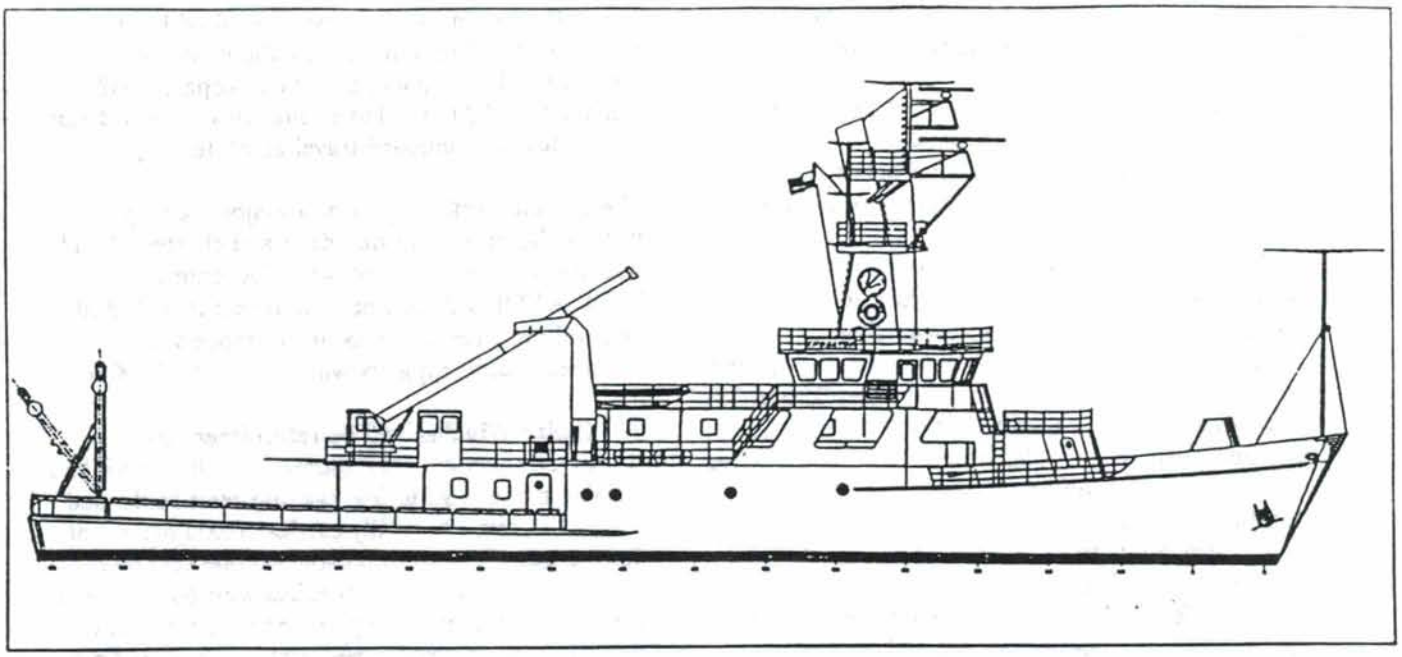
LENGTH (OVERALL)	418' 6"
BEAM (EXTREME)	76' 11"
DRAFT (FULL LOAD)	29' 4"
DISPLACEMENT (FULL LOAD)	12,588 TONS
TYPE PROPULSION	DIESEL/ELECTRIC (AC-AC CYCLO-CONVERTER)
SHAFT HP/NO. SCREWS	30,000/2
SPEED (SUSTAINED)	12.5 KNOTS
ENDURANCE	16,000 NM AT 12.5 KT
ICEBREAKING	4.5FT AT 3KT

POLAR ICEBREAKER
WAGB 20 CHARACTERISTICS
AME POINT DESIGN

LENGTH (OVERALL)	397' 5"
BEAM (EXTREME)	84' 1"
DRAFT (FULL LOAD)	32'
DISPLACEMENT (FULL LOAD)	13,867 TONS
TYPE PROPULSION	DIESEL/ELECTRIC (AC-AC CYCLO-CONVERTER)
SHAFT HP/NO. SCREWS	30,000/2
SPEED (SUSTAINED)	12.5 KNOTS
ENDURANCE	16,000 NM AT 12.5 KT
ICEBREAKING	4.5FT AT 3KT

APPENDIX VIII

The Research Vessel ENDEAVOR
Mid-life Refit Update
1 March 1993



After 16 years of service ranging from Easter Island and the Galapagos in the Pacific, to the coasts of South America and Africa in the southern Atlantic, to the very edge of the iceshelf in the North Atlantic, the R/V ENDEAVOR is now beginning her mid life refit.

ENDEAVOR was built with an expected service life of about three decades. About half of this time has past, and assuring her continued safe and efficient service requires major planned maintenance. This upcoming period of intense work also permits modifications and upgrades that will enable ENDEAVOR to be as effective and reliable for science today as she was when originally delivered for service.

We are committed to maintaining and improving the characteristics that have made this class much sought after as a general-purpose scientific platform. Minor modifications in the past, predominantly to ENDEAVOR's scientific support equipment suite, have slowed the growth of a predictable gap between her original design and contemporary requirements. Now there is an opportunity to close this gap while also improving her reliability.

Our overall plan includes major modifications to ENDEAVOR, new equipment acquisitions, and equipment upgrades. There are also plans for the replacement and maintenance of existing equipment and systems. We are making every effort to incorporate changes that improve coastal zone capability without sacrificing blue water capability.

The modifications and improvements planned for ENDEAVOR focus on three major areas:

(1) Improvements to increase and enhance her ability to conduct both blue water and coastal oceanography.

(2) Upgrades to improve her day to day operation and maintainability.

(3) Improvements and refinements that improve her habitability.

Improvements in operation/maintainability and habitability will clearly contribute to ENDEAVOR's ability to increase the quality and quantity of science she can support. We are exercising great care to make sure that none of her modifications compromise endurance, speed, seakeeping or station keeping capabilities.

ENDEAVOR is now at the dock in Rhode Island where she is being prepared for the upcoming yard period. We plan to move her to the yard in late April, where she will spend five to six months. The remainder of 1993 will be spent back in Rhode Island at our dock. There we will complete ENDEAVOR's outfitting. We will be ready to go back to sea starting in January of 1994.

Planned Modifications and Upgrades:

ENDEAVOR's **Superstructure** will be replaced with a new pilot house and combined mast/stack configuration. This creates room for new science spaces. The winch control house will be moved aft to provide better visibility for the winch operator of both the deck below the J-frame and the stern.

Accommodations are currently for 16 scientists. Consideration is being given to adding one or two additional berths by using the new space on the 01 Deck as multi-purpose berthing/laboratory space.

ENDEAVOR's **Habitability** will markedly improve with a new water-chilled, electric-heated air handling system servicing the entire ship. Independent maintenance of all the staterooms and most of the other ship's spaces, between 70 and 75 degrees, with 50% humidity and 9 to 11 air changes per hour, will be possible. We are also undertaking an intensive program of airborne sound source identification and elimination. We will be installing larger bilge keels to improve seakeeping. A wash basin will be added near the mess and a public head on 01 Deck. We will be replacing galley equipment and cabinets, as will the refrigerated and frozen food boxes and their associated machinery.

The Main Lab will not increase in size, but the removal of some permanent and semi-permanent equipment will make most of the 675 ft² lab available for science.

The Special Purpose Lab will remain at 150 ft², however a new 60 ft² electronic repair area on the 01 Deck makes the entire lab available for science. A permanent fume hood is planned for this lab.

The Wet Lab increases in size from 80 to 224 ft². Special doors and an overhead trolley will allow movement of the rosette into the lab where water samples can then be drawn.

The Upper Lab area consists of two new labs totaling 220 ft² on the 01 Deck. The smaller lab, at 100 ft² is being considered for multipurpose (lab and berthing) use.

Science Storage in the main hold increases from 880 to 1,300 ft³ through the relocation of equipment. Ballast tank modifications will yield about 2000 ft³ of new science storage.

The Main and Fore Deck layout and features of will remain the same: five feet to the water line, removable steel bulwarks, deck hold downs on two foot centers, and deck loading at 1,200 lbs./ft² with an aggregate load of 55 tons. An addition to the stern will add some deck space while the wet lab modifications will result in the loss of a small amount of Waist Deck area. This is a net increase of about 100 ft², bringing her new total to about 1,100 ft². The Fore Deck will continue to be kept clear to allow for the installation of towers and booms that extend out beyond the bow wave.

The A-Frame on the stern will be raised by three feet to 18 ft. This will simplify the deployment and recovery of larger packages. Load capacity will remain at 25,000 lbs. Horizontal clearance will stay at 10.5 feet and inboard travel at 9.5 feet.

The J-Frame will, as part of a major redesign of the wet lab, be moved up one deck and shortened. This will maintain the same package footprint on ENDEAVOR's deck when the frame is retracted and will increase the outboard distance when extended. Load capacity will remain at 25,000 lbs.

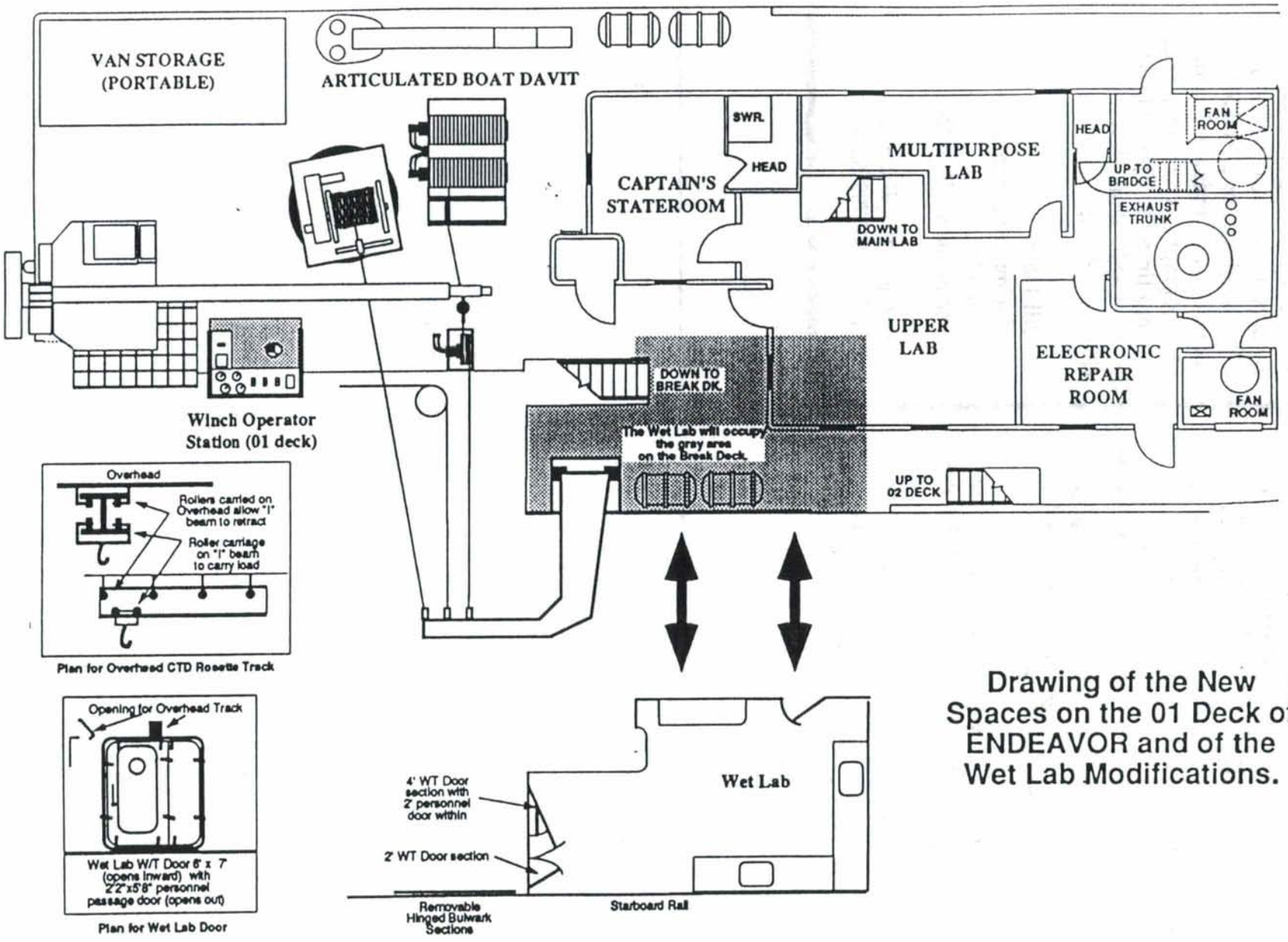
The Hydro Winches will be refurbished and continue in service. The number one hydro winch is a traction winch with dual take-up reels fairleaded to the J-frame. It usually carries 10,000 meters of 0.322 electro/mechanical cable on one reel and 10,000 meters of 0.25 mechanical wire on the other reel. The number two hydro winch is a Markey DUSH 5 on a rotatable pedestal. It services both the J-frame and the A-frame and can handle the same quantity and types of wire.

The Trawl Winch will continue to be a SMATCO traction winch which can be fitted with 10,000 meters of 0.68 electro/mechanical wire or a similar amount of 1/2, 9/16 or 5/8 inch mechanical wire. It can also handle 8,000 meters of 5/8 inch Kevlar cable. It currently serves the J-Frame and the A-frame. We plan to gain added flexibility for the deployment of equipment by providing a fairlead for the trawl cable through the base of the ship's crane to an overboard block on the crane's boom.

Overside Towing capability will continue to allow pulling 10,000 lbs. of tension at six knots and 25,000 lbs. at two and a half knots.

The Ship's Crane will be replaced with a new crane that can lift 10,000 lbs. off of any deck, except the Fore Deck. The crane will be able to pick up 20,000 lbs. at 30 ft. of extension. This long, heavy reach capability will ease loading containers aboard. Although it is more than the total weight that should be placed on the deck at any one time, the new crane is capable of lifting 70,000 lbs. at ten ft. of extension.

The Transducer Well will be increased in the size from 40 to 60 ft². Permanent equipment will be relocated to make the installation and removal of other equipment considerably easier. ENDEAVOR will continue to be able to use her 12 & 3.5 KHz echo sounders though Sea State 4.



Drawing of the New Spaces on the 01 Deck of ENDEAVOR and of the Wet Lab Modifications.

Communications aboard ENDEAVOR will include internal voice and data communication in all science and working areas. A local area network will distribute ship control data, environmental parameters and data from over-the-side instruments virtually anywhere on the ship. Closed circuit TV will monitor working areas and external communication for voice, fax and high speed data will include a combination of VHF and UHF radios, and INMARSAT. Satellite monitoring for remote sensing and Wx will be available.Speed and Seakeeping capabilities will not change. She will continue to have a maximum speed of 15.4 knots and to cruise at 12 knots, a speed that she can sustain at Sea State Four. She will continue to be able to sustain nine knots at Sea State Five and Seven knots at Sea State Six. Her speed will be controllable to within a tenth of a knot up to six knots and to two tenths of a knot at higher speeds. The new bilge keels should make for a more comfortable ride.

Ship's Equipment will be upgraded in several areas include a dual wildcat anchor windlass, a new stern deck capstan, and a modern autopilot.

Workboat Capability will increase with the installation of an articulated davit on the 01 Deck which will simplify the deployment and recovery of ENDEAVOR's 16 foot small craft.

Scheduling: We are very excited about the upgrades that are planned for ENDEAVOR. Work is on track and we will be ready to sail on 3 January 1994 on the first cruise of the second half of ENDEAVOR's career. The Graduate School of Oceanography is accepting requests for ship time for 1994. Please forward Ship Time Request Forms (NSF 831R) to:

Bill Hahn
Marine Superintendent
URI/GSO
Narragansett, RI 02882

Phone: (401)792-6203
FAX: (401)792-6574

Marine Office
Graduate School of Oceanography
University of Rhode Island
Narragansett, RI 02882

APPENDIX IX

TYPES OF COASTAL RESEARCH REQUIREMENTS

SYNOPTIC OBSERVATIONS

TIME SERIES MEASUREMENTS

MULTIDISCIPLINARY STUDIES

INFORMATION MANAGEMENT AND COMMUNICATION

TYPES OF FACILITIES

LARGE SHIPS

SMALL SHIPS AND BOATS

AIRCRAFT, SATELLITES, MOORINGS, AND FIXED PLATFORMS

FIELD AND SHIPBOARD INSTRUMENTATION

SUMMARY OF NEEDS

- More effective data transmission
- Higher resolution data collection capability
- Increased ability to operate inshore in heavy weather
- Increased ability for simultaneous sampling
- Aircraft, satellites must be used in coordinated program along with vessels
- Scientific need for vessels that can accomodate groups of 20 or more scientists
- Interdisciplinary ship with the ability to work in shallow water (< 7 m)
- Standard set of routinely acquired data from all vessels
- Enhanced communication/data transfer links
- Regional pools of shared equipment
- Access to larger vessels to support multidisciplinary teams
- Ability to service very dense station spacing
- Quick-response vessels needed to service moorings
- Ability to support multiple wires from anchored vessel
- Ability to maintain 3-point mooring for prolonged periods

VESSEL-SPECIFIC RECOMMENDATIONS

- Large ships should be available to coastal community
- New generation of shallow draft vessels needed
- Increased sea-keeping ability for coastal vessels
- Ability to support multi-wire operations
- Increased ability to launch AUV's, ROV's, moorings, etc.
- Modified water-sampling techniques via flow-through intakes, towed systems
- Vessels should be capable of 3-point anchoring in depths < 100 m
- Improve links to shore-based communications for data transfer
- New generation small coastal vessels ($\sim$ 30 m) needed

NON-VESSEL RECOMMENDATIONS

- Educate coastal community on new platforms and instruments How
- Develop better algorithms for analysis of satellite data Manipulation and display.
- Develop comprehensive data archive and index Distributed system, with metadata and interface hardware.
- Develop better shore-based data acquisition systems - Microwave, satellite links
- Establish regional or national pools of shared, expensive equipment like ships
- Establish regional or national shore-based facilities for instrument calibrations, technician training, computer applications, etc.

APPENDIX X

March 12, 1993

Dr. Marcus G. Langseth, Chairman
UNOLS fleet Improvement Committee
Lamont-Doherty Earth Observatory
Palisades, NY 10964

Via Telefax (914) 365-0718

Dear Marc:

This confirms Bob Dinsmore's suggestion to you that Woods Hole keep the Fleet Improvement Committee informed of its plans to acquire a small SWATH R/V. As you know, Woods Hole has long been enthusiastic over the possibilities which SWATH ships offer for carrying out science work at sea. With the advent of the current coastal initiatives, we believe that SWATH research vessels may have an important role.

The attached sheets describe the background, mission requirements, and alternative designs under consideration. Joe Coburn will be at the forthcoming FIC meeting, and time permitting can briefly discuss this information.

While we are still working toward the resources for acquiring the new ship, Woods Hole welcomes comments and recommendations by FIC on the proposed design(s) and operational arrangements.

Sincerely,

Richard F. Pittenger
Associate Director for
Marine Operations

RFP:reg

cc: Joe Coburn

Attachment

March 12, 1993

Report by the Woods Hole Oceanographic Institution to the UNOLS Fleet Improvement Committee on a Proposal to Acquire a Small Swath R/V

Background

During a recent internal study of the seagoing facilities at Woods Hole, the need for a small, seaworthy vessel capable of operating year around in New England coastal waters at relatively low cost was identified as a a significant requirement. Based upon studies becoming available and the cruises by WHOI and other investigators on SWATH ships, it was decided that the best hull form to fulfill this requirement was a SWATH ship of about 80-100 ft. LOA.

Pursuant to this, Woods Hole promulgated an RFP for the design and construction of a small SWATH R/V. A total of eight responses were received ranging in size from 70-285 Tons and in cost from $2.3M to $13.4M. Following a review of offerings to requirements (and resources), the list was cut to two candidates which remain as contenders for possible further action.

Mission Profile

To operate during all seasons off the Northeast Coast making short cruises up to 10 days and distances no further than Bermuda (650 miles). Highly flexible in science outfitting - all winches, cranes, frames, etc. to be totally portable through the use of deck boltdowns. Clear, unencumbered deck space is equally important as laboratory space. Seakeeping is of paramount importance and performance on station (including dynamic positioning) - stopped or slowspeed - is more important than cruising. To be as acoustically quiet as feasible. Total science payload (may reach 20 LTons) will be highly variable and may include winches, vans, ROV's cranes, and itinerant deckloads such as buoy moorings.

Examples of missions are:

- Equipment and instrument testing during development stage needing platform capability (size and stability) simulating larger ships where equipment ultimately will be used.
- Coastal science studies in bays and gulfs including multi-anchor moored stations.
- Open sea operations in all science disciplines including net tows, deep sampling, ROV's, diving support, seismics, coring and buoy work.
- Rapid response to oceanographic and atmospheric "events" possibly involving heavy weather transits at reasonable speed.
- Student training and practicum.

Design Requirements

Size

Based upon the need to operate in the open ocean in a wide range of sea conditions, a minimum length of 80 ft. seems prudent. At the same time, acquisition and operating costs dictate that the size not be greater than 100 ft. Target size is about 90-ft. LOA.

There is no beam or draft limitation; these should be optimum for a SWATH having the best possible seakeeping characteristics. We would prefer that the navigational draft not exceed 17 feet.

Speed and Power

Seakeeping, payload, range and cost are more important than speed. 15 knots is the desired maximum speed - full power, calm sea. The cruising speed, sustainable into moderate sea states should not be less than 12 knots.

Payload, Range and Endurance

Science payload includes all winches, cranes, vans, frames, lab equipment, deckloads, etc., and can be highly variable and can total 20 long tons. The vessel should be able to carry a highly variable science load up to 20 LT for the full cruising range and maintain its designed waterline. Heeling and ballast systems should be able to compensate for minor off-center weights.

Target cruising range is from Woods Hole to Bermuda plus reserve; total 1,000 nautical miles.

Required endurance, based on personnel support is for short cruises not to exceed 10 days.

Manning

Accommodations should be provided for six science personnel.

Crew size will be two persons permanent and for day trips. For long voyages, two additional crew will be added.

Total accommodations for ten persons preferably in double staterooms. Four person staterooms are an acceptable alternative for space restrictions.

Machinery

Main engines should be located so that the main deck is flush. Maintenance considerations and ship radiated noise dictate that engines not be in lower hulls.

Auxiliary electrical power to be two 100 KW generators. Three hydraulic power units to be installed for portable deck equipment (50, 25, 15 hp).

Machinery installations to be designed acoustically quiet as feasible.

Ease of maintenance is a design requirement to reduce cost of operations.

Arrangements

The work deck area should comprise about one-half the after main deck - about 2,000 sq. ft.. It should be flat, without camber, unobstructed, and not more than nine feet above the waterline.

One inch flush deck boltdowns should be on 2 ft. centers in a grid pattern.

All winches, frames, cranes and other scientific deck outfitting will be portable and owner supplied.

Bulwarks along the work deck area should be removable in sections.

Laboratory space should be in the main deck house and comprise about 300 sq. ft.. Lab to be left unfinished.

Outfit

Science outfit to be owner supplied. Builder supplied electronics to comprise gyro compass, two radars, auto pilot, navigation echo sounder, Loran/GPS, SSB, two VHF transceivers, weatherfax and INMARSAT-C.

Design Priorities

The following elements of the design are listed in order of importance:

1. Stability both on station and underway.
2. Scientific payload and deck space.
3. Operating costs.
4. Range and endurance.
5. Procurement cost.
6. Speed.

Candidate Designs

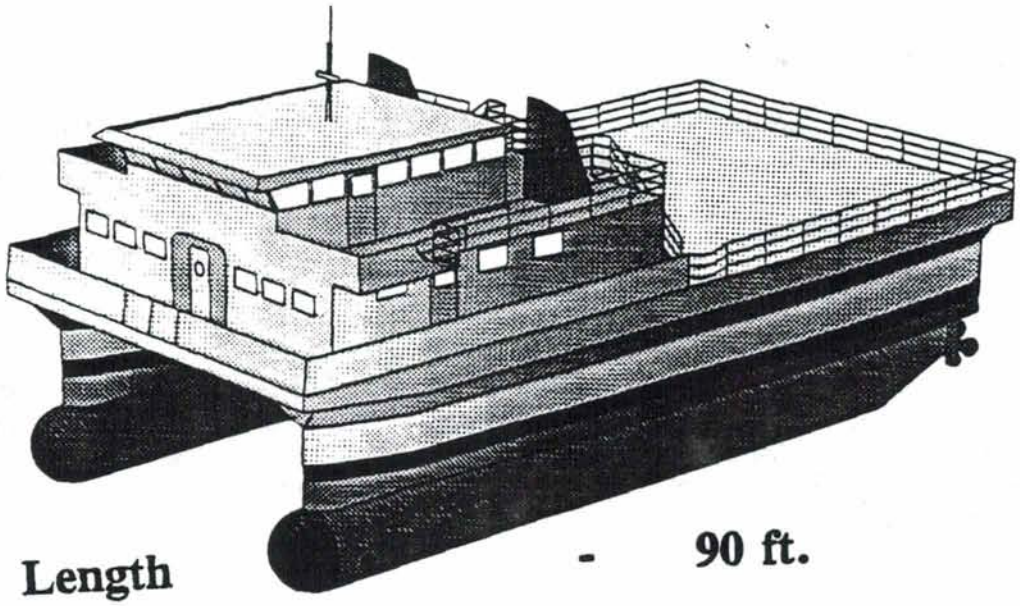
Woods Hole has selected two proposals for further action. These are designs by SAIC and BSM and are described on the attached sheets. The SAIC is a simple single strut SWATH of conventional design. The BSM is a tandem strut variable draft hull. Each is considered acceptable for the mission and each comes with highly attractive features.

Future Action

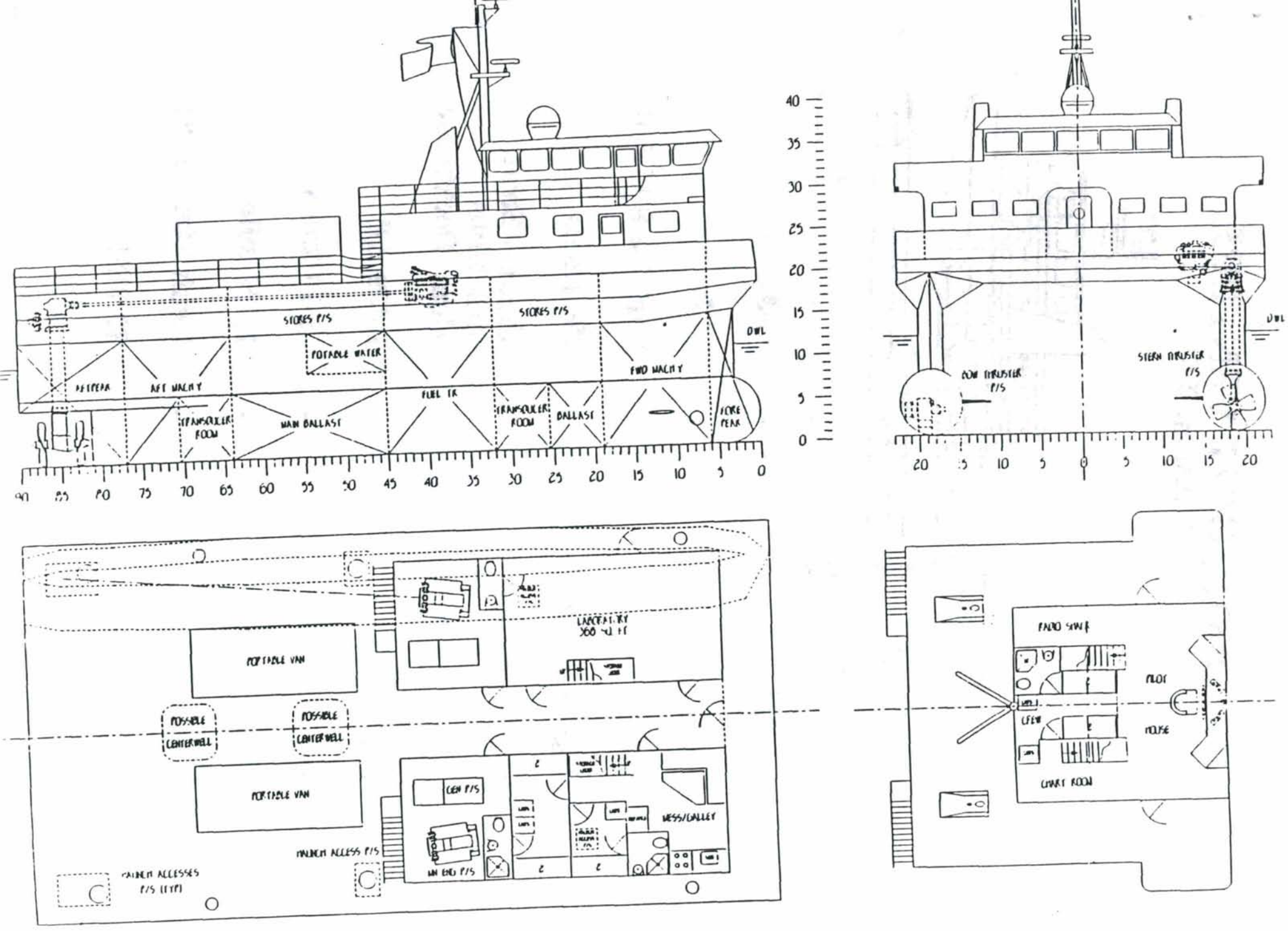
Review of the designs continue at Woods Hole along with efforts in seeking funds to proceed further. The next step will be selection of one of the two designs and - when funding permits - continuation of the design state including model testing. Comments on this proposed procedure by Woods Hole or on the designs themselves are welcome. More detailed information on each of the designs is available on request.

SAIC MARITIME SERVICES

Alexandria, Virginia



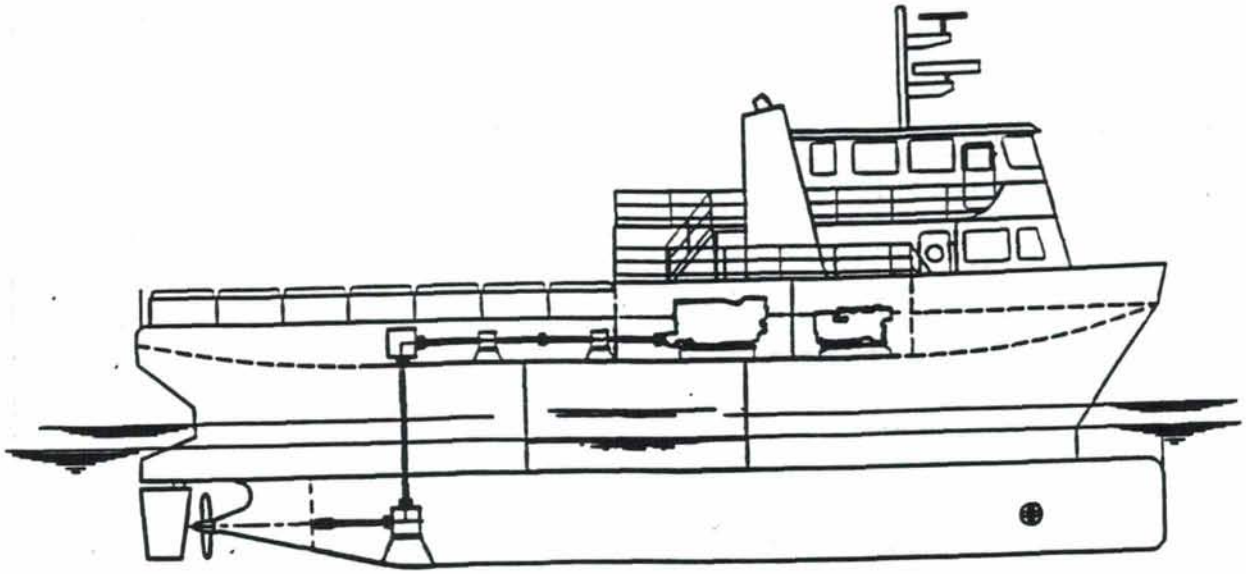
Length	-	**90 ft.**
Beam	-	**45 ft.**
Draft	-	**11 1/2 ft.**
Displacement	-	**256 Ltons**
Construction	-	**Single Strut Steel**
Power	-	**1,400 HP**
Speed	-	**12-15 knots**
Range	-	**1,200 miles**
Builder	-	**Gladding-Hearn Fall River, MA**
Cost	-	**$2.68 M**



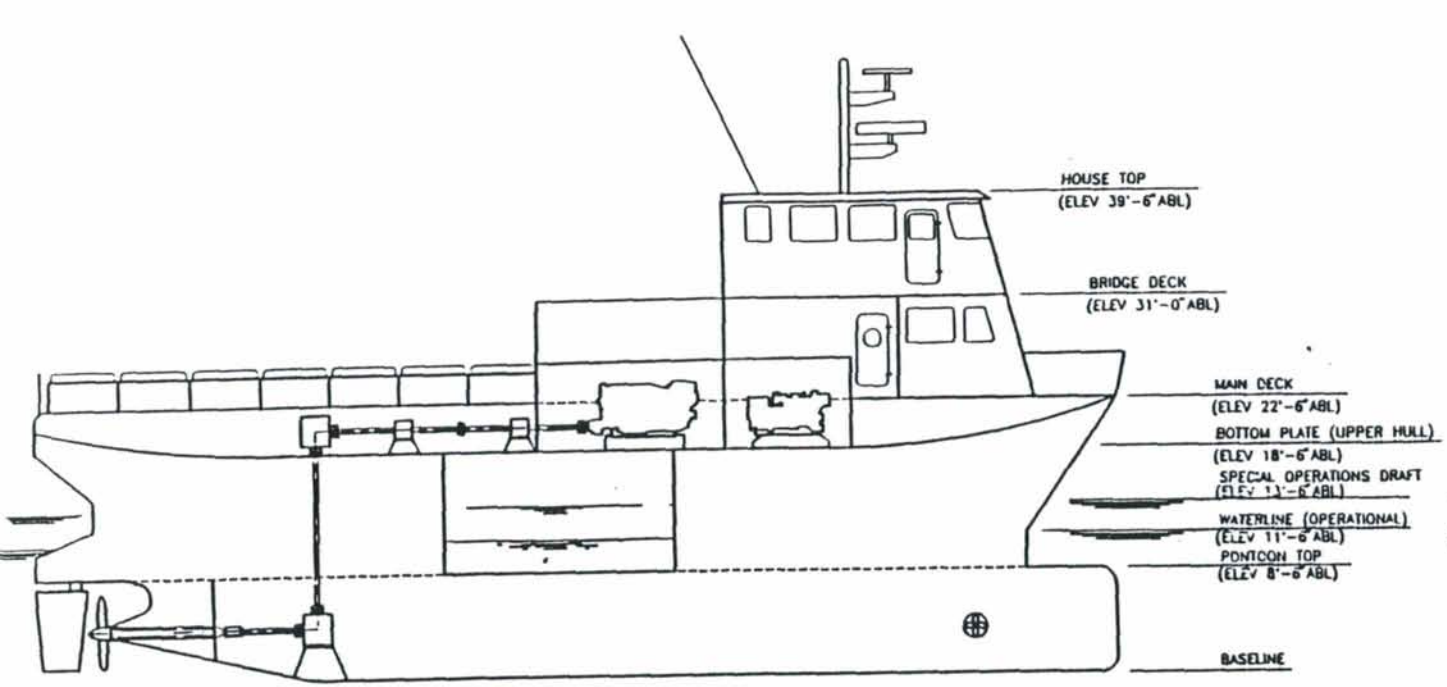
SAIC CONCEPT DESIGN - 90 Ft. SWATH R/V

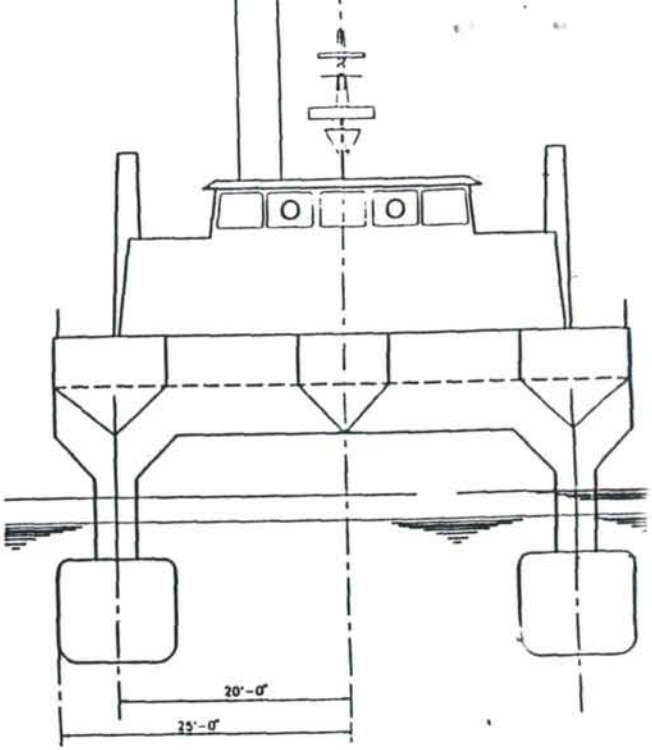
Revised - 6 March 1992

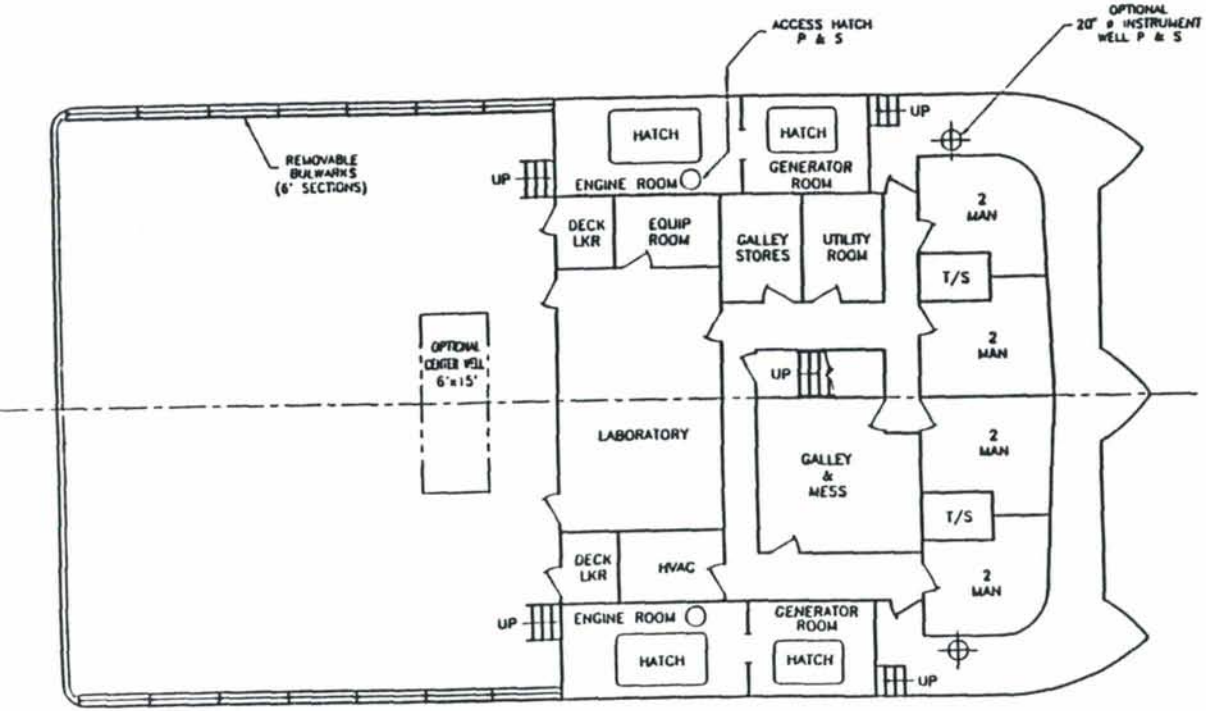
BSM JOINT VENTURE
Houston, TX

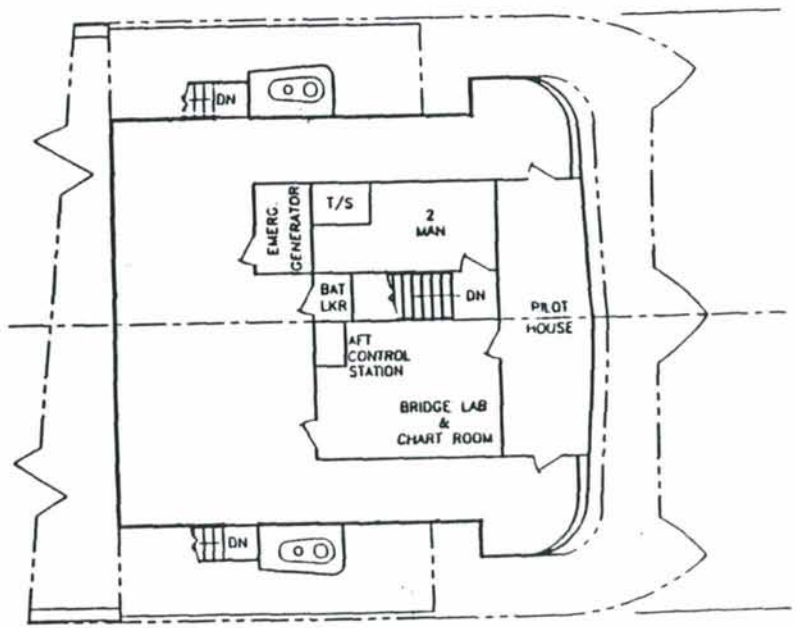


Length	-	**93-ft.**
Beam	-	**50 ft.**
Draft	-	**Variable 8-11.5 ft.**
Displacement	-	**285 Ltons**
Construction	-	**Tandem Strut Steel Hulls Alum. Deckhouse**
Power	-	**1,400 HP**
Speed	-	**11-14 knots**
Range	-	**1,700 miles**
Builder	-	**Keith Marine, FL**
Cost	-	**$3.0 M**









March 20, 1992

APPENDIX XI

Outline for UNOLS Fleet Improvement Plan Update 1993

Feb. 93 version

I. Introduction to the 1993 update

II. Background

- A. Purpose and objectives of the current update.
- B. FIC and UNOLS
- C. The UNOLS Fleet
- D. Impetus for change
- E. Research and funding trends

III. What academic fleet is required in the next 20 years.

- A.Current demand and ongoing oceanographic programs (RIDGE, WOCE, TOGA, JGOFS, Core Program, ONR, NOAA).
- B. Coastal cocean science needs
- C. Arctic Research Vessel
- D. Other facilities and high tech systems.

III. Funding the fleet::

- A. Usage vs. availability a 5 year history
- B. Current and projected costs of the maintaining the fleet. (An optimistic and pesimistic projection.
- C. Sources of funding
  1. Traditional (NSF, ONR)
  2. Cooperation with other elements of the federal fleet..

IV. Recommendations:

- A. Fleet size and composition
- B. Modes of operation
- C. Methods for monitoring ship needs and means to adapt the fleet to meet future needs.

Reference documents:

1. A plan for Improved Capability of the University Oceanographic Research Fleet, UNOLS document prepared by the Fleet Replacement Committee, June 1986.

2. The Research Fleet, A brochure prepared by WHOI for NSF (1991)

3. Submersible Science Study for the 1990's, UNOLS document prepared by the Submersible Science Committee (Nov. 1990).

4. Report on the Federal Oceanogrphic Fleet Requirements, Prepared by FOFCC, (Aug. 1990).

5. UNOLS Fleet Imporvement Plan, Prepared by the UNOLS Fleet Improvement Committee (May 1990).
6. Academic Research Vessel, 1985-1990, Report prepared by the National Academy of Sciences, Ocean Science Board, 1982.
7. History of the U.S. Oceanographic Research Fleet and the Sources of Research Ships, Report of the UNOLS/FIC (Sept. 1988).
8. Scientific Mission Requirements for Oceanographic Research Vessels, Report of the UNOLS/FIC, (1989).
9. NOAA's Ocean Fleet Modernization Study, 3 part report prepared by NOAA (Sept. 1990).
10. Stable Research Platform Workshop, Report of Scripps Workshop, (April 1988).