UNIVERSITY-NATIONAL OCEANOGRAPHIC
LABORATORY SYSTEM

*An association of institutions for the coordination and support of university oceanographic facilities.*

# UNOLS
# FLEET IMPROVEMENT
# COMMITTEE

## MEETING REPORT

**March 17-18, 1994**

**East-West Center**
**Kamehameha Room**
**1777 East-West Road**
**University of Hawaii at Manoa**
**Honolulu, HI**

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# MEETING REPORT
# UNOLS
# FLEET IMPROVEMENT COMMITTEE

**East-West Center**
**University of Hawaii at Moana**
**Honolulu, Hawaii**
**March 17-18, 1994**

*Day 1: March 17*

The UNOLS Fleet Improvement Committee met at the East-West Center at the University of Hawaii at Moana Campus, Honolulu, Hawaii on March 17-18, 1994. The meeting was called to order at 9:00 am by FIC Chair, Marcus Langseth.

## *MEETING PARTICIPANTS*

| FIC Members | Participants |
|---|---|
| Marcus Langseth, Chair | Jack Bash, UNOLS |
| Peter Betzer | Bill Coste, U. Hawaii/SOEST |
| Garry Brass, UNOLS Chair | Annette DeSilva, UNOLS |
| Joe Coburn | Don Heinrichs, NSF |
| Eric Firing | Keith Kaulum, ONR |
| Charlie Miller | Dick Longfield, U. Hawaii/SOEST |
| Tom Royer | Martin Mulhern, NOAA |
| | Brian Taylor, U. Hawaii/SOEST |

## *APPENDICES*

I. FIC Agenda
II. Estimated 1992 Operating Costs & ARV Arrangements
III. EOS Article, *Arctic Research Vessel Design Would Expand Science Prospects*
IV. ONR Reorganizational Chart
V. NSF Funding Overheads
VI. SOEST - SWATH Ship Design Recommendations

GREETINGS AND MEETING LOGISTICS - Eric Firing welcomed the FIC meeting participants to Hawaii and arranged for a visit to Snug Harbor to tour the vessels, R/V THOMPSON and R/V KAIMIKAI-O-KANOLA (KOK).

APPROVAL OF MINUTES AND MEETING AGENDA - The minutes of the July 19-20, 1993 FIC meeting at Oregon State University were approved as written. The meeting agenda, **Appendix I**, was accepted with modifications to the order of items to be addressed. Also an item was

added to discuss the future of Hawaii as an operator institution. These minutes reflect the order in which items were addressed.

**UNOLS COUNCIL REPORT** - Garry Brass provided a report on the Council Meeting held prior to the FIC meeting on March 15-16 and on other UNOLS issues occurring over the last six months. The Council has been discussing the complex issue of the future of a vessel at Hawaii. They would like to know from Hawaii the type of vessel that will be needed at their institution.

UNOLS has also been working towards trying to eliminate the need for Radio Officers on the large vessels. There are two bills before Congress on the issue, one promoting the continuation of the need for radio officers and one for the elimination of same. The purpose for the conflicting bills is to stimulate debate and on the issue. It appears that the dialogue between the sea-going unions and operators may have broken down. If the issue is not resolved through these bills, Congressman Markey, Chair of the Subcommittee on telecommunications and Finance, has appended an amendment to the "National Communications Competition and Information Infrastructure Act of 1994" to exempt research ships from this requirement. By eliminating the need for a radio officer, those UNOLS vessels previously required to carry a radio operator could see a savings totalling approximately $500K.

Under a Memorandum of Agreement between NSF and the Department of Defense, the three institutions; Scripps, the University of Washington and WHOI will receive access to P-code for GPS. After one year they will all be reviewed. If all goes well, access to the P-code may be provided to the entire UNOLS Fleet. An institution would be required to have security clearance and a security officer to receive access to the code. WHOI has offered to serve as a security center for the East Coast institutions.

**UPDATE ON THE PROGRESS OF THE ARCTIC RESEARCH VESSEL** - Tom Royer gave the FIC a status report on the Arctic Research Vessel (ARV). Tom started by reviewing how the design got to its present state. The ARV subcommittee distributed the Science Mission Requirements (SMR) to the community and received an excellent response. The SMR called for a ship that could break four feet of ice at three knots and have a 90 day endurance.

These requirements equated to an ABS Class A-3 and a ship length of 340 feet. The dead weight tonnage is approximately at 11,000-12,000 tons. The vessel size is the minimum required to still meet the SMRs. The vessel will require 8,000 hp at 12 knots in Sea State 2. The ship will carry 35-36 scientists and have over 6000 square feet of laboratory space. The preliminary design has been completed and will be distributed.

The ARV design differs from the design of NATHANIEL PALMER to meet the ice characteristics unique to the Arctic and to meet the different geographic and operational profiles. The ARV is also designed to meet the Canadian Arctic Shipping Pollution Prevention Regulations (CASPPR). It will have an innovative hull form which builds on the well developed design of the Swedish ODEN. It emphasizes ice capability as well as

maneuverability in ice. The estimated material costs for this ship is $42.5 M with a construction cost bringing the ship total to $94-$105 M.

Tom presented overheads of the ship layout and estimated operating cost of the vessel, see **Appendix II**. The layout shows wide passageways, large labs, double staterooms and a forward Baltic Room. The estimated daily operating costs is expected to be $28,000 per day based on a 300 day operating year.

Two videos were shown of the ARV design. The first video demonstrated the design's ice capability during model tests in Hamburg, Germany. The second video was produced by WHOI and Annette DeSilva for UNOLS. It provides an overview of the ARV design process and the unique features the vessel will have to offer. It was recommended that the videos be widely distributed and included with the preliminary design.

The ARV construction is not in the NSF FY95 budget. NSF has added a new line item to their budget for capital expenses. The ARV construction costs can compete for funds under this item. In FY95, $70 million has been budgeted for capital expenses, however, most of this is already committed to other programs. GAO is expected to prepare a "buy versus lease" study which could affect the process by which this ship is acquired and funded. In the interim a proposal is being written to continue work on the ARV design study.

Tom reported that $5 to $10 million a year is presently going into Arctic research. Alaska has also been getting regular queries from the Japanese, JAMSTEC for work on ALPHA HELIX and increased work in the future is suggested. Tom also sees several issues in the Arctic receiving more attention such as global warming, climate and ocean circulation, and pollution concerns. All of this indicates continued and potentially increased funding for Arctic research. Tom distributed an article on the ARV which was run in EOS, see **Appendix III**.

KNORR CONVERSION SUBCOMMITTEE REPORT - Peter Betzer brought the FIC up to date on the plans for KNORR conversion to a submersible handling ship. The FIC/DESSC subcommittee met aboard KNORR in September 1993 with representatives from Glosten Associates and WHOI to review Glosten's plans for the conversion. The subcommittee was concerned with the number of scientific berths that would go to the submersible group and suggested that an effort should be made to increase berthing by six to ten. Stern slamming, which is presently being experienced aboard KNORR, was also of concern. To maintain the maximum flexibility for general oceanography it was suggested that an overhead rail system be investigated to permit a clear deck. A consideration will be given to building a new A-frame if financial conditions permit. New hydraulics will be needed even if the old frame is cross-decked. Dry storage space and an exercise room were also suggested. Glosten plans to complete their preliminary design by May 1994 and the contract design by August 1994. The time frame for the conversion will be dependent upon KNORR's operating schedule. The earliest date for conversion would be late 1995 with the preferred date in early 1996. At present there are no serious buyers for AII. Funds from the sale of AII would be used to support KNORR's conversion.

UPDATE AND RECENT DEVELOPMENTS FOR USE OF NUCLEAR SUBMARINES FOR OCEANOGRAPHY - Marcus Langseth reported that the scientific the nuclear submarine was a success. Ted DeLaca of the University of Alaska was the scientific coordinator on the cruise to the Arctic. The opportunity was announced in January 1993 and rapid planning was necessary to prepare. Forty scientists from seventeen institutions provided input to the science plan and five scientists actually made the cruise. All members of the science party were required to have a secret clearance. The data collected would be unclassified and publishable. Presently, the Defense Mapping Center is still holding the navigation data collected and it hoped that it will be released in April 1994.

The cruise was conducted in the summer of 1993 and lasted 40 days with 21 days under the Arctic ice. Fifteen surface stations were planned with twenty actually conducted. Also, more track lines were run than originally requested. Support from the submarine crew was helpful in maximizing science.

Presently, a Memorandum of Understanding (MOU) is circulating through the agencies for further operations using submarines. The MOU was drafted by ONR. The Navy plans to have a 5-year submarine opportunity each summer beginning in 1995. The Navy would assume the operating costs. An announcement of the opportunity should be available soon. Tom Curtin will be in charge of organizing this program. George Newton will also work on the project.

The FIC sees arctic research benefiting by having both the nuclear submarine and ARV platforms. They have different operational capabilities and will compliment each other.

There was some discussion of updating the SOONs report. The experience aboard the submarine cruise this summer could be applied to an updated report. Also, there is additional knowledge of the steps required to install scientific instrumentation on a submarine. FIC will create a subcommittee for updating the report at a future meeting.

UNOLS VESSEL IN HAWAII - Barry Raleigh was unable to attend the FIC meeting, so Dick Longfield and Bill Coste gave a presentation on the SOEST plans for replacing MOANA WAVE. Dick explained that the newly acquired KAIMIKAI-O-KANOLA (KOK) is not and will not be the MOANA WAVE replacement. The KOK was purchased by NOAA and is owned by Hawaii. It's purpose is to serve as a support ship for the submersible PISCES. The ship is 222 feet LOA and displaces 2200 tons with a gross tonnage of 297. In 1995, KOK is expected to operate 180 days and conduct 90 PISCES dives. Although this ship can be made available for UNOLS programs such as HOTS (once outfitted for CTD work), it is not a general purpose ship.

ONR has indicated that once AGOR 25 is on-line, MOANA WAVE will be retired. Dick said that they are investigating several SWATH options as a replacement for MOANA WAVE. They envision a large SWATH with full ocean capability. When asked if KAIMALINO may be an option, Dick said that it did not have the capabilities they were looking for. Dick was also asked if an East Coast intermediate might satisfy Hawaii's requirements. He indicated that

they were looking for a ship with capabilities equal to or greater than that of MOANA WAVE and that an intermediate vessel would not be appropriate. Hawaii is looking at a partnership with Lockheed for SWATH development.

The FIC requested that SOEST provide UNOLS with mission requirements for their ship needs so that UNOLS can be of assistance in working on a replacement for MOANA WAVE. Also discussed was the fact that an additional Class I/II ship is not in the long range UNOLS plans and would exacerbate an already difficult funding situation.

## AGENCY REPORTS

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION - Captain Martin Mulhern provided the report for the National Oceanic and Atmospheric Administration (NOAA). Marty said that Rear Admiral Petersen, as chairman of the Subcommittee of Federal Oceanographic Fleet Coordination (SFOFC), is polling the members of SFOFC to determine their preferences regarding the future of the organization. SFOFC has existed under authority of the Federal Coordinating Council for Science, Engineering, and Technology, (FCCSET) Committee on Earth and Environmental Sciences (CEES). With creation of the new National Science and Technology Council (NSTC) and its Committee on Environment and Natural Resources (CENR), SFOFC needs to be reorganized if it is to continue. So far the responses have been favorable to reconstituting and continuing the functions of SFOFC.

The contract for the NOAA AGOR (sister ship to AGOR 23) had been signed with the keel laying planned for the July-November 1994 time frame. A total of $50.1 M has been allocated for construction of this ship. Preparation is nearly complete for issue of Requests for Proposals for conversion of TITAN, a T-AGOS ship transferred from the Navy (for support of the TAO array and related process research), and for a Repair to Extend (RTE) of the DELAWARE II, one of NOAA's fisheries research vessels. Enhanced maintenance periods are underway for ALBATROSS IV and the MALCOLM BALDRIGE. NOAA is also working on a design study for a new fisheries research vessel.

The upgrades to ALBATROSS IV will significantly improve its science and fishing capability at a cost of approximately $3M. Included are improvements to labs, new trawl winches, booms, stern gantry, and side J-frame, a new science computing system, an ADCP, enhanced navigation, and a ship service power upgrade. One of the programs this ship will support is the GLOBEC/JGOFS program in the George's Bank area.

The maintenance on BALDRIGE will cost approximately $1.5M, including installation of new ship service diesel generators, structural steel repair and preservation, and upgrades of the oceanographic laboratory. A second maintenance period is planned to prepare this ship for its extended deployment to the Indian Ocean in 1995.

NOAA has budgeted $2.3 M for charters in 1994. A UNOLS ship(s) will be used for $300K of this money on the NOAA Ocean Color/SEAWIFS program off Hawaii, and the NOAA

charting program will charter vessels for surveys in Long Island Sound. The charting program is also re-evaluating their requirements for conversion of the T-AGOS ships received from the Navy. The NOAA fleet is studying crew size and compensation, and evaluating an economic study of various modernization alternatives. The FY94-FY95 fleet operating funds appear steady. NOAA is awaiting the results of the Marine Board's review of the NOAA Fleet Replacement and Modernization Plan.

The NOAA fleet is also conducting a "Re-Engineering" study to identify ways to improve NOAA's operating efficiency. As part of that study a team from NOAA is meeting with a number of the UNOLS ship operators. Marty reported the team has received outstanding cooperation from the UNOLS institutions it has visited.

There was general discussion of the benefits of documenting case studies of existing ships and facilities and how they match up with science needs. Marty provided a review of ship support for the Nutrient Enhancement and Coastal Ocean Program (NECOP). Initially, MALCOLM BALDRIGE supported this program, responding to program requests to utilize the large oceanographic laboratories and scientific berthing available on that vessel. In the third year BALDRIGE was not available and the work was planned for MT. MITCHELL, but MT. MITCHELL was then called into service in the Persian Gulf. The NECOP work was put on two UNOLS coastal vessels, PELICAN and LONGHORN. Adjustments were made in the scientific plan, but these vessels also provided excellent support of NECOP.

Lastly, Marty reported that conversion of the USGS T-AGOS vessel WORTHY is planned for later this year. NOAA will jointly operate and utilize the vessel with USGS. The vessel's home port is Redwood City, and it will operate off the west coast.

**OFFICE OF NAVAL RESEARCH** - The Office of Naval Research (ONR) report was given by Keith Kaulum. ONR's most recent reorganization combines Basic, Applied and Advanced Research (6.1, 6.2 & 6.3) into a Science and Technology Directorate which is made up of various departments. The Ocean Atmosphere and Space Science and Technology Department is headed by Dr. DeCorpo and is divided into two divisions; the Sensing and Systems Division with Steve Ramberg as Director and the Modeling and Prediction Division headed by Rick Spinrad. Research Facilities will fall under the Sensing and Systems Division. Jim Andrews who will be taking over many of the duties of Steve Ramberg as Steve moves into other areas of responsibility. The reorganization is still evolving and basic research will still be a high priority. An organizational wiring diagram is included as **Appendix IV**.

Keith reported that Research Facilities was given an imposed reduction in funding of $2M in FY 1994 as part of an overall $9M reduction in Basic Research (6.1).

Keith further reported that the AGOR-25 contract has been let to Halter Marine and that the first round of changes have been worked into the contract with comparative ease. Work towards a second round of change orders is beginning. All three AGOR 23 ships will receive SeaBeam. Every major deficiency item found on AGOR 23 has been corrected. NAVSEA has been increasingly flexible in accepting and funding proposed change orders. Most piping

on AGOR 23 has been replaced with Copper-Nickel. AGORs 24, 25 and 26 will have Copper-Nickel.

In other facility news, the dynamic positioning on KNORR, MELVILLE and THOMPSON have not been operating to up to par. The problems are being investigated and some improvements are being made using new hardware and software. Funding to rebuild FLIP has died, and does not appear in future budgets. Funds for routine support are continuing at approximately $900K per year. Users are charged a day rate of approximately $1,500 for FLIP use.

NATIONAL SCIENCE FOUNDATION - Don Heinrichs provided the report for the National Science Foundation (NSF) with a series of transparences which are included as **Appendix V.** The first transparency outlined the total NSF 1995 budget which requested $3.2 Billion, an increase of $182.2 M or 6%. Most of this increase is in the Research and Related Activities category. The second transparency outlined the NSF Geosciences' budget which requested an increase of $39.2 M or 9.7%. The major portion of this increase, $35.2 M, is in Global Change Programs. The Ocean Science part of the budget requested a total of $207.9 M for a 10.1% increase. The third transparency elaborated on the Ocean Science budget request. The largest portion of this budget is that of the Ocean Science Research Support (OSRS) which requested $114 M with a $14 M increase or 14%. The Oceanographic Centers & Facilities (OCFS) requested $53.9 M which represents a $3.7 M increase or 7.3%. As with the total budget, the Global Change Programs make up the largest single portion of the increase.

The overall NSF budget format has changed and now includes a line item for Major Research Equipment. It is in this section that major facilities will be funded, including ship construction. The FY95 request includes $70 M in the Major Research Equipment category, all of which is accounted for. Don indicated that these budget commitments will run into 1996 when they will ramp down, allowing for competition from new initiatives, such as funding for the Arctic Research Vessel (ARV) construction. Don feels that the ARV can be competitive in vying for these funds.

The ship operations budget for FY94 includes $31.6 M plus an additional $1.5 from ODP for a total of $33.1. This does not include $2.2 M for ALVIN. Science Instruments and Shipboard Equipment are each budgeted at $2.5M. Ships, Upgrades budget drops from $7.2 M to $2.3 M representing the completion of the mid-life refits on the OCEANUS class ships.

Don provided transparencies reflecting the total 1993 operations support for the UNOLS fleet broken down by funding agency and ship class. NSF provided 67.9% of the total support in 1994 with ONR contributing 14.3%. NOAA and "Other" each provided 6.5% with Institutional support at 4.8%. The transparencies also indicated that the five large ships use 44.6% of the operating funds with the seven intermediate ships using 32.2%. Averages by class of annual cost, operating days and cost per day are also reflected.

In Don's last transparency he broke out the "other support" category for 1992-94. This provided an interesting spread of those agencies other then the big major (NSF, ONR & NOAA) that fund sea going science and represent about 6.5% of the total support.

UNITED STATES COAST GUARD - The USCG did not send a representative to the FIC meeting. No report is available.

## FIC ISSUES

SHIP REFITS/CONSTRUCTION - Jack Bash and Joe Coburn provided an update on the OCEANUS Class mid-life refits. ENDEAVOR completed the refit in November 1993 and completed outfitting in March 1994. WECOMA is about to complete its refit and OCEANUS is expected to be completed in May 1994. When operational, the vessels will be significantly enhanced for science. Improvements included a new deckhouse, stack and mast for ENDEAVOR and OCEANUS. A deck extension was completed on ENDEAVOR and WECOMA. Air conditioning and refrigeration upgrades were completed on all ships. New and rebuilt cranes and winches were effected.

All three ships have experienced an admeasurement problem, none of which was precipitated by the refit, however the three ships can not sail until the problem is resolved. The ships were admeasured to comply with a new international tonnage treaty which goes into effect in July 1994. Apparently, the class had been admeasured incorrectly by the USCG when they were built. Now the American Bureau of Shipping (ABS) is responsible for performing the admeasurement for the Coast Guard. The ABS admeasurement puts all of the ships over 300 tons. USCG will not waive their earlier error and insist that all three ships must become inspected or correct the tonnage problem. The ships were built to be under 300 gross tons which would exempt them from the requirement of being USCG inspected. Four possible solutions are being investigated: 1) Provide structural changes to allow the ships to admeasure under 300 tons; 2) Provide structural and other changes necessary to be an inspected vessel; 3) Get Congressional relief with special legislation; or 4) Declare the ships Public Vessels which exempt them from the admeasurement rules.

COASTAL OCEANOGRAPHY WORKSHOP REPORT - Marcus Langseth reported that the Coastal Workshop report is in its final draft form. It has been endorsed by the Council and can be distributed after going through an editorial review by FIC. FIC suggested that the report should make mention of the Fleet Improvement Committee. Also, a glossary of acronyms would be helpful as an appendix. Data formats need to be looked over to see if they are still current. An Executive Summary would also be useful. The workshop participant list should include their respective institutions/agencies. There was also a recommendation to identify the need for a regional center for coastal facilities. Marcus will write a cover letter to go along with the report. Don Wright will be asked to provide the final draft within a month.

SCIENCE MISSION REQUIREMENTS FOR A COASTAL RESEARCH VESSEL - The UNOLS Council has charged the FIC with preparing Science Mission Requirements (SMR) for a large

capacity coastal research vessel. Once the SMRs are prepared, a concept design can be developed. The concept design would provide guidelines for a new vessel configuration, along with an assessment of potential refits for existing vessels.

An outline of major categories that should be addressed in the SMRs was discussed and included:

Vessel size, draft, tonnage, endurance, range and speed
Multiwire capability
Science party and crew size
Multi-Engine for safety inshore
Bow thruster
3-point mooring capability
Gear handling for Mochness, AUVs, ROVs, moorings, etc
Storage and lab space
Power

The requirements should be consistent with the coastal workshop recommendations. Peter Betzer will draft an outline for the SMR.

**UNOLS SAFETY STANDARDS** - Joe Coburn reported that RVOC is beginning to revise the safety standard manual. Input is encouraged.

*Day 2: March 18*

**SMR FOR COASTAL VESSEL (CONTINUED FROM DAY 1)** - Peter Betzer reviewed the draft outline for Science Mission Requirements for a general purpose, high capacity coastal research vessel. A subcommittee was formed to review the outline and begin development of the SMR. The subcommittee will include Marcus Langseth, Peter Betzer, Tom Royer and Don Wright. Other members may be added. After some discussion it was pointed out that the SMR is not justification to build a vessel, it may be used to see if any existing vessels will fit the SMR.

It was recommended that the SMR should include three to four case studies of programs that require coastal vessels. Investigators from these programs could identify the types of science performed and what they would have liked to see for platform support. Programs suggested included GLOBEC, AmasSeds, SHELFEX, LATEX, and the NY Bight Program. Marcus will contact the Coastal Workshop Steering Committee for case studies. Another suggestion for the SMR was to include a map which defines the geographic regions that would benefit by the availability of a shallow draft, large capacity coastal vessel.

**FLEET IMPROVEMENT PLAN UPDATE** - Marcus reported that the UNOLS Council had a number of recommendations to the Fleet Improvement Plan (FIP) update. They suggested that the FIP Recommendations be updated to be more current. For example, the recommendation for FOFCC to establish a mechanism for annual updates of facility needs should be modified

since FOFCC no longer exists. The Council also recommended that a section on deep submergence be included in the report.

The FIC discussed the update draft in detail. A number of editorial changes were noted. It was recommended that there needs to be consistency in the tables referring to fleet size. Marcus will reconstruct these tables using the Heinrich's Classification. A new table was suggested that would summarize ship tonnage to be replaced or refit over the next five years. It was also recommended to include ship statistics for 1993 if possible.

The FIP recommendations were carefully reviewed and a number of changes were identified. For coastal vessels, it was recommended to look at the applicability of existing assets to meet coastal science needs. It was also suggested to modify the ARV recommendation to read that the ARV be built only if it does not jeopardize blue water oceanography funding. Eric Firing will add some wording to the section on the distribution of the fleet to emphasize the strong scientific justification for ship operation bases in Hawaii and Alaska.

UNIVERSITY OF HAWAII SWATH DESIGN RECOMMENDATIONS - Brian Taylor from the University of Hawaii/SOEST reported on their efforts to identify a platform to meet their research needs. The SOEST Ship Users Executive Committee has compiled a list of SWATH Ship Design recommendations, see **Appendix VI**. Lockheed Industries has expressed interest in Hawaii's SWATH design and they are presently making recommendations on what the design might look like. Accommodations presently call for a maximum of 40 people. The SWATH offers a valuable design concept with features intended to provide high seakeeping and easy access to the water. The SWATH is intended for blue ocean operations throughout the world. Funding for construction of a vessel has not yet been identified.

Marcus explained that the Fleet Improvement Plan update stresses the importance of balancing the geographic distribution of the academic fleet. It identifies the need to maintain a ship operation base in Hawaii. Brian explained that Hawaii is searching for a plan to keep the University as an operating base. FIC encouraged Hawaii to stay in touch with UNOLS regarding this issue.

R/V THOMPSON TOUR - FIC was provided a tour of University of Washington's vessel, R/V THOMPSON. The vessel was in port at the Snug Harbor marine facility.

FIC MEMBERSHIP - The FIC terms for Marcus Langseth, Chair; Peter Betzer; Teri Chereskin; Charlie Miller and Don Wright have expired. Peter and Don have agreed to serve a second term. Nominations for replacement of the Chair and other members were recommended with consideration given for scientific discipline and experience at-sea. Marcus will contact the nominees to determine their interest in serving on FIC. Farewells and appreciations were extended to all FIC members rotating off the committee.

MEETING SCHEDULE - The next meeting was tentatively scheduled for October 3-4, 1994 at Lamont-Doherty.

***The meeting was adjourned at 3:30 pm.***

# APPENDIX I

UNOLS FLEET IMPROVEMENT COMMITTEE
**March 17-18, 1994**
**East-West Center**
**University of Hawaii at Moana**
**Honolulu, Hawaii**

*Convene Thursday, March 17 at 9:00 am*

1. **Greeting and meeting logistics** - Mark Langseth and Eric Firing

2. **Approval of minutes of July 19-20, 1993 meeting and agenda** - Mark Langseth

3. **UNOLS Council report** - Garry Brass

4. **Agency Reports:**

   NSF - Dick West
   ONR - Keith Kaulum
   NOAA - Martin Mulhern
   USCG - LCDR Steve Wheeler

5. **Update on the progress of the Arctic Research Vessel** - Tom Royer

6. **Coastal Oceanography Workshop Report Status** - Marcus Langseth

7. **Subcommittee report on the KNORR Conversion** - Peter Betzer

8. **Science Mission Requirements for Coastal Vessel** - At the September UNOLS Council meeting, the Coastal Subcommittee was tasked to develop SMRs for a large capacity coastal research vessel. - Peter Betzer

9. **Update and recent developments toward use of Nuclear Submarines for Oceanography** - Mark Langseth

10. **Mid-life refits of OCEANUS Class** - Jack Bash

12. **FIC Membership** - Mark Langseth

    The first terms of Peter Betzer, Teri Chereskin, Charlie Miller, and Don Wright expired in October 1993. All are eligible for second terms.

    Mark Langseth's term expired in October. Discuss potential nominations for new chair.

13. **Fleet Improvement Plan** - Mark Langseth
    The main purpose of this meeting will be to complete the draft update. Please bring any text you have prepared and/or any changes to the existing draft.

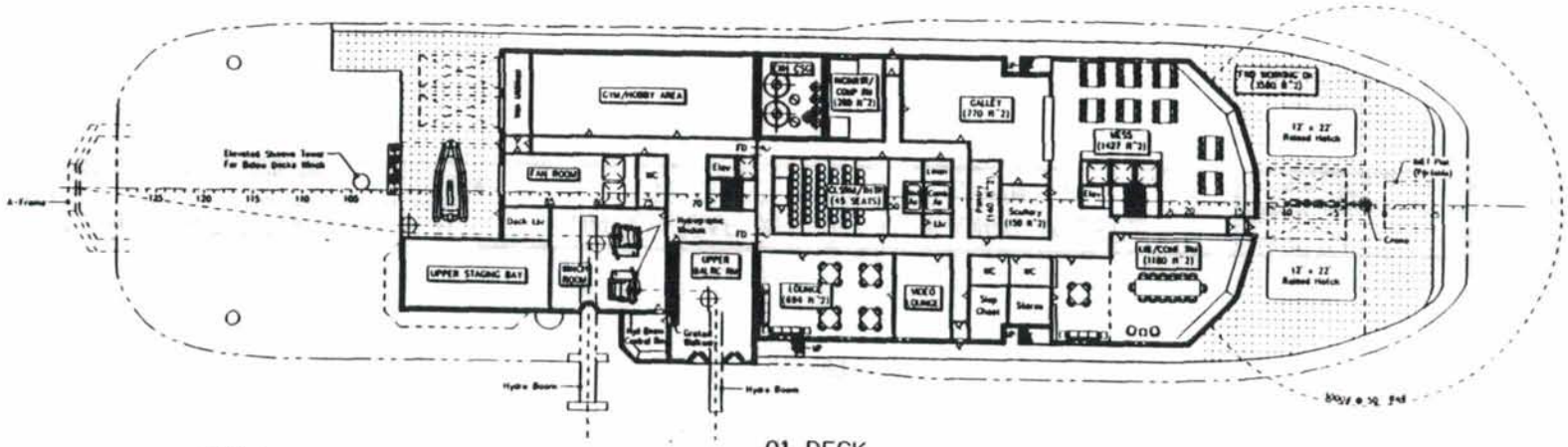
# APPENDIX II

## Estimated 1992 Operating Costs
Costs in Thousands of Dollars

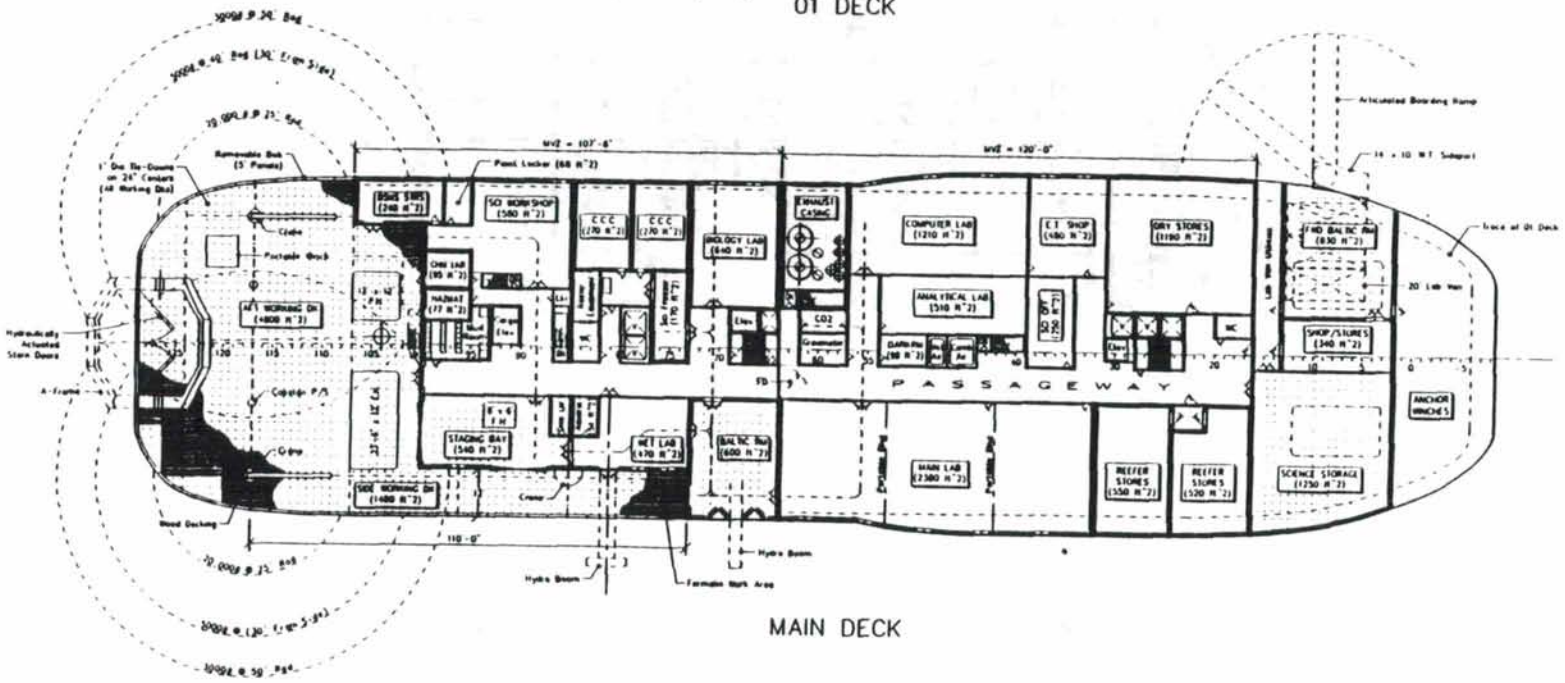
| | R/V Thompson | R/V Ewing | R/V Knorr | ARV | Notes | |
|---|---|---|---|---|---|---|
| **1. Assumptions** | | | | | | |
| Crew size | | 22 | 22 | 25 | 26 | |
| Propulsion BHP | | 6,000 | 3,250 | 3,000 | 18,000 | |
| Operating days | | 277 | 314 | 344 | 300 | |
| Days at sea | | 258 | 274 | 305 | 270 | |
| Fuel, gal per day | | ? | ? | 1,960 | 10,700 | 1 |
| **2. Salaries & Wages** | | | | | | |
| Ship base salaries | | 770 | 861 | 818 | 923 | 2 |
| Overtime & leave | | 613 | 822 | 945 | 897 | 2 |
| Fringe benefits | | 258 | 383 | 625 | 477 | 2 |
| Shore based administration | | 208 | 554 | 253 | 338 | 3 |
| Total Payroll | | **1,849** | **2,620** | **2,641** | **2,635** | |
| **3. Repair, Maintenance & Overhaul** | | **397** | **480** | **650** | **1,059** | 4 |
| **4. Other Expenses** | | | | | | |
| Fuel and lube oil | | 732 | 774 | 628 | 2,900 | 5 |
| Food | | 296 | 151 | 206 | 246 | 2 |
| Insurance | | 145 | 269 | 35 | 342 | 6 |
| Stores, parts, etc. | | 120 | 194 | 225 | 320 | 4 |
| Travel | | 112 | 208 | 118 | 165 | 2 |
| Shore support & Miscellaneous | | 235 | 256 | 235 | 242 | 3 |
| Total Other Expenses | | **1,640** | **1,852** | **1,447** | **4,215** | |
| **5. Indirect Costs** | | **375** | **0** | **595** | **485** | |
| **6. Total Operating Costs** | | **4,261** | **4,952** | **5,332** | **8,394** | 7 |
| **7. Average Daily Cost** | | **15.4** | **15.8** | **15.5** | **28.0** | |

**Notes:**

1. Reference Glosten "Decision Paper No. 1" May 1993
2. Average of Thompson, Ewing, and Knorr increased by ratio of crew (i.e. 26/23)
3. Average of Thompson, Ewing, and Knorr
4. Thompson increased by ratio of horsepower (i.e. 18,000/6,000)
5. [Gallons per day] x [Days at sea] x [$1.00/gallon]
6. [Thompson Insurance] x [ARV Hull CN/Thompson Hull CN]
7. Amortized construction costs not included.




01 DECK

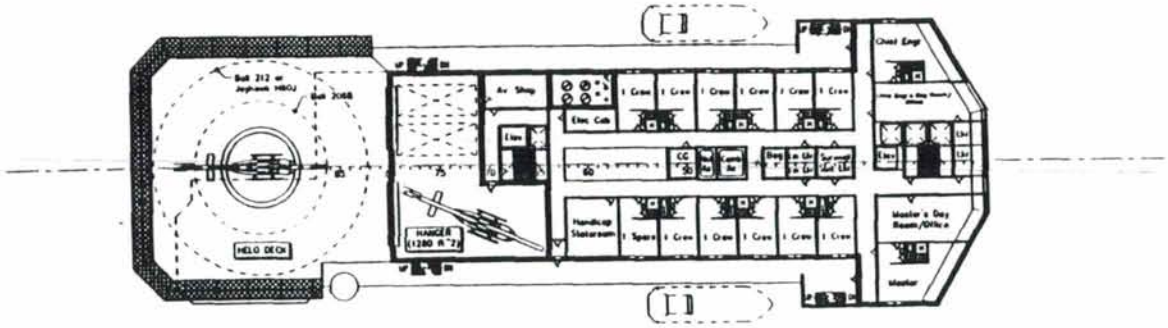



MAIN DECK

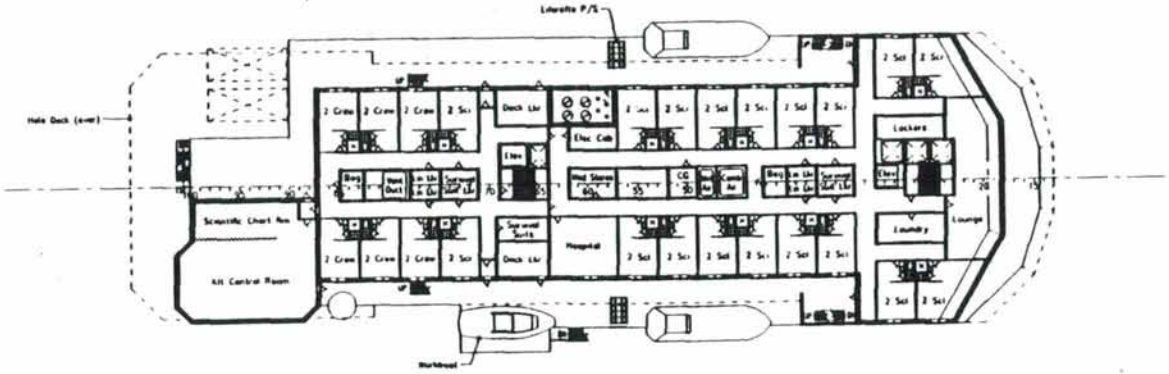
THE GLOSTEN ASSOCIATES, inc.
CONSULTING ENGINEERS SERVING THE MARINE COMMUNITY
600 Mutual Life Building • 605 First Avenue • Seattle, Washington 98104-2224

# UNOLS/UAF ARCTIC RESEARCH VESSEL
## Main & 01 Deck Arrangements

| | | | |
|---|---|---|---|
| DRAWN BY DHK | DATE Dec 1992 | SCALE 1/32" = 1' 0" | |
| CHECKED BY P&H | DATE Jan 1993 | DWG NO 9243-A-4 | REV - |
| APPROVED BY [illegible] | DATE [illegible] | | |




03 DECK



02 DECK

THE GLOSTEN ASSOCIATES, inc.
CONSULTING ENGINEERS SERVING THE MARINE COMMUNITY
600 Mutual Life Building • 605 First Avenue • Seattle, Washington 98104-2224

# UNOLS/UAF ARCTIC RESEARCH VESSEL
## 02 & 03 Deck Arrangements

| | | | |
|---|---|---|---|
| DRAWN BY DHK | DATE Dec 1992 | SCALE 1/32" = 1'-0" | |
| CHECKED BY PWH | DATE Jan 1993 | DWG NO 9243-A-5 | REV |
| APPROVED BY DHK | DATE Jan 1993 | | |

# APPENDIX III

Eos, Transactions, American Geophysical Union, Vol. 74, No. 45, November 9, 1993, Pages 523, 525

# Arctic Research Vessel Design Would Expand Science Prospects

Robert Elsner and Dirk Kristensen

The U.S. polar marine science community has long declared the need for an arctic research vessel dedicated to advancing the study of northern ice-dominated seas. Planning for such a vessel began 2 decades ago, but competition for funding has prevented construction. A new design program is underway, and it shows promise of opening up exciting possibilities for new research initiatives in arctic marine science.

With its latest design, the Arctic Research Vessel (ARV) has grown to a size and capability that will make it the first U.S. academic research vessel able to provide access to the Arctic Ocean. This ship would open a vast arena for new studies in the least known of the world's seas. These studies promise to rank high in national priority because of the importance of the Arctic Ocean as a source of data relating to global climate change. Other issues that demand attention in the Arctic include its contributions to the world's heat budget, the climate history buried in its sediments, pollution monitoring, and the influence of arctic conditions on marine renewable resources.

Funding for the current design study has been provided by the National Science Foundation as part of the University National Oceanographic Laboratory System (UNOLS) Fleet Improvement Committee (FIC) long-range plan. A subcommittee of the FIC, chaired by Tom Royer, Institute of Marine Science, University of Alaska, oversees the design process. The ARV subcommittee developed scientific mission requirements for an arctic marine research program of broad disciplinary and national interest. The mission requirements have been widely distributed throughout the oceanographic and arctic science communities, and numerous exchanges have led to the current design concept. Primary responsibility for the design and engineering rests with The Glosten Associates of Seattle, Wash., a naval architectural firm. Canadian and German consultants are participating in the development and testing of the hull design.

The ARV project suffered a setback in the Fiscal Year 1994 NSF budget process in late September. Although NSF had included $6.5 million in the FY 1994 budget request to begin acquisition of the ship, it was excluded from the Senate Appropriations Bill. The concerns rested primarily with the procedures for construction and operation of the vessel. It is expected that NSF will include similar funding in the FY 1995 budget request. Construction would begin in 1995 with completion in about 3 years.

## Modern Icebreaker Design

To take best advantage of new concepts in research vessel design, both conventional and innovative icebreaker technologies were considered. Traditional icebreaking ships have depended largely on mass and power to force their way through sea ice. In the past, comfort has had to assume a secondary priority due to the ships' rounded, egg-shaped hulls and severe rolling in open water.

A new age of icebreaker design was initiated in the 1970s. One of the innovative concepts was developed by the German naval architect Heinrich Waas. Working at the marine testing laboratory, Hamburgische Schiffbau Versuchsanstalt (HSVA), he experimented with models in an exploration of the physical processes involved in the passage of the hull through ice. He found that the traditional V-shaped ice-breaking bow expended a large amount of energy in crushing ice; that is, in applying force in the compressive mode. Since ice is relatively resistant to compression, it was thought that a more efficient technique might be developed that would take advantage of the relatively low bending and shear strength of ice [*Schwarz and Weeks*, 1977]. Shearing was accomplished by reamers at the outer sides of the bow. Between the two outboard reamers, the bow geometry resembled a flat, shallow-sloped plate that broke ice primarily by bending. The broken ice was then displaced laterally under the adjacent ice by the hull shape.

The first full-scale attempt to implement this concept resulted in the conversion of the conventional German icebreaker Max Waldeck in 1980. The converted icebreaker performed well and led a few years later to conversions of the Soviet icebreakers *Mudyug* and *Kapitan Sorokin* [*Varges*, 1990]. Although these ships were able to break ice better, there were penalties in open water. The broadened bow created more resistance, and it was prone to increased slamming in head seas.

In Canada around the same time, Bengt Johansson, a naval architect formerly with the Wartsila shipyard in Helsinki, Finland, designed a family of icebreaking support vessels for petroleum exploration activities in the Mackenzie Basin of the Beaufort Sea. The icebreakers *Kigoriak* and *Robert Lemeur*, which were introduced in 1979 and 1982, respectively, heralded a series of novel designs, of which the most recent evolution is the Swedish icebreaker *Oden* [*Johansson and Liljeström*, 1989]. The bow configurations of these designs also take advantage of the low bending strength of ice. There are similarities between the Waas and Johansson designs in that both have broad, shallow-sloped bows, bow reamers, and hull shapes intended to divert the broken ice to the sides of the channel. The reamers of the Waas designs serve the dual purpose of imparting shearing forces on the ice and im-

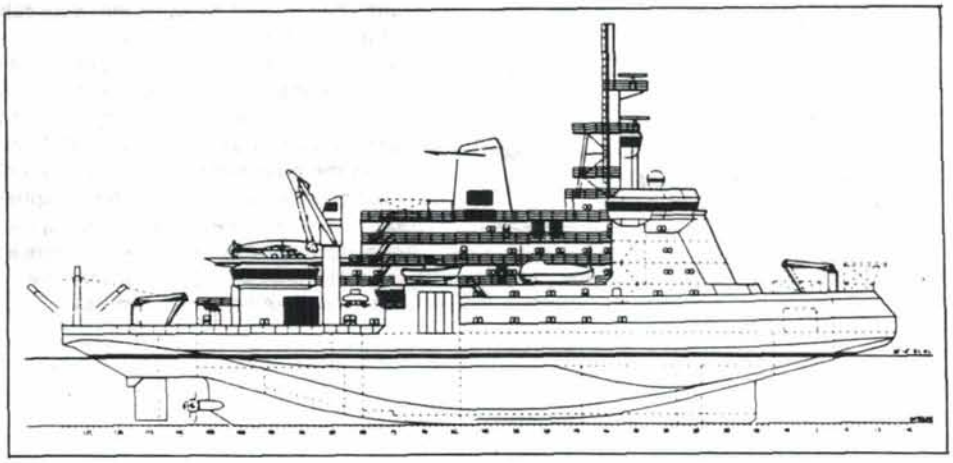


*Fig. 1. Outboard profile, from the conceptual design of the Arctic Research Vessel. Scientific spaces are concentrated on the main deck. Enclosed laboratory area exceeds 4700 square feet; main deck working area, 5300 square feet; science hold, 27,000 cubic feet.*

Robert Elsner, Institute of Marine Science, University of Alaska, Fairbanks, AK 99775; and Dirk Kristensen, The Glosten Associates Inc., 605 First Avenue, Seattle, WA 98104


0096/3941/7445/93/523/$01.00.

proving maneuverability by decreasing the turning diameter. The Johansson designs utilize reamers primarily for improved maneuverability.

Modern icebreaker designs have also made extensive use of hull lubrication systems to decrease hull-ice resistance. These have included water lubrication at the bow, combinations of water and air injection below the ice surface at the bow, and air bubbling along the hull forebody. These techniques can produce a significant reduction in hull resistance, particularly in snow-covered ice. Low friction hull coatings also decrease hull resistance in ice. Some recently built icebreakers have incorporated a band of stainless steel plating at the waterline, effectively reducing the friction between the hull and the ice.

These modern ships compare favorably with conventional icebreakers in sea ice operations. They are more economical to operate, and they break comparable ice with less power. They are less subject to uncomfortable motion in open seas. However, the higher cost of increased open water resistance, which can be as much as 20%, becomes a significant penalty if the ship is required to operate extensively in that environment. Accordingly, the choice of design hinges on the operational need for improved and economical function in ice.

## Current Design of the Arctic Research Vessel

The ARV will equal or exceed UNOLS mission requirements for long-range, high endurance research vessels. The current design calls for a vessel of 340 feet overall length, 76 feet midship beam and 30 feet draft, driven by 18,000 horsepower. It will accommodate 36 scientists, and it will have an endurance of 90 days at sea. Operations in the multiyear arctic ice environment demand an extraordinarily strong ship with long endurance and reserve. Even so, prudence and scientific opportunity will require that the ship operate occasionally in conjunction with more powerful escort icebreakers. Arctic Ocean ice is largely of multiyear character and therefore less saline, stronger, and more massive than first-year ice typical of the seasonal ice formed in polar peripheral seas. Because of its predominantly multiyear character, Arctic Ocean ice presents a more formidable challenge to a ship than does Antarctic ice.

The conceptual design was completed early in 1993, and work has commenced on the preliminary design. This phase includes model testing in a variety of conditions that will predict the performance of the full scale ship. These tests have recently been completed at the HSVA facility. All indications are that the vessel will fully meet the scientific mission requirements and that it will be highly capable in both ice and open water.

## Ice Capability

The deliberations of the UNOLS oversight committee have consistently favored the best possible ice capability rather than open ocean performance, if a choice must be made. Because the capability of the ship for operations in the Arctic Ocean is a primary determining consideration, it is important to establish clearly what its ice worthiness is to be. Listed here are the requirements for the ARV ice capabilities, as stated in the Scientific Mission Requirements:

- The ship will be able to operate continuously in first-year ice, will be capable of limited operations in multiyear ice, and will be able to transit 7-foot ridges by ramming.
- The required operating profile of the vessel generally falls within the operating areas and seasons described for ice class A3 in the American Bureau of Shipping's guide to ice classification.
- The vessel is to have excellent maneuvering characteristics to enhance ice trafficability and science operations. Optimum maneuverability is to be achieved through hull design, high performance rudders, and a rapid heeling system.
- The vessel must meet the requirements of the new Canadian Arctic Shipping Pollution Prevention Regulations.

## Science Prospects

However appealing the technological innovations and operational capabilities of the arctic research vessel might be, they are dwarfed by the prospects of expanded horizons that will come about when this ship becomes part of the national oceanographic fleet. The highly successful joint scientific voyage of the Swedish icebreaker *Oden* and the German research vessel *Polarstern* to the North Pole in 1991 revealed the practicality and potential for performance of marine science in that newest and neglected oceanographic frontier. Their voyage was the culmination of ship operations dating back to the *Fram* voyages of a century ago and demonstrated the possibilities for expanded arctic scientific enterprises beyond the peripheral seas of seasonal ice. These recent operational developments and related science prospects have strongly influenced the course of the ARV design process.

The pace of long-range planning for arctic science has increased in recent years. Several national deliberative bodies representing research interests have identified topics of arctic marine science that deserve attention. The U.S. Arctic Research and Policy Act of 1984 established the Arctic Research Commission (ARC), which is responsible for identifying scientific goals and methods for logistic support. Its recommendations have assigned the highest research priority to new initiatives for understanding the Arctic Ocean, its marginal seas, and their interactions with the atmosphere [*ARC*, 1993]. The act also required the Interagency Arctic Research Policy Committee (IARPC) to establish long-range planning for national priority investigations in the Arctic. That organization recently published *Arctic Oceans Research*, which identified as scientific research topics Arctic Basin circulation, ecosystem and biogeochemical dynamics, lead and polynya dynamics, marginal ice zone processes, paleoclimate, and shelf dynamics.

NSF's Arctic System Science Program convened a workshop in 1990 to provide advice regarding scientific priorities for Arctic marine research. The executive summary of the report includes the following statement:

"Research on the arctic marine system is urgently needed to support planning and policy decisions that arise as nations develop strategies for predicting, mitigating, and adapting to global change. Until now, such needs could not be met, due to limited support for basic research in the Arctic Ocean and lack of research platforms and facilities upon which scientific progress in this field depends."

The plans to build a research ship capable of working in the central Arctic enhance expectations that the goals of arctic marine science will be realized and that the United States will play a leading role in this important development.

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Arctic Research Commission, *Goals and Priorities to Guide United States Arctic Research*, Washington, D.C., 35 pp., 1993.

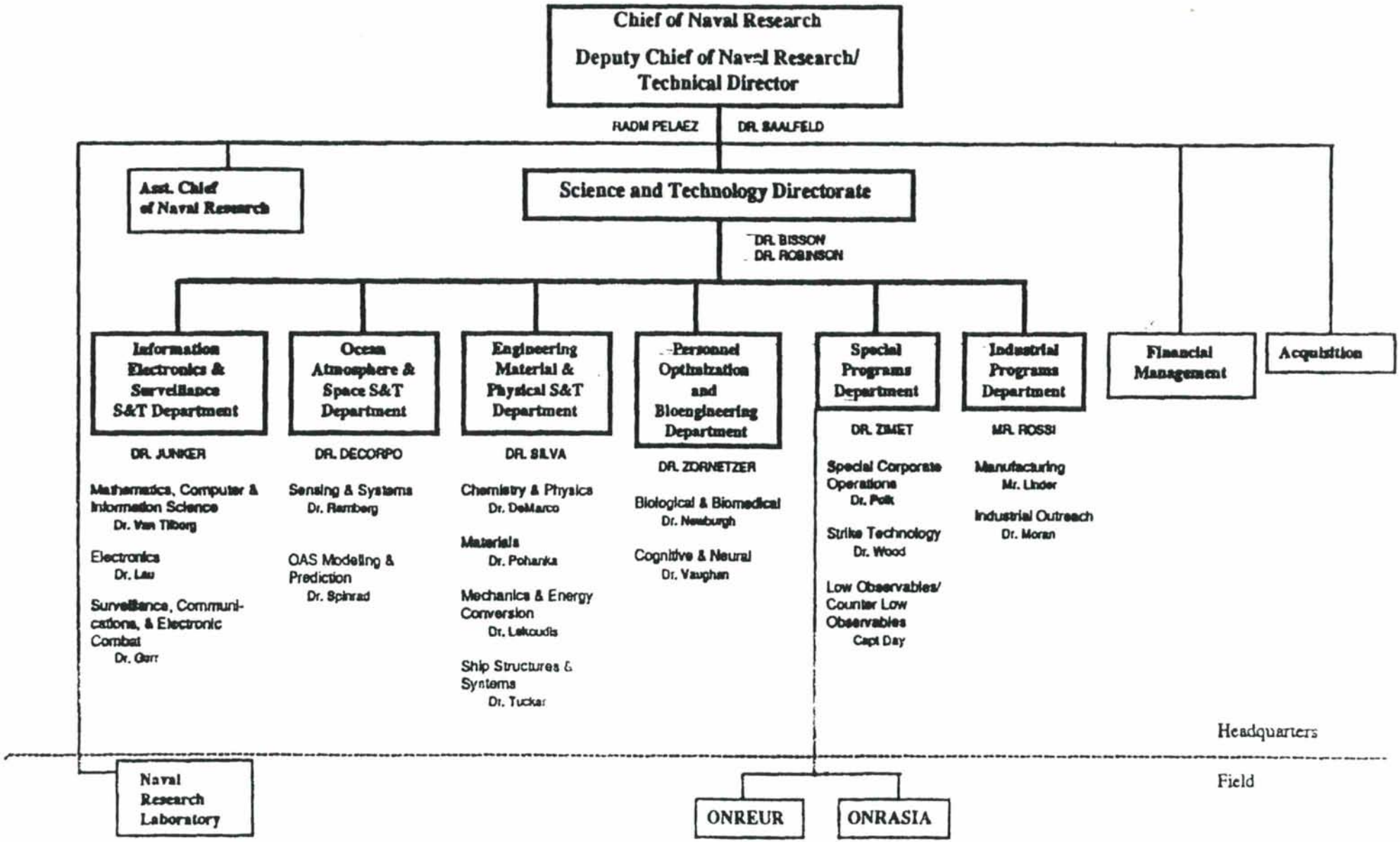
Johansson, B. M., and G. C. Liljestrom, Oden—Icebreaker technology for the year 2000, *Trans., Soc. Nav. Arch. Mar. Eng., 97*, 53, 1989.

Schwarz, J., and W. F. Weeks, Engineering properties of sea ice, *J. Glaciol., 19*, 499, 1977.

Varges, G. R., Full-scale experiences with Thyssen/Waas icebreakers, Proc. 4th Int. Conf. Ships and Mar. Sys. in Cold Environ., 1990, SNAME, Paper H.

# APPENDIX IV

# Office of Naval Research - 1994



OAS Sensing and Systems Division (ONR 321)

**Director**: S. Ramberg
**Military Deputy** (321B): P. DeVries
**Associate for Integration** (321N): J. Andrews
**Associate for Warfare Applications** (321W): T. Goldsberry
**Division Support Staff** (321S1 & S2): K. Kvitkovich, K. Whitehead

**321OA - Ocean Acoustics** - M. Badiey (Program Manager), J. Simmen, (E. Estalote), (*P. Jackson*), T. Travis (Secretary)

6.1 FRC's - as current for 324OA
6.2 FRC from 6.2314 for acoustics

**321OP - Ocean Optics** - S. Ackleson (Program Manager), (*B. Almquist*), V. Hoey (Secretary)

6.1 FRC's - as current for 323OP
6.2 FRC's from 6.2315 for LIDAR, SEAL systems and MCM EO

**321RS - Remote Sensing** - F. Herr/*D. Trizna* (Program Manager), C. Luther, *E. Mozeley,* M. Mizuki (Secretary)

6.1 FRC's - as current for 321RS
6.2 FRC's from 6.2315 for SQUID radiometer, magnetic/E-field MCM

**321SI - Sensing Information Dominance** - D. Johnson (Program Manager), (J. Simmen), (E. Shulenberger), *N. Harned, R. Bluth, J. Walker,* C. Wheeler (Secretary)

6.1 FRC - as current for 451E
6.2 FRC for current efforts under 451E
6.2 FRC's from 6.2314 for acoustic fusion, full spectrum processing
6.2 FRC's for SSBN security

**321SS - Sensing, Sources and Arrays** - K. Dial (Program Manager), R. Doolittle, (C. Luther), *P. Jackson, R. Varley,* T. Travis (Secretary)

6.2 FRC's from 6.2314 for for expendable sensors, magnetic/optical sensors
6.2 FRC's for efforts under 451B and G

321OE - **Ocean Engineering and Marine Systems** - T. Swean (Program Manager), *D. Robeson*, (*B. Almquist*), (D. Small), M. Mizuki (Secretary)

6.1 FRC's - as current for 321OT
6.2 FRC's from 6.2131M
6.2 FRC's from 6.2315 for spec warfare

321RF - **Research Facilities** - K. Kaulum (Program Manager), J. Keller, *P.Dennis*, M. Mizuki (Secretary)

6.1 FRC - as current from 321RF
6.2 FRC from all accounts for ship operations

321US - **Undersea Surveillance Systems** - T. Goldsberry (Program Manager), E. Estalote, *L. Jacobi*, *R. Wheatley*, (*N. Harned*), C. Wheeler and B. Didier (Secretaries)

6.2 FRC's from 6.2314 for efforts under 451C

321LS - **Littoral Surveillance and Systems** - J. Andrews (Program Manager), (W. Ching), *B. Almquist*, V. Hoey (Secretary)

6.2 FRC's from 6.2315 for MCM
Hamlet's Cove liaison

321TS - **Tactical Sensing Support** - W. Ching (Program Manager), (B. Blumenthal), *D. Davison*, D. Small, C. Wheeler (Secretary)

6.2 FRC's from 6.2315 for MCM and 6.2314 for TDAs
6.3b FRC from AEAS for TDAs

<u>OAS Modelling and Prediction Division (ONR 322)</u>

**Director**: R. Spinrad
**Military Deputy** (322B): T. Sheridan
**Associate for Integration** (322N): A. Weinstein
**Associate for Warfare Applications** (322W): R. Feden
**Division Support Staff** (322S1 & S2): J. Myles & K. Dillard

322PO - **Physical Oceanography** - L. Goodman (Program Manager), S. Ramp, (R. Edson), M. Prude (Secretary)

6.1 FRC's - as current from 322PO except portion to 322OM

**322BC - Biological/Chemical Oceanography** - E. Shulenberger (Program Manager), E. Green, B. Zahuranec, (*R. Bluth*), T. Anthony (Secretary)

6.1 FRC's - as current from 323B and C

6.2 FRC's from 6.2435 for atmospheric chemistry and bio-optical modelling

**322CD - Coastal Dynamics** - T. Kinder (Program Manager), *L. Vincent*, New Hire, J. Albrittain (Secretary)

6.1 FRC's - as current from 321CS

**322HL - High Latitude Dynamics** - T. Curtin (Program Manager), L. Johnson, R. Edson, *L. Codispoti, J. Fondrk*, H. Whitlock (Secretary)

6.1 FRC's - as current from 324AR

6.3 FRC for Arctic Radionuclides

**322OM - Ocean Modelling and Prediction** - R. Peloquin (Program Manager), M. Fiadeiro, E. Chaika, J. Bergin, J. Albrittain & P. Eppinette (Secretaries)

6.1 FRC's - as current from 453B and including portion of 322OP

6.2 FRC's from 6.2435 for physical modelling and acoustics modelling

**322AM - Atmospheric Modelling and Prediction** - *S. Sandgathe* (Program Manager), G. Geernaert, T. Anthony (Secretary)

6.1 FRC's - as current from 453B & including portion of 322MM

6.2 FRC's from 6.2435 for atmospheric prediction, EM/EO effects

**322TE - Tactical Environmental Support** - R. Feden (Program Manager), B. Blumenthal, R. Jacobson, S. Lovelace, (*D. Robeson*), J. Albrittain (Secretary)

6.1 FRC's - as current from 453

6.2 FRC's from 6.2435, 6.2314, 6.2315 for hi-res modelling/simulation

6.3b FRC's from AEAS

**322GG - Marine Geology and Geophysics** - J. Kravitz (Program Manager), (W. Ching), H. Whitlock (Secretary)

6.1 FRC's - as current from 324GG

6.2 FRC's from 453E for littoral sediment transport, bathymetry

**322MM - Marine Meteorology** - R. Abbey (Program Manager), M. Prude (Secretary)

6.1 FRC's - as current in 322MM except portion to 322AM

6.2 FRC's from 6.2435 for tropical cyclones

**322SP - Space Physics** - G. Joiner (Program Manager), *D. Chen, R. McCoy, J. Foreman*, H. Whitlock (Secretary)

6.1 FRC's - as current from 314SP

6.2 FRC from 6.2111 for POAM

4. All responsibilities for 6.3a accounts will remain unchanged from the current assignments.

# APPENDIX V

# NSF FY 1995 BUDGET REQUEST

## NSF

- **Total Request is $3.200 Billion**
- **Increase of $182.2 Million or 6.0%**

| | Total | Increases |
|---|---|---|
| Research and Related Activities | $2348.7 M | $180.0M or 8.3% |
| Education and Human Resource | 586.0 M | 16.4M or 2.9% |
| Academic Research Infrastructure | 55.0 M | -45.0M or -45.0% |
| Major Research Equipment | 70.0 M | 18.0M or 34.6% |
| Salaries, Expenses, IG Office, Relocation | 140.3 M | 12.8M or 10.0% |

- **Major Research Initiatives**

| | | |
|---|---|---|
| Advanced Materials and Processing Program | 313.2 M | 5.2M or 2.7% |
| High Performance Computing and Comm. | 328.6 M | 61.6M or 23.1% |
| Biotechnology | 205.7 M | 6.2M or 3.1% |
| U.S. Global Change Research Program | 207.5 M | 65.6M or 46.2% |
| Environmental Research | 156.0 M | 11.6M or 8.0% |
| Advanced Manufacturing Technology | 196.3 M | 5.2M or 2.7% |
| Civil Infrastructure Systems | 54.1M | 3.0M or 5.9% |
| | $1461.4M | $158.4M or 12.2% |

- **Other Research Activities** — 887.3M — $ 21.6M or 2.5%

# NSF FY 1995 BUDGET REQUEST

## Geosciences

- **Total Request is $443.1 million**
- **Increase of $39.2 million or 9.7%**

| | Total | Increases |
|---|---|---|
| **Atmospheric Sciences** | **$147.9 M** | **$13.5M or 10.0%** |
| **Earth Sciences** | **87.3 M** | **6.7M or 8.3%** |
| **Ocean Sciences** | **207.9 M** | **19.0M or 10.1%** |
| **• Major Support Categories** | | |
| **Research Projects** | **$293.5 M** | **$28.6M or 10.8%** |
| **Centers & Facilities** | **138.7 M** | **10.6M or 8.3%** |
| **Education & Training** | **10.9 M** | **No Change** |
| **• Major Research Initiatives** | | |
| **Global Change Programs** | **$134.5 M** | **$35.2M or 35.5%** |
| **Biotechnology** | **3.6 M** | **- 0.4M or -10.0%** |
| **High Performance Computing** | **6.9 M** | **4.0M or 137.0%** |
| **Environmental Research** | **23.7 M** | **0.5M or 2.2%** |
| **Advanced Materials and Processing Program** | **8.0 M** | **No Change** |
| | **$176.7 M** | **$39.3M or 28.6%** |
| **• Other Research Activities** | **$266.4 M** | **-$0.1M or 0.0%** |

# NSF FY 1995 BUDGET REQUEST

## Ocean Sciences

- **Total Request is $207.9 million**
- **Increase of $19.0 million or 10.1%**

| | Total | Increases |
|---|---|---|
| Ocean Science Research Support (OSRS) | $114.0M | $14.0M or 14.0% |
| Oceanographic Centers & Facilities (OCFS) | 53.9M | 3.7M or 7.3% |
| Ocean Drilling Program (ODP) | 40.0M | 1.3M or 3.4% |
| • Major Research Initiatives | | |
| Global Change Programs | 71.4M | 17.8M or 33.2% |
| Biotechnology | 3.6M | -0.4M or -10.0% |
| High Performance Computing | 1.6M | 1.2M or 300.0% |
| Environmental Research | 2.5M | 0.5M or 25.0% |
| | $79.1M | $19.1M or 31.8% |
| • Other Research activities | $128.8M | -$ 0.1M or 0.0% |

# OCEAN SCIENCES DIVISION

| | FY 1992 | FY 1993 | Estimated FY 1994 |
|---|---|---|---|
| Ocean Sciences Division | $177.5 M | $177.7 M | $ 188.9 M |
| Ocean Sciences Research | 90.0 M | 92.5 M | 100.0 M |
| Ocean Drilling Program | 36.3 M | 36.0 M | 38.7 M |
| Oceanographic Facilities | 51.2 M | 49.2 M | 50.2 M |

## OCEANOGRAPHIC FACILITIES DETAIL

| | | | |
|---|---|---|---|
| **Operations** | | | |
| Ship Operations | 31.1 M* | 29.4 M* | 31.6 M * |
| ALVIN, Aircraft, etc. | 0.9 M | 1.4 M | 2.2 M |
| Marine Techs | 4.3 M | 4.2 M | 4.2 M |
| | $ 36.3 M | $ 35.0 M | $ 38.0 M |
| **Infrastructure** | | | |
| Science Instruments | 1.7 M | 1.3 M | 2.5 M |
| Shipboard Equipment | 2.8 M | 2.1 M | 2.5 M |
| Ships, Upgrades | 2.9 M | 7.2 M | 2.3 M |
| UNOLS, Misc. | 0.6 M | 0.5 M | 0.7 M |
| | $ 8.0 M | $ 11.1 M | $ 8.0 M |
| **Technology, Centers, Reserves** | | | |
| Technology Development | 4.4 M | - | - |
| AMS Center | 1.2 M | 1.0 M | 1.5 M |
| Cross Directorate/Reserves | 1.3 M | 2.1 M | 2.7 M |
| | $ 6.9 M | $ 3.1 M | $ 4.2 M |

*Plus $1.6 M from ODP (1992 and 1993), $1.5 M (1994)

# ACADEMIC FLEET OPERATIONS SUPPORT
## (SHIP CLASS - 1993)

| | LARGE | INTER | REGION | LOCAL | HBOI | TOTAL | SHARE |
|---|---|---|---|---|---|---|---|
| NSF | 16,037 | 9,138 | 4,742 | 912 | 242 | 31,071 | 67.9% |
| ONR | 2,704 | 3,387 | 479 | 23 | 0 | 6,593 | 14.3% |
| NOAA | 539 | 1,024 | 58 | 439 | 944 | 3,004 | 6.5% |
| OTHER | 486 | 648 | 972 | 364 | 530 | 3,001 | 6.5% |
| INST | 724 | 564 | 346 | 129 | 460 | 2,223 | 4.8% |
| | $20,490 | $14,761 | $6,597 | $1,867 | $2,177 | $45,892 | |
| PERCENT | 44.6% | 32.2% | 14.4% | 4.1% | 4.7% | | |
| AVERAGES | $4.1M | $2.0M | $1.1M | $0.3M | $1.1M | | |
| | 265 days | 216 days | 162 days | 106 days | 140 days | | |
| | ($15,470) | ($9,700) | ($6,790) | ($2,940) | ($7,800) | | |

(Updated Dec. 1993)

# "OTHER SUPPORT" FOR UNOLS OPERATIONS
## (1992 - 1994)

| SPONSOR | ACTUAL 1992 | ESTIMATE 1993 | PROJECTED 1994 |
|---|---|---|---|
| NAVY LABS" | 623 | 678 | 1,094 |
| DOE | 231 | 380 | 770 |
| ARPA | - | 46 | 1,277 |
| MMS | 665 | 327 | 248 |
| CNOC | 367 | 339 | 346 |
| USGS | 297 | 15 | 94 |
| EPA | 87 | - | 60 |
| JAMSTEC | 359 | 762 | 207 |
| OTHER | 210 | 454 | 182 |
| | $ 2,839 | $ 3,001 | $ 4,278 |

**NOTES**

NAVY LABS - - NRAD, NOSC, ARL, NUSC, "NAVY", JHU/APL.

OTHER - - INDUSTRY, MBARI, NIH, JOI, MUSEUMS, ETC.

(Updated Dec. 1993)

# ACADEMIC FLEET OPERATIONS SUPPORT

## (1991-1994)

| UNOLS TOTALS | ACTUAL 1991 | ACTUAL 1992 | ESTIMATE 1993 | PROJECTED 1994 |
|---|---|---|---|---|
| NSF | 26,179 | 35,396 | 31,071 | 35,207 |
| ONR | 5,211 | 4,005 | 6,593 | 3,979 |
| NOAA | 2,490 | 4,124 | 3,004 | 2,172 |
| OTHER | 3,129 | 2,839 | 3,001 | 4,278 |
| INST | 2,117 | 2,332 | 2,223 | 2,580 |
| | $39,126 | $48,696 | $45,892 | $48,216 |

* Data Sources

o 1991 - 1994 NSF Ship Operations Proposals Oct. (1993)

(Updated Dec. 1993)

# AGENCY SUPPORT BY RESEARCH VESSEL
## Three Year Average (1992 - 1994)

| | Over 60 days | 30-60 Days | 15-30 Days | Less Than 15 Days |
|---|---|---|---|---|
| **NSF** | ALL OTHER SHIPS | LAURENTIAN - 53<br>VICKERS - 52<br>PELICAN - 40 | S. JOHNSON-28<br>GYRE-26<br>E. LINK-19 | LONGHORN-14 |
| **ONR** | OCEANUS-73 | ISELIN-55<br>WECOMA-51<br>MOANA WAVE-49<br>KNORR-37 | ENDEAVOR-22<br>SPROUL-20<br>HENLOPEN-20<br>NEW HORIZON-19<br>HATTERAS-17<br>EWING-16<br>THOMPSON-15<br>GYRE-15 | ALL OTHER SHIPS |
| **NOAA** | VICKERS-122<br>E. LINK-78<br>PELICAN-61 | S. JOHNSON-59 | ATLANTIS II-29<br>LONGHORN-28 (?)<br>BLUE FIN-17 | ALL OTHER SHIPS |
| **OTHER** | PELICAN-67<br>PT. SUR-67 | ALPHA HELIX-36<br>GYRE-36<br>SPROUL-35<br>MOANA WAVE-34 | E. LINK-26<br>BLUEFIN-18<br>HENLOPEN-16 | ALL OTHER SHIPS |
| **INST** | NONE | S. JOHNSON-60<br>THOMPSON-50<br>GYRE-46<br>NEW HORIZON-37 | SPROUL-17<br>LAURENTIAN-16<br>LONGHORN-15 (?) | ALL OTHER SHIPS |

NOTES: VICKERS Two Year Average (1992 - 93)

# APPENDIX VI

Memo To: Dean Barry Raleigh 2/15/94 Fax # 956.9152
From: Brian Taylor, on behalf of SOEST Ship Users Exec. Cmte
Re: SWATH Ship Design Recommendations
(for blue ocean operations throughout the world)

| | |
|---|---|
| Accommodations | 35-40 persons in 2-person rooms |
| Science Lab Space | min. 3000 sq ft |
| Science Storage Space | min. 1000 sq ft |
| Open Deck Work Space | min. 5000 sq ft |
| Science Power | 2 ea @ 250 kW, 480 VAC, 60 Hz |
| Moon Pool | 15 ft x 20 ft (with retractable steel covers) |
| Endurance | 45 days fuel & food (20 steaming, 25 on station) |
| Range | 6000 nm |
| Working Speed | 0-12 kts (sea state 6 & 15-18 ft swell) |
| Cruising Speed | 14-16 kts (sea state 5) |
| Dynamic Positioning | 50-150 ft watch circle in 35 kt winds, 3 kt current |
| Payload | Total 150-200 long tons above deck level |
| Draft at Full Load | max. 18 ft |
| Ship Width | max. 80 ft |
| Configuration | Lower hulls and screws not to extend beyond deck |
| Special Features | Ability to sustain loads of 15 tons during seafloor sampling operations (from stern or moon pool) |

Ranges given above (other than for "working speed") indicate allowable variations in the ship performance. Diesel-electric generators, steerable bow thrusters, and a tandem strut hull configuration are likely design characteristics but are not assumed; there may be better options.

The ability to launch/recover instruments (sidescan sonar, AUV) within 6 ft of sea level (via hanger deck/ramp/reballasting?) would be an advantage but was not considered essential by all. Below deck deployment areas are desirable, both along the stern for towed systems and facing the moon pool for vertically deployed systems.

| | | Fax #'s |
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