Research Vessel Operator's Committee

Summary Report

of the

1990 Annual Meeting

Hosted by
Louisiana Universities Marine Consortium

Sessions held at the
Dauphine Orleans Hotel
New Orleans, Louisiana
9-11 October 1990

Contents:

MINUTES OF THE 1990 ANNUAL RVOC MEETING LOUISIANA UNIVERSITIES MARINE CONSORTIUM NEW ORLEANS, LOUISIANA 9-11 OCTOBER, 1990

WELCOMING REMARKS

The meeting was called to order by Chairperson Jim Williams, Marine Superintendent, Scripps Institution of Oceanography.

Steve Rabalais, Marine Superintendent, LUMCON, welcomed the RVOC to New Orleans and reviewed the calendar of planned social activities.

The meeting followed the Agenda outlined in Appendix I. Registered attendees are listed in Appendix II.

OLD BUSINESS

1989 MEETING MINUTES

A motion was made, seconded and passed to accept the minutes of the 1989 meeting.

RVOC NEWSLETTER

When queried about the present format and contents of the Newsletter, and as to whether it was serving a useful purpose, a majority of the membership responded in a positive way. Solicitations for input will continue to be posted on telemail. At least two Newsletters will be published during 1991.

COMMUNICATIONS GUIDE

Ken Palfrey reported that the Communications Guide has been updated and distributed for the second time. Operators should continue to provide Ken with updates or changes as they occur.

WIRE UPDATE

Don Moller briefed the meeting on future wire acquisitions which will replenish the inventory of "Pooled" oceanographic wires. By the end on November, 1990, the Pool will be augmented with 14 reels of .322 E-M wire and 6 reels of 3x19 trawl wire, to be split between East and West coast. Operators should continue to contact Don or Dick West, via telemail, for their wire needs. (See Appendix III).

Don noted that during the past 9 years, 129 reels of wire, totaling 1,100K meters in length and costing $2,623K, has been purchased for the Pool. He also pointed out that the performance specifications for the wire used throughout the UNOLS fleet are nearly 7 years old and that it appeared time for the users to update these specs to reflect their wire needs for the next 5-6 years. (See Appendix IV).

A discussion was held regarding wire longevity. Of general concern was the criteria used to determine when a length of wire should be retired. The criteria varied among institutions, but it was generally agreed that sheave size, the package being handled and frequency of wire use all play an important role in this determination. A recommendation was made for the RVOC to look at the wire longevity issue by soliciting and comparing wire logs (#casts, tension, wire out, wire in, etc.).

RVOC BYLAWS/MEMBERSHIP

A draft of updated RVOC Bylaws, prepared by Dean Letzring, with input from Jim Williams and Bruce Cornwall, was presented for discussion. Several changes were made to the Bylaws in this draft, most notably in the areas of membership and voting. These changes were made to bring the Bylaws more into line with the RVOC's role as a Committee under UNOLS.

The discussions yielded several minor amendments to the wording of the draft.

A motion was made, seconded and passed to accept the updated Bylaws as amended. (See Appendix V).

ALCOHOL/ZERO TOLERANCE: ONE YEAR LATER

Jim Williams summarized the progress he felt the fleet had made during the past year regarding alcohol use and the zero tolerance issue:

1. Our efforts, with the support of outgoing UNOLS Chair George Keller, has gotten the word to the scientific community about alcohol abuse in the fleet.
2. The meeting with U.S. Customs officials last year in Miami apparently has had some effect; they appear to be giving a more cursory exam to research vessels.

Bill Barbee, UNOLS Executive Secretary, lauded Jim Williams' efforts on behalf of the RVOC regarding the Zero Tolerance Issue.

SAFETY COMMITTEE REPORT

Bill Coste reported that the Safety Committee has approved the final draft of the RVOC Safety Training Manual for publication. Bill announced that he and Jack Bash would be stepping down from the committee. Mike Prince agreed to take over as Chairman for one year.

The members of the RVOC Safety Committee include:

Mike Prince, MLML (Chairman)
Ken Palfrey, OSU
Joe Coburn, WHOI
Don Newman, USC
Tom Smith, Alaska

Tim Askew, HBOI
Bruce Cornwall, CBI

On the recommendation of Bill Barbee, the RVOC formally commended Safety Committee Chair Bill Coste and the Committee members who were instrumental in bringing the RVOC Safety Training Manual to fruition:

Gene Almendinger, UNH
Jack Bash, URI
Joe Coburn, WHOI
Ken Palfrey, OSU
Mike Prince, MLML

FEDERAL REGISTER MONITOR

Bill Barbee reported that a UNOLS Office poll of the RVOC indicated a general satisfaction with the Federal Register clipping service currently provided by Ireland Consulting Services, Inc.

A recommendation was made, seconded and passed for Ireland Consulting Services, Inc. to continue to provide the Federal Register clipping service.

Ireland Consulting Services, Inc. provided an update for the meeting of some of the regulatory projects underway that are of particular interest to the RVOC. (See Appendix VI).

NEW BUSINESS

INSTRUCTIONS FOR PREPARATION OF PROPOSALS (BLUE BOOK) REVISION UPDATE

Dolly Dieter fielded questions on changes to the NSF proposal preparation guidelines as they related to the Ship Operations proposals.

AGENCY REPORTS

NATIONAL SCIENCE FOUNDATION

Dolly Dieter briefed the meeting regarding the budget problems NSF is experiencing as a result of the current federal budget uncertainty.

OFFICE OF NAVAL RESEARCH

ONR representative June Keller provided the following information:

1) AGOR 23, Thomas G. Thompson, has been launched.
2) Problems with cost overruns for Knorr/Melville refits.
3) Solicitation for operators of AGORs 24 & 25 will occur in the near future.

4) New area code for ONR: 703 vs 202.

UNOLS

Bill Barbee reported on UNOLS Office activities during the past year and raised two issues which he thought were of importance to the RVOC.

First, effective 1 May 1991 the UNOLS Office will be discontinued at the University of Washington and reestablished at the University of Rhode Island. Operations at the U. Washington Office will continue until about 1 August 1991.

Second, Bill strongly suggested that the 1992 UNOLS Ship Scheduling groups develop a straw man schedule that is cost effective and eliminates unnecessary transits, etc. He reiterated that the scheduling scheme used this year (for 1991) was essentially that of the funding agencies and that he felt that it should come from UNOLS.

The RVOC formally recognized Bill Barbee and applauded the support he has given to the RVOC during his tenure as UNOLS Executive Secretary.

NOAA

Capt. David Yeager reviewed NOAA vessel operations for the year. He also provided a summary of future initiatives for refits and new building to modernize and replace the aging NOAA fleet.

U.S STATE DEPARTMENT

In the absence of Tom Cocke, State Department representative, Jim Williams reported that during a recent UNOLS Council Meeting he learned that nearly 70% of the requests for foreign clearances were late. It was emphasized that this situation had to be corrected.

A recommendation was made for the RVOC to request that Gary Brass, newly elected UNOLS Chairman, send a letter to the scientific community emphasizing the urgent need for PI's to expedite the submittal of the required clearance information to the operator in a more timely fashion.

SPECIAL REPORTS

THOMAS G. THOMPSON

Bill Jeffers presented an update of construction progress on the Thompson during the past year, including slides showing the ship's launching and installation of the Z-drives. (See Appendix VII).

VICKERS

Don Newman provided an update, which included a slide presentation, of the conversion progress to date on the Vickers (ex-Osprey).

MAURICE EWING

Sam Gerard summarized the major improvements performed on the Ewing (ex-Bernier), which included modifications to the main deck labs, the addition of tie-down sockets and installation of a Becker articulated rudder. (See Appendix VIII).

RIDGELY WARFIELD

Bruce Cornwall reported on the status of the proposed Warfield re-engining and the transfer of the ship to the University of Maryland System.

NATHANIAL PALMER

Al Southerland, NSF Polar Programs, reviewed the construction progress, operational capabilities, and general characteristics of the Nathanial Palmer, NSF's new Research Vessel Ice Breaker (RVIB). (See Appendix IX).

WEATHERBIRD II

Harry Barnes provided a review of the modifications performed and future conversion activities planned for the BBS operated Weatherbird II. (See Appendix X).

DISCOVERY

Chris Adams, NERC Research Vessel Services, UK, reported that the major rebuild of RRS Discovery will be performed at a shipyard in Portugal. Chris summarized the work planned during the rebuild, which is scheduled to end during March, 1992. (See Appendix XI).

INSTITUTE OF OCEAN SCIENCES

Tony Fitch presented a brief look at IOS ship operations. He also announced his retirement and introduced his "relief", Dale Gibb.

OCEANOGRAPHER OF THE NAVY

Patrick Dennis briefed the meeting on the budget status of AGORS 24 and 25.

MOSS LANDING MARINE LAB

Mike Prince provided an update on the status of MLML as a result of the earthquake damage the lab suffered last year. He noted that MLML will not rebuild on the existing site and is currently looking for a new location inshore of it. In the interim, the lab will be located in Salinas.

INVITED SPEAKERS

USE OF FIBER OPTICS AT SEA

Don Moller, WHOI, addressed the construction and use of fiber optic cable in the oceanographic community. The needs of the scientist are driving the development of fiber optic technology, which at present is changing as rapidly as computer technology. These needs include:

1) A fiber optic cable with electric conductors of sufficient capacity to power packages with large thrusters, such as Jason/Argo.
2) To augment or replace coax, which has reached the threshold of its data transmission capability, a fiber optic cable with greater transmission rates.
3) Fiber optic cable for sonar.

In further discussion, Don compared the cost of fiber optic cable to conventional wires and described sheave, rotary joint and connector requirements.

TRACTION UNIT WINCH

Ivor Chivers began his presentation on a new design for a traction unit winch with a brief look at NERC and the Research Vessel Services (RVS), followed by a brief description of the fleet, which includes the research ships Charles Darwin, Discovery, Challenger and James Clark Ross.

Changes in package sizes and the need for efficient operations of research ships led to the need for new winches. After a review of the packages to be lowered, and the current inventory of wires and winch types, a decision was made to design a winch which could accommodate a range of wire sizes. The new design would replace the direct pull level wind winches with a traction type winch utilizing a "Cobra" principle for sheave placement.

The presentation concluded with a description of the winch design, control and monitoring systems. (See Appendix XII).

SAFETY SEMINAR

Bill Coste began the Safety Seminar by briefly outlining the committee's activities during the year. Discussions followed which focused on these activities, including the Safety Manual, a Safety and Orientation Video, and Safety Training Teams.

SAFETY MANUAL

Jack Bash briefed the meeting on final preparations for printing the RVOC Safety Manual, which should be ready to go to the printer by the end of October. No date has been set yet for final distribution.

SAFETY TRAINING VIDEOS

Ken Palfrey began a discussion which focused on producing an RVOC Safety and Orientation Video by briefly reviewing the pre-production, production and funding requirements necessary to produce one.

It was noted that the specifications (contents) for the video are the most important and must be developed first. Production could be done in house or by a consultant. The cost would be approximately $15k-$25K if done in house, as high as $50k if produced by a consultant. Funding to produce the video would most likely have to come in the form of a grant to an individual institution.

Mike Prince continued the discussion by reviewing a draft outline for the Safety and Orientation Video. The outline followed the contents of Chapter 1 of the RVOC Safety Training Manual. (See Appendix XIII).

The contents and merits of an orientation video were discussed at length. A recommendation was made for those operators who have pre-cruise safety talks (typically the script used by the mate) to submit these to the Safety Committee to assist them in the refinement of the contents of a video.

Bill Coste recommended that the Safety Committee continue with their efforts to produce a Safety and Orientation Video. This recommendation was endorsed by Bill Jeffers and Tom Smith.

SAFETY TRAINING

A brief discussion was held regarding safety training. It was suggested that the Safety Committee work towards a recommendation to the RVOC concerning the feasibility of developing a safety training program for the fleet.

DIVING: CHAPTER 15 OF THE UNOLS SAFETY STANDARDS

After some discussion, a motion was made, seconded and passed to accept Chapter 15 (pp.25-26) of the Final Report of The Workshop on Scientific Shipboard Diving Safety for inclusion in the UNOLS Research Vessel Safety Standards. A recommendation from the RVOC for acceptance by UNOLS will be forwarded to the UNOLS Council. (See Appendix XIV).

Jack Bash led a discussion concerning the recommendations contained in the Final Report of The Workshop on Scientific Shipboard Diving Safety. The report will also be submitted to the UNOLS Council for their review and action on the report's recommendations.

DIVING: AAUS INTERFACE

Jim Williams described the RVOC/AAUS relationship. In the past there has been no communications between the two groups. It was agreed that there should be more interaction between the two groups, such as cross representation at significant meetings.

LEGAL UPDATE

The membership heard comments from Dennis Nixon, URI, concerning several legal issues of interest. The issues included:

> On Diving: Based on statistics, Dennis felt that the courts would agree that recompression chambers were not necessary on UNOLS vessels, except under extraordinary circumstances (ie, extensive diving in a remote location).
>
> On Insurance Rates: Insurance rates appear to be softening, or going down, despite an increase in claims, a trend that was substantiated by several operators. Dennis expects rates to eventually go up, making insurance P&I clubs all the more alluring.

Other discussions were held regarding workman's compensation, umbrella policies and insuring divers.

WORKSHOPS

SMALL BOAT OPERATIONS

Tim Askew chaired a discussion which addressed the five questions posed in the Final Report of the Workshop on Shipboard Scientific Diving Safety, pp.32-35, "Small Boats and Small Boat Operators: Are There Adequate Rules and Guidelines for the Use of Small Boats Launched From Research Vessels?" (See Appendix XV).

After much debate, a panel was formed to accomplish three objectives concerning small boat operations:

1) Address the recommendations articulated in the Final Report of the Workshop on Shipboard Scientific Diving Safety and prepare a proposed RVOC response.
2) Assess the need for standard boat operator qualifications.
3) Review and promulgate the procedures used by the UNOLS institutions operating "marina-type" small boat facilities.

The panel members will include Tim Askew, HBOI; Wadsworth Owen, U. Del.; Steve Rabalais, LUMCON; Jim Williams, SIO; Dave McWilliams, OSU and Ron Hutchinson, Miami.

ROUND TABLE DISCUSSION

The following topics were addressed by Marine Superintendents during the round table discussion:

KEVLAR

Jack Bash briefed the membership on URI's experiences with the length of 5/8" Kevlar currently being used as the standard cable on Endeavor's deep sea winch. Though no deep casts have been made yet to put the cable to a real test, Jack reported that it has been used for a number of projects with good success, and that it is easy to handle.

MAS

The positive and negative aspects of the services MAS provides to the fleet were addressed.
In discussing the drug testing services MAS provides to some operators, a recommendation was made that MAS should provide indemnification for lawsuits that might occur as a result of their report of a positive test, regardless of the challenge. It was reported that Ron Scheible was recently named president of MAS and that he has expressed a desire to make the training services we seek more available than they are now.

MARPOL

A discussion was held concerning the requirements, under MARPOL, for waste management plans, placards and garbage logs. The carriage, use and disposal of hazardous wastes was also addressed.

ALCOHOL

Discussions were held regarding the use of alcohol fleet-wide and what, if any, progress had been made to curb its use, especially among the scientific community.

SMOKING

Several policies concerning smoking on board were described. The policies varied from no smoking at all inside the ship to "designated" smoking areas. Some of the smoking policies currently in effect appear to be extensions of campus policies or regulations.

AMENITIES TO SCIENTISTS IN PORT

Accounting for science costs such as agent, transportation and lodging fees in foreign ports was reported to be a problem. In most cases, the agent is asked to

break out the ship vs science costs, which is accomplished with varying degrees of success throughout the fleet.
The problem of accounting for the use of INMARSAT and other sources of communication by the scientific party, mostly for data transmission, was discussed. Further discussions were held regarding crew rest in port, sailing times, meals, departure/arrival times, lodging, etc.

ACCOMMODATING THE PHYSICALLY HANDICAPPED

A discussion was held concerning the impact of proposed regulations which may require some operators to accommodate the physically handicapped on board.

EMPLOYMENT DATABASE

Jack Bash mentioned that he intends to establish a data base of perspective seagoing employees at the UNOLS Office at URI.

NEW TECHNOLOGY

Communications

Don Gibson described the OmniTracs mobile communications system that has been in operation on Longhorn for about eight months. According to Don, this system provides two-way messaging within the LORAN C coverage areas of North America. Cost for hardware and software for IBM 286-386 is approximately $10k, not including computer.

Dual Axis Speed Logs

Jack Bash described the problems URI has had with Endeavor's Sperry speed log. Sam Gerard reported that Lamont was pleased with the Furuno CI-30 three axis doppler speed log on Maurice Ewing. A recommendation was made for the membership to exchange information regarding their experiences with doppler speed logs thru the RVOC Newsletter.

Navigation

The capabilities and cost estimates for an integrated navigation system which utilizes all available information (loran, GPS, speed, etc.) was briefly reviewed.

BUSINESS MEETING

1991 RVOC MEETING AGENDA TOPICS

The following topics were suggested for the 1991 meeting agenda:

Vessel Chartering
Salary Survey
Manning Levels
SAIL

Radio Communications Gear for the 90's
Winches/Wires for the Future
ABSTECH Inspections
Electronic Charting
Radars
Safety Statistics

1991 RVOC MEETING LOCATION

The membership voted to hold the 1991 meeting in Sidney, B.C., to be hosted by the Institute of Ocean Sciences. Dates to be determined.

ELECTION OF CHAIRMAN AND VICE CHAIRMAN

Jim Williams, SIO, was re-elected Chairman for another two-year term. Bruce Cornwall, CBI, has one year remaining as Vice-Chairman.

The meeting was adjourned at 1245 on Wednesday, October 11, 1990.

APPENDICES

RESEARCH VESSEL OPERATOR'S COMMITTEE
1990 ANNUAL MEETING
LOUISIANA UNIVERSITIES MARINE CONSORTIUM

AGENDA

0830, TUESDAY, 9 OCTOBER 1990

REGISTRATION AND COFFEE

WELCOMING REMARKS

Introduction
- Steve Rabalais, Marine Superintendent, LUMCON
- Dr. Michael Dagg, Interim Executive Director, LUMCON
- Jim Williams, Chairman, RVOC

OLD BUSINESS

- Minutes of the 1989 Meeting - Jim Williams
- RVOC Newsletter - Bruce Cornwall
- Communications Guide - Ken Palfrey
- Wire Update - Don Moller
- RVOC Charter/Membership - Dean Letzring
- Alcohol/Zero Tolerance: One Year Later - Jim Williams
- Safety Committee Report - Bill Coste
- Federal Register Monitor - Bill Barbee

NEW BUSINESS

- Instructions for Preparation of Proposals (Blue Book) - Dolly Dieter

AGENCY REPORTS

- National Science Foundation - Dolly Dieter
- Office of Naval Research - June Keller
- UNOLS - Bill Barbee
- NOAA - Captain Yeager
- U.S. State Department - Tom Cocke

SPECIAL REPORTS

- THOMAS G. THOMPSON - Bill Jeffers
- VICKERS - Don Newman
- MAURICE EWING - Sam Gerard
- KNORR/MELVILLE - Joe Coburn
- RIDGELY WARFIELD- Bruce Cornwall
- WEATHERBIRD II - Harry Barnes
- NATHANIAL PALMER - Al Southerland

0830 WEDNESDAY, 10 OCTOBER 1990

INVITED SPEAKERS

- Use of Fiber Optics at Sea - Don Moller (WHOI)
- New Design, Traction Unit Winch - Ivor Chivers (NERC)

SAFETY SEMINAR

- Safety Manual - Bill Coste
- Safety Training/Videos - Bill Coste
- Diving: Chapter 15 of the UNOLS Safety Standards - Jack Bash
  AAUS Interface
- Legal Update - Dennis Nixon

WORKSHOPS

- Vessel Chartering - Joe Coburn
- Small Boat Operations - Tim Askew

0830 THURSDAY, 11 OCTOBER 1990

ROUND TABLE DISCUSSION

- Alcohol
- Drug Testing
- Smoking
- Amenities to Scientists in Port
- New Technology:
    * Communication
    * Navigation
    * Dual Axis Speed Logs
- Accommodating the Physically Handicapped

BUSINESS MEETING

- Election of Chairman and Vice Chairman
- 1991 RVOC Meeting Agenda Topics
- 1991 RVOC Meeting Location

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Office Memorandum

WOODS HOLE OCEANOGRAPHIC INSTITUTION
Operations Office (508) 457-2000 [x2277]

From: Don Moller

Date: 5 October 1990

To: UNOLS Dir. of Operations / Marine Superintendents

Subject: Oceanographic Cable Pools

The following is the current inventory of "Pooled" Oceanographic Cables. The cables are available to the UNOLS research vessel operators to be drawn upon in emergencies or in special cases where use of normal proposal and procurement procedures are not possible.

Cables are stockpiled in Woods Hole and at MarFac in San Diego. Distribution is authorized by Dr. Richard West of NSF.

The Pools will be augmented with 14 reels of .322" E-M by the end of October and with 6 reels of 3x19 trawl wire by the end of November..

For further information please contact Don Moller at Woods Hole.
Telephone: (508) 457-2000 X2277
Facsimile: (508) 457-2185
Telemail: D.MOLLER

OCEANOGRAPHIC CABLE POOLS

INVENTORY - 5 OCTOBER 1990

Type	ID	Size	length	Design	Manuf	Weight	Reel *	Location
EM	85-C14	.225"	25,200	A01077	Rochester	?	Q0527-C1-1	W.C.P.
EM	85-C17	.225"	25,200	A01077	Rochester	?	Q0527-C2-1	W.C.P.
EM	82-C1	.303"	27,665	3-H-305	Rochester	4,445*	E2793-C2-1	E.C.P.
Hydro	84-H3	3/16"	30,000	3X19,AA	U.S.Steel	1,820*	24493	E.C.P.
Hydro	86-H10	3/16"	30,000	3X19,AA	Macwhyte	2,200*	F0592	W.C.P.
Hydro	85-H4	1/4"	30,000	3X19,AA	Macwhyte	3,375*	6268921	E.C.P.
Hydro	86-H7	1/4"	30,000	3X19,AA	Macwhyte	3,600*	E2204	W.C.P.
Hydro	86-H8	1/4"	30,000	3X19,AA	Macwhyte	3,600*	E2028	E.C.P.
Hydro	86-H12	1/4"	25,000	3X19,AA	Macwhyte	3,000*	97-13621	E.C.P.
Hydro	86-H13	1/4"	25,000	3X19,AA	Macwhyte	3,000*	97-13611	E.C.P.
Trawl	85-T3	1/2"	26,000	3X19,AA	Macwhyte	11,125*	D-8362	E.C.P.
Trawl	86-T5	1/2"	30,000	3X19,AA	Macwhyte	13,120*	E9793	W.C.P.
Trawl	86-T7	9/16"	45,000	3X19,AA	Macwhyte	23,200*	F0372	W.C.P.

OCEANOGRAPHIC CABLE POOLS
SUMMARY
(1982 - 1990)

Type	Size	# Reels	Km	Cost (K$)
COAX	.68"	9	74	$580
EM	.225"	18	139	133
EM	.303"	5	40	92
EM	.322"	39	365	646
Hydro	3/16"	9	83	73
Hydro	1/4"	20	180	258
Trawl	1/2"	20	182	461
Trawl	9/16"	9	111	383
	TOTALS	129	1,100	$2,623

BYLAWS OF THE

RESEARCH VESSEL OPERATOR'S COMMITTEE

A. PURPOSE

1. The purpose of the Research Vessel Operator's Committee shall be to promote cooperation among marine science research and educational institutions and to represent their interests in the areas of marine operation, marine safety, governmental regulations, labor regulations, labor relations, and public relations as those affect their research fleets.

B. MEMBERSHIP

2. Membership in the RVOC shall be based on representation from UNOLS Operator Institutions. Membership shall also be open to all UNOLS institutions, or non-UNOLS institutions who operate research vessels for purposes similar to UNOLS.

C. REPRESENTATION

1. Each UNOLS Operator Institution shall designate a representative to RVOC. Institutions other than operators may designate a representative as necessary. All member institutions shall be entitled to send as many individuals as desired to the Annual Meeting.

2. Each member institution shall be notified of the Annual Meeting by the Vice Chairperson of the Committee at least one month prior to the Annual Meeting.

3. UNOLS Operator Institutions shall be entitled one vote on matters at the Annual Meeting. In extraordinary circumstances, matters may be submitted for vote by the Chairperson at times other than the Annual Meeting. These matters will be voted on by mail or electronic mail. Matters voted on will be decided by a simple majority of UNOLS Operator Institutions casting votes. Two-thirds of the UNOLS Operator Institutions must be represented to establish a quorum.

4. A UNOLS Operator Institution which is temporarily without a vessel due to replacement through construction, new acquisition, major refit, or in lay up, may continue to have a voting representative on the RVOC, as long as that institution is actively engaged in resuming operational status.

D. OFFICERS

1. The Research Vessel Operator's Committee shall have a Chairperson and Vice Chairperson. The Chairperson and Vice Chairperson will be elected by a majority vote at the Annual Meeting for a two year term. Date of office shall commence at the close of the Annual Meeting. The Chairperson and Vice Chairperson shall be elected in alternate years.

2. The Chairperson shall represent the Committee in all matters stipulated in the purpose of these bylaws and in all matters deemed necessary in the interest of the Committee. The Chairperson shall implement the programs enumerated by the Committee and shall conduct the Annual Meeting and whatever special meetings are deemed necessary by the Chairperson or the members.

3. The Vice Chairperson shall be responsible for recording the business of the Committee and for dissemination of information through a newsletter or other media as stipulated in these bylaws to all members of the Committee.

4. If the Chairperson or Vice Chairperson are unable to fulfill their duties of office, the Chairperson shall appoint a successor to act with authority until the succeeding Annual Meeting.

E. WORKING GROUPS AND PANELS

1. Upon the recommendation of the Chairperson, and with a majority vote of the Committee at the Annual Meeting, various working groups and panels, as necessary to the work of the Committee, may be constituted. The duration of action of such working groups and panels shall be stipulated at the time of inception.

2. Special working groups or panels may be established if required between the Annual Meetings, but they must be confirmed by vote.

F. ANNUAL MEETING AND OTHER MEETINGS

1. A general meeting of the Committee shall be held at least once yearly. The Chairperson shall preside over this Annual Meeting. The business of this meeting shall encompass reports of any active working groups and panels, and discussions of projects and actions of the Committee. Speakers from the marine community may also be included on the agenda. Workshops for projects of general concern are encouraged.

2. Passage of projects and actions shall be by vote, in accordance with the voting procedures set forth in Section C, REPRESENTATION, paragraph 3.

3. The various working groups and panels shall each meet at least once yearly, at the Annual Meeting.

G. FINANCES

1. UNOLS will provide limited funding for the Committee to include the following:

   a. Travel expenses for the Chairperson and Vice Chairperson to RVOC Meetings.
   b. Travel expenses for the Chairperson to attend UNOLS Meetings.
   c. Meeting facilities, when required.
   d. Travel and meeting expenses for panels, workshops or the Annual Meeting when appropriate.

Approved and adopted at the RVOC Meeting in New Orleans, Louisiana on 9 October 90.

IRELAND CONSULTING SERVICES, INC.
58 Northbriar Drive
North Kingstown, Rhode Island 02852

Marine Operations and Safety

Captain George F. Ireland
(401) 885-2822
(401) 885-3678

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RVOC ANNUAL MEETING

Regulatory Update

{5 October 1990}

The following is an update of some regulatory projects underway that are of particular interest to operators of U.S. flag Oceanographic Research Vessels.

RANDOM CHEMICAL DRUG TESTING

The requirement for random testing was suspended by the Coast Guard per Federal District Court of the District of Columbia order of 18 December 1989. The court stated that application for random testing was too broad. This was published in the Federal Register of 26 December 1989. Requirements for pre-employment, periodic, post accident and reasonable cause testing were not affected.

In response to the court order, the Coast Guard issued new proposed standards for Random Chemical Drug Testing in a notice of proposed rulemaking published in the Federal Register of 27 July 1990.

Application of the proposed rules is to persons "... performing vessel navigation or vessel operation duties as defined ..." In the preamble to the proposed rule the Coast Guard explains that "... crewmembers assigned to perform these emergency duties should be subject to random drug testing, even if their routine shipboard duties do not affect the safe operation and navigation of the vessel". Therefore, a cook aboard an OSV assigned a specific responsibility for an emergency evolution will be subject to random drug testing. A cook {or other crewmember having a position not affecting navigation or operation of the vessel} not assigned a SPECIFIC responsibility for an emergency evolution probably will not be subject to random drug testing.

RVOC Annual Meeting
Regulatory Update

Captain Barton, the project officer, related to me this week that the Coast Guard expects to have final rules published by 1 November of this year. The final rules would become effective 30 days after publication in the Federal Register. This means that the original implementation date of 21 December 1990 for random testing would remain the same.

The final rules regarding random chemical drug testing will be virtually the same as the proposed rules of 27 July 1990.

LIFESAVING EQUIPMENT

Proposed rules for lifesaving equipment were published in the Federal Register on 21 April 1989. Consisting of almost 100 pages this proposal contains requirements to upgrade equipment, implement SOLAS standards and consolidate regulations.

Many of the proposed regulations contained implementation dates of 1 July 1991. Among others, there is a proposal that vessels in ocean, coastwise or Great Lakes service be fitted with gravity davits and a winch. This would affect some UNOLS vessels.

The 1 July 1991 date will slip for standards that are not driven by the SOLAS Convention. Upgrading of lifeboat davits is not driven by SOLAS. The proposed requirement for rail openings to facilitate launching of inflatable liferafts is driven by SOLAS. Other SOLAS requirements, such as immersion suits, life jacket lights, etc. have already been incorporated into U.S. regulations.

The Coast Guard is reviewing comments from the April 1989 proposal and expects to issue final rules this December/January. Part of the project may be reissued as proposed rules in response to industry sectors {such as the offshore industry} that want to keep lifesaving standards published with other regulations applicable to their vessels rather than have them in a separate section.

RVOC Annual Meeting
Regulatory Update

ANNEX V TO THE MARPOL CONVENTION

This annex to the convention deals with plastics, garbage, etc.

Interim final rules were published in the Federal Register on 2 May 1990. These regulations require that ships have a Waste Management Plan and that placards be posted, became effective on 31 July 1990.

The Waste Management Plan regulations apply to most oceangoing ships of 40' or more in length.

Placarding requirements apply to vessels of 26' or more in length.

The most recent RVOC Newsletter contains information on where to get placards.

TONNAGE CONVENTION

Existing ships {except for Great Lakes vessels} must be measured according to the new standards by 19 July 1994.

Existing ships may keep 'old' tonnage values for purposes of application of regulatory requirements after assignment of 'new' tonnage values.

Vessels having modifications accomplished after 1994 that substantially affect the value of gross tonnage will then be measured ONLY by the new system. A shift to the new tonnage measurement system at that time may have an economic impact.

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM {GMDSS}

This is being implemented as an amendment to the SOLAS Convention. It implements satellite communication safety standards while phasing out radiotelegraphy.

The standards enter into force on 1 February 1992 with final implementation by 1 February 1999.

Elements of GMDSS are:

- Satellite Communications equipment
- Digital Selective Calling
- Navtex
- EPIRB's
- Radar Transponders {for survival craft}

Application of the standards is somewhat dependent upon the distance offshore and areas traversed by ships.

SOLAS standards require Navtex and EPIRBs to be on board by 1 August 1993.

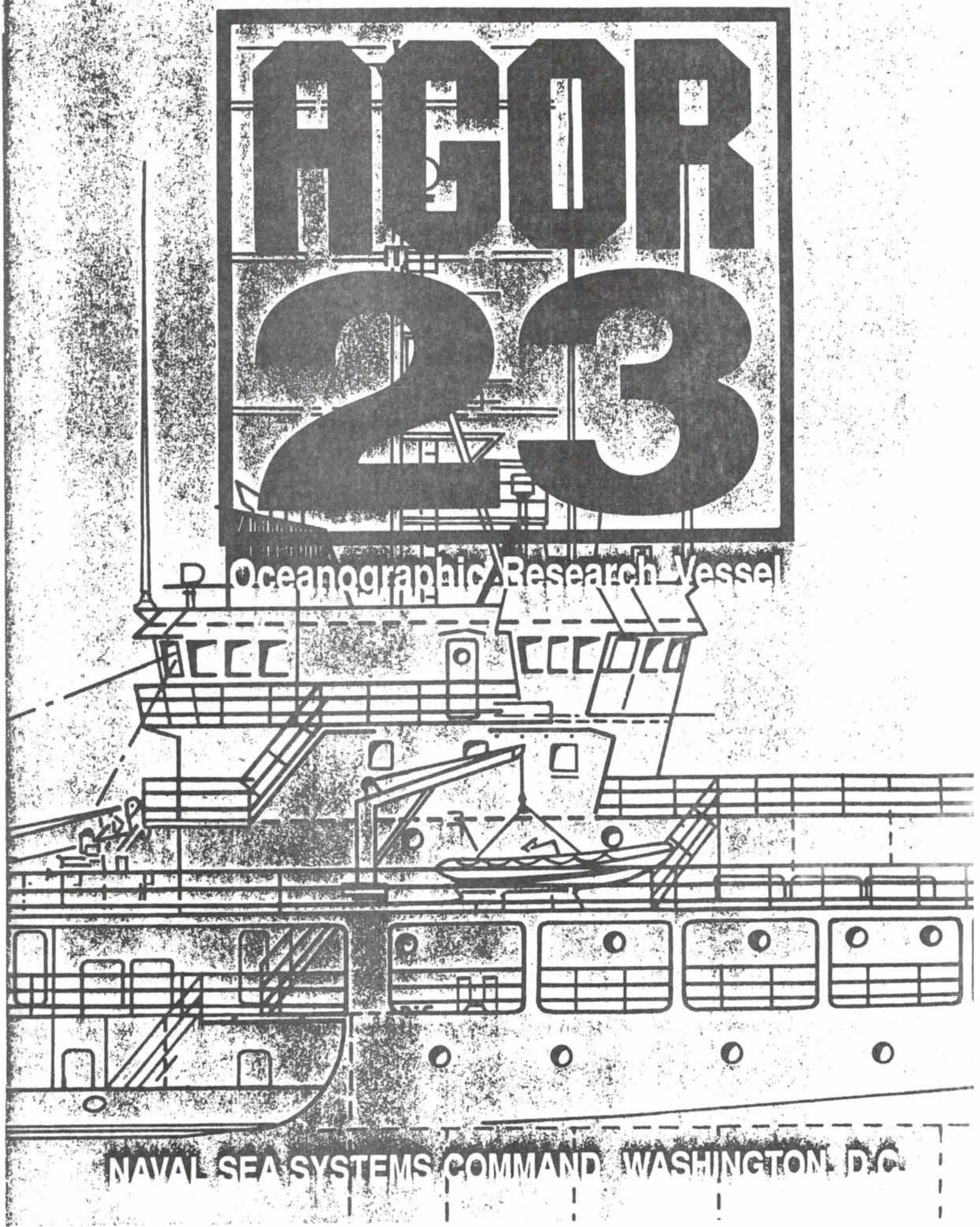
The proposed lifesaving regulations take into account some of these SOLAS standards.

ON THE HORIZON

There will be an International Conference {which becomes an International Convention when approved by member nations} on International CO-Operation on Oil Pollution Preparedness and Response at IMO from 19 - 30 November 1990.

The purpose of this Conference is to provide mechanisms to facilitate sharing of information and resources among countries during an oil spill response.

An item of particular interest to ship operators is provision for a Shipboard Oil Spill Response Plan. This will probably come about as an amendment to the MARPOL Convention rather than being a part of the November conference. In any case it will be some time before this may be required. Scope of applicability is undecided but could be for each ship required to have a MARPOL Certificate.


AGOR
23
Oceanographic Research Vessel
NAVAL SEA SYSTEMS COMMAND WASHINGTON D.C.

Introduction

The mission of AGOR 23 is to operate as a general purpose oceanographic research vessel in coastal and deep ocean areas in all seasons. Typical scientific missions include physical, chemical and biological oceanography, multi-discipline environmental investigations, ocean engineering, marine acoustics, marine geology and geophysics, and survey tasks such as bathymetry, gravimetry and magnetometry.

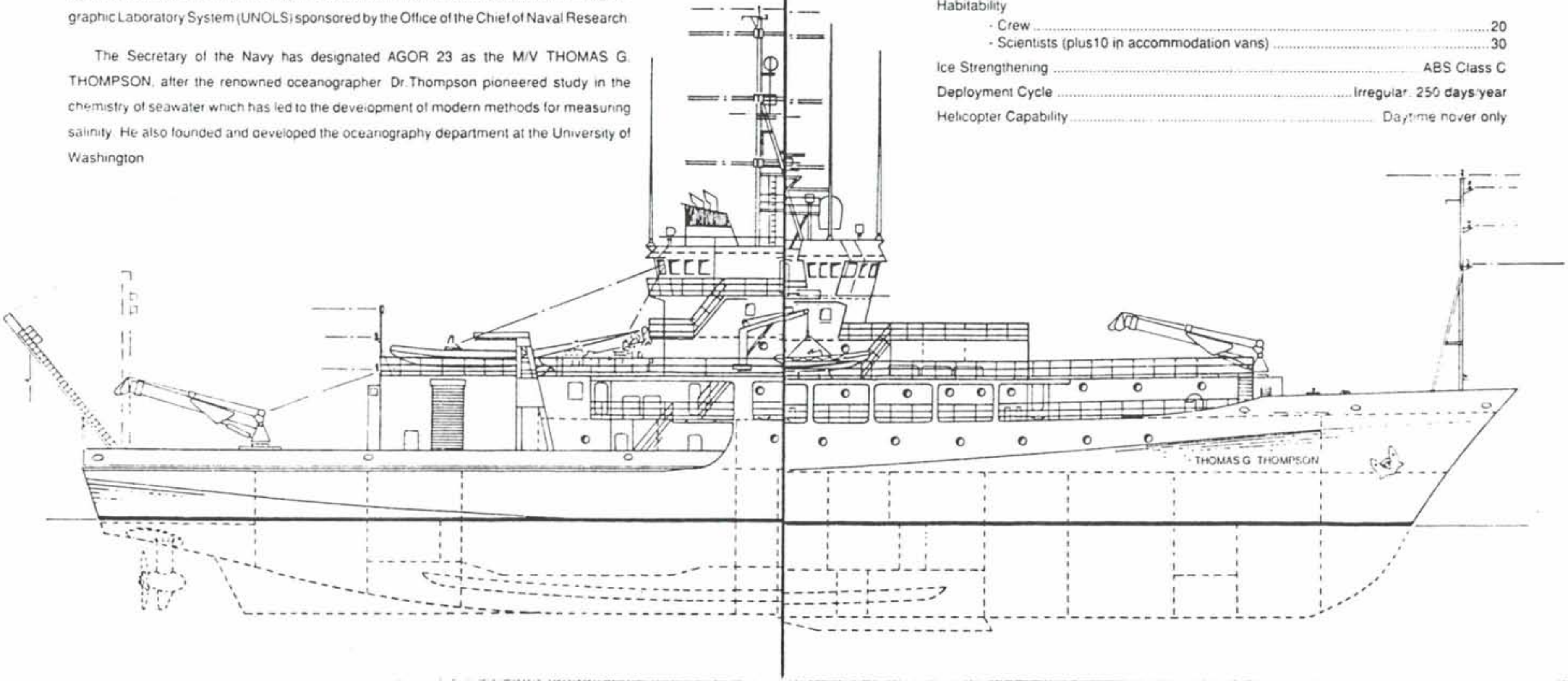
AGOR 23 has greater endurance, higher speeds and better seakeeping capability than [illegible]. These enhancements, as well as modern navigation and communications capability, sensors and computers, ship control equipment, and [illegible] laboratory spaces and support systems, enable the ship to perform a broad range of functions year round, and worldwide.

AGOR 23 is designed and constructed to commercial standards, and complies with American Bureau of Shipping and U.S. Coast Guard regulations. On delivery, AGOR 23 will be bailed to the University of Washington for operation under the University National Oceanographic Laboratory System (UNOLS) sponsored by the Office of the Chief of Naval Research.

The Secretary of the Navy has designated AGOR 23 as the M/V THOMAS G. THOMPSON, after the renowned oceanographer. Dr. Thompson pioneered study in the chemistry of seawater which has led to the development of modern methods for measuring salinity. He also founded and developed the oceanography department at the University of Washington.

Principal Characteristics

Length Overall	[illegible]
Breadth	52.5 ft
Depth to Main Deck	26.5 ft
Draft	16.5 ft
Speed (Transit)	15.0 kts
Endurance at 12 kts (plus 29 days at 3 kts with 10% fuel reserve)	12,000 nmi
Displacement (Full Load)	3,250 T
Lightship Weight	[illegible]
Propulsion - Diesel Electric	[illegible] hp
Propellers - Fixed Pitch on Z drives (2)	180 rpm
Bow Thruster - Azimuthing Jet Type (1)	1,180 hp
Seakeeping	
- Significant Wave Height 12 ft	15.0 kts
- Significant Wave Height 14 ft	10.0 kts
Habitability	
- Crew	20
- Scientists (plus 10 in accommodation vans)	30
Ice Strengthening	ABS Class C
Deployment Cycle	Irregular, 250 days/year
Helicopter Capability	Daytime hover only



Mission Systems

Sonar Acoustic Systems

Hull-mounted, deep sea, Krupp Atlas Elektronik (KAE) Hydro Sweep DS, swath type multibeam sonar system, 15.5 kHz, 237 db source level, with a range of 10 to 10,000 + meters at 12 kts.

Hull-mounted, Raytheon Sub-Bottom Profiler Systems, 3.5 and 12 kHz.

Hull-mounted, R.D. Instruments Acoustic Doppler Current Profiler, 150 kHz.

The ship's hull is shaped to minimize hull induced flow noise and bubble sweep down effect on hull mounted acoustic systems. Machinery systems are designed, and installed to achieve maximum noise reduction. All laboratories and interior scientific spaces are sound insulated.

Cranes

Two fixed foundation cranes with telescopic boom located aft, heavy lift, 65 ft (max) reach, 30.5 T (max) lift. One fixed foundation crane with telescopic boom located forward, 50 ft (max) reach, 2 T (max) lift. One portable crane with double telescopic, foldable boom stored aft, 34 ft (max) reach, 2 T (max) lift.

Winches

One research winch, electric double drum waterfall, 150 hp, DESH 9-11-WF. Drum capacity is 10,000 meters of 0.68 inch dia. coaxial cable on one drum, and 10,000 meters of 9/16 inch dia. wire rope on the other. A digital readout system displays line speed, tension, and amount of line out in the Aft Control Station and the Main Laboratory.

Two tow winches, electric single drum, 60 hp, DESH 5. Drum capacity is 10,000 meters of 0.25 inch dia. wire rope, or 10,000 meters of 0.322 inch dia. EM cable (spare drum).

A/J-Frames

One hydraulic A-Frame extends 13 ft outboard and 9 ft inboard with 12 T (max) static lift. A 125 hp motor drives a variable-volume hydraulic pump rated at 132 gpm (max), 77 gpm (at 2500 psi).

One hydraulic J-Frame with 8 ft reach, and 12 T (max) static lift.

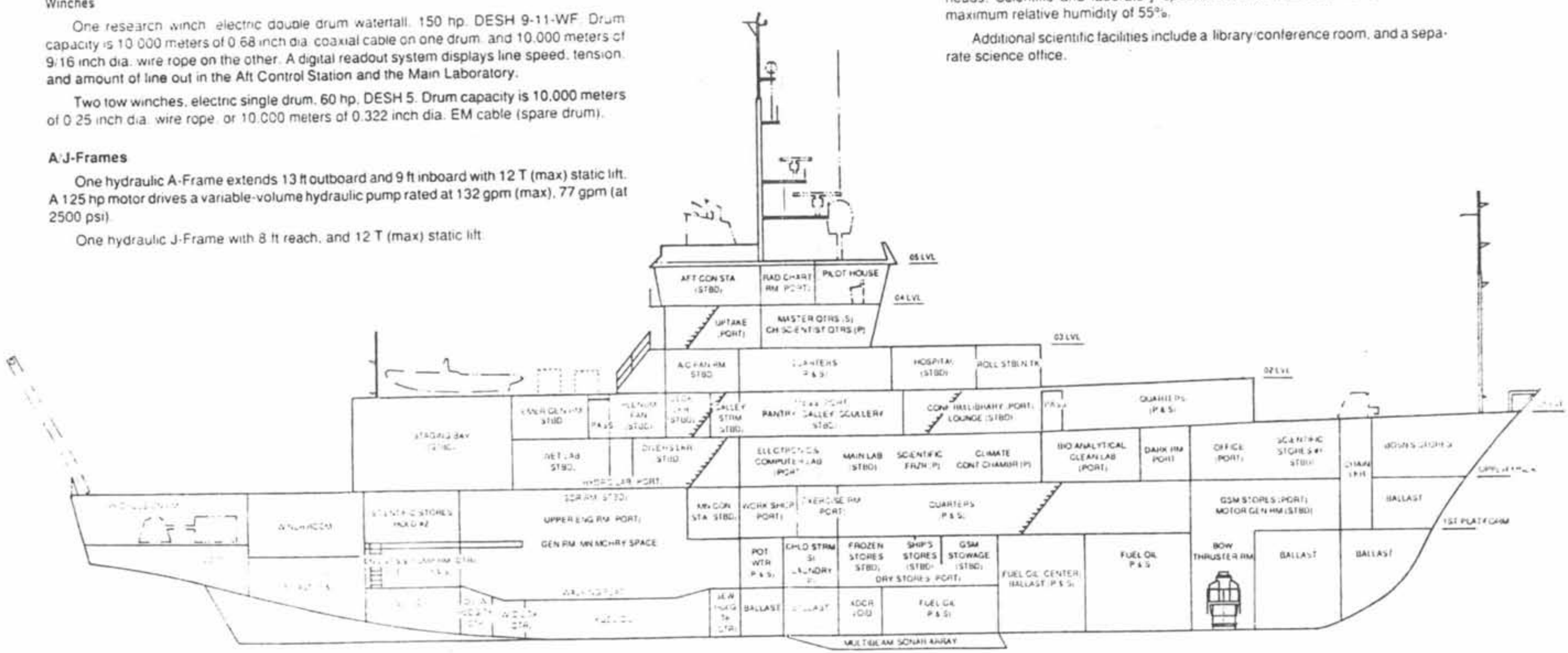
Laboratories

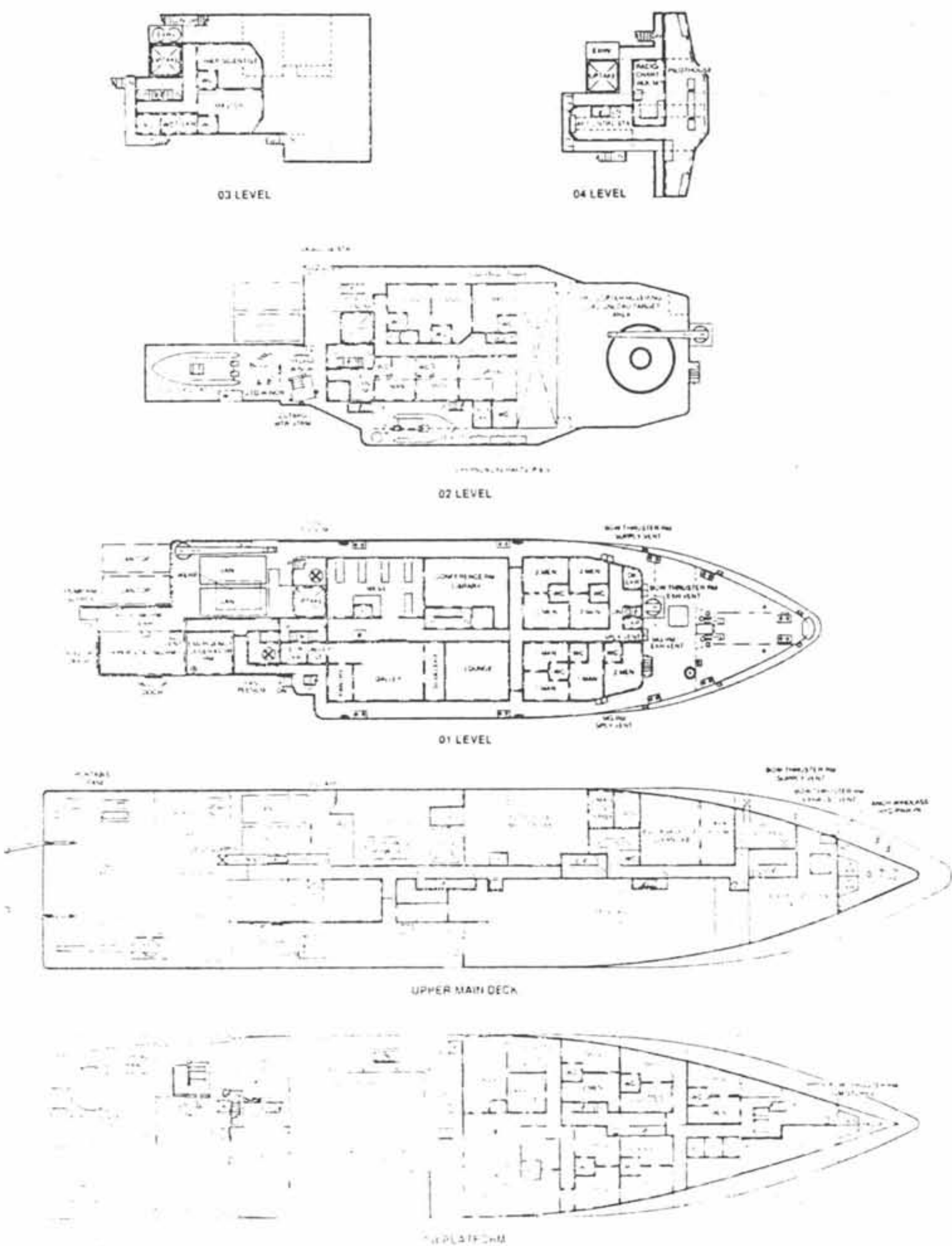
Over 4000 sq ft of laboratory space includes:

- Main Lab Area (1730 sq ft), Hydro Lab (700 sq ft), and Wet Lab (230 sq ft), all located adjacent to sampling areas
- An enclosed Staging Bay (330 sq ft) adjacent to the working deck and the Hydro Lab
- Bio-Chemical Analytical Lab (330 sq ft)
- Electronics Computer Lab (720 sq ft)
- Darkroom (150 sq ft)
- Climate-Controlled Chamber (90 sq ft)
- Freezer (80 sq ft)
- Space adjacent to the lab areas for the handling and storage of hazardous material.

The laboratory spaces are designed to facilitate rapid rearrangement, via flush-deck boltdown fittings and the use of unistruts on overheads and bulkheads. Scientific and laboratory spaces are maintained at 70-75 °F with a maximum relative humidity of 55%.

Additional scientific facilities include a library/conference room, and a separate science office.





Ship Features

Ship Control

AGOR 23 can launch and recover scientific equipment and conduct routine oceanographic operations in seas with significant wave height (SWH) of 12 ft as well as perform limited operations in seas with SWH of 14 ft. Ship Control equipment and spaces include:

- Dynamic Positioning System (DPS) provides automated precision track-line and station keeping capability. The DPS uses data input from a Global Positioning System (GPS), an acoustic vertical reference system, the gyro-compass, and a wind sensor system, to control the ship.
- The Pilot House, Aft Control Station (ACS) and Main Lab can independently control ship speed, and ship steerage by directing the main propulsion Z-Drives and the bow thruster. The ACS faces aft with a clear view of the A and J frames and most of the working deck.
- Enclosed bridge wings are fitted with gyro repeaters, rudder angle indicators, shaft RPM indicators, and throttle, steering, and maneuvering controls.

The ship can maintain position within a 300 ft radius at best heading and maintain track-line within plus or minus 300 ft at 2.5 kts forward speed. AGOR 23 can tow large scientific packages and vehicles (10,000 lbs tension at 5 kts, and 20,000 lbs tension at 2.5 kts).

Propulsion Electrical Systems

AGOR 23 has a diesel electric propulsion system. Twin, omni-directional Z-Drives and a bow thruster provide necessary maneuverability to meet operational station keeping requirements. Continuous, variable control of ship speed can be maintained up to maximum speed. Machinery spaces normally operate unattended. Propulsion and auxiliary machinery systems are monitored and controlled from the air-conditioned Machinery Control Room.

The power generating system is configured for maximum flexibility. Three 715 kW and three 1500 kW diesel generators are integrated to provide power to the propulsion and ship service electrical systems. Clean power to laboratories is provided from the ship service electrical system through motor generator sets.

Accommodations Habitability

AGOR 23 accommodates a total of 20 officers and crew and 30 scientists. There are 10 single staterooms (8 officer, 2 scientist), and 20 double staterooms (6 crew, 14 scientist/technician). There is space for two deck vans that can accommodate as many as 10 additional persons. Officers, crew and scientists enjoy common messing, lounge, recreation, and training facilities. The ship has a hospital space, and a self-service laundry.

Deck Arrangements

3500 sq ft of working deck space (4.5 ft above the waterline) includes a 12 ft x 100 ft deck edge area on the starboard side. The ship accommodates four standard laboratory vans: 2 on the Main Deck and 2 on the 01 Level, which have direct access to the ship's interior.

Lamont-Doherty Geological Observatory

DESCRIPTION OF VESSEL AND STANDARD EQUIPMENT
R/V Maurice Ewing(X - R/V Bernier)

BUILT: 1983
LENGTH: (LOA) 70.20 m
BEAM: (EXTREME) 14.10 m
DRAFT: (MAX) 5.3 m
GROSS TONNAGE: 1978
DISPLACEMENT: 2666
CREW: 20
SCIENTIFIC PERSONNEL: 30
FULLY AIR CONDITIONED
CALL LETTERS: WLDZ
SCIENTIFIC STORAGE: 5,000 cu. ft.

SPEED, CRUISING: 12 knots
SPEED, FULL: 13.5 knots
SPEED, WORKING: 0-12 knots
ENDURANCE: 60 days
RANGE: 17,000 Nautical miles
FUEL CAPACITY: 500 tons(98%)
LABORATORY (sq. ft.) :
INSTRUMENT: 1400 DRY LAB: 550
ANALYTICAL: 225 CTD SAMPLING: 380
VEHICLE STAGING: 320
DARK RM.: 60 OFFICE: 90

MAIN ENGINES:

Main Ship Power	4 Diesel generator sets, each rated at 1000 kW at 600 Vac, 3 phase, 60 Hz.
Main Generating Diesels	4 Burmeister and Wain Holeby Diesel generating sets, type 6S28LH-4.
Propulsion Motors 4 GE	model 752 Dc motors rated at 800 HP each.
Gear Box	Lohmann Stolterforth 4 input, single output ratio = 6.06:1 Model GvA 1120.B/SO.
Bow Thruster	CGE DC motor. rated at 378 kW.
MARINE SANITATION SYSTEM:	OMNIPURE Model 12M
PROPELLER:	Single screw, 5 blade with a Kort nozzle
RUDDER:	Becker articulated rudder
OWNERSHIP:	Title held by the trustees of Columbia University in the City of New York.
OPERATED BY:	Lamont-Doherty Geological Observatory of Columbia University
CLASSIFICATION:	ABS, A1 Ice Strengthening

Background: R/V MAURICE EWING was built at Marine Industries Limitee shipyard in Sorel, Quebec and delivered to the original owners, Petro-Canada Resources, in August 1983. From the time of its delivery the vessel was chartered to and operated exclusively by Sonics Exploration Ltd. of Calgary. Under their operation the vessel successfully conducted geophysical surveys throughout the world oceans including sub-arctic seas.

R/V MAURICE EWING was designed by the firm of Evans, Yaetman and Endal of Dartmouth, N.S. as a state-of-the-art geophysical survey vessel with special provisions for high-latitude ice navigation.

PROPULSION AND POWER MANAGEMENT: The R/V MAURICE EWING is equipped with AC/DC diesel electric propulsion. Four 1000 kW B&W diesel generators provide 600 volt A.C. electrical power which is converted to D.C. by a Ross Hill S.C.R. system. The main propulsion, bow thruster and seismic compressors are all driven by D.C. motors with infinite speed control. Hotel services are handled by step down transformers. Where required the power is conditioned by regulating transformers and motor generator plants to provide clean power to all scientific work areas.

SHIP"S SERVICE ELECTRICAL POWER: 110 KVA of clean single phase clean power is distributed through the scientific work areas. This is provided by a combination of regulated isolation transformers, Motor Generator sets, and UPS power supplies.

40 KVA motor generator set
5 KVA UPS system
45 KVA SOLA regulated isolation transformer 115 vac single phase(60 Hz)
10 KVA SOLA regulated isolation transformer 220 vac single phase(60 Hz)

Additional 440 vac 3 phase power is distributed to all scientific work areas, 20' container mounting sights, plus various remote deck locations to support a portable welding unit.

FRESH WATER: Water distillation - 2 evaporator type and 1 reverse osmosis water maker. This system is capable of producing 18 tons/day of potable water.

NAVIGATION EQUIPMENT:

2 - ARMA BROWN MK-10 gyro compasses, stepper output.
1 - SPERRY MK37 gyro compass, stepper and syncro outputs.
2 - MAGNAVOX MX1107 transit satellite recievers with automatic speed, heading and DR position indicators with remote CRT displays.
2 - MAGNAVOX GPS T-SET recievers with dual satellite software capability and remote CRT displays.
1 - NORTHSTAR 6000 Loran C with lat/long. readout and steer computed L.O.P..
1 - INTERNAV LC-408 Loran C dual chain, hyperbolic/Rho-Rho receiver with full navigation package.
1 - SPERRY SRD 301B Speed Log
1 - FURUNO CI-30 three axis Doppler speed log and current profiler.
1 - FURUNO FR-12625-7, 10 cm radar
1 - SPERRY MARK 340, 3 cm radar with collision avoidance system.
2 - SIMRAD ND-2 automatic direction finders
2 - HEWLLET-PACKARD Rubidium frequency standards
1 - HONEYWELL Elac echograph depth recorder(0-1000 m)
1 - Integrating navigation/display system based on Masscomp 5400 and 5550 computers, with appropriate displays of logged data.

COMMUNICATIONS:

1 - MOTOROLA Micor-Compaq Satellite Communications System with digital coder/decoder(PCM modem), ATS-3 system.
1 - RAYTHEON RAY-150 SSB transceiver, 150 watts.
1 - SEA 222, SSB transciever, 150 watts.
1 - SAILOR R1119 MF/HF & SITOR system, 400 watts.
1 - SIMRAD RW105 2182 watch receiver.
1 - ITT MACKAY 2012C 500 kHz xmtr.

1 - ITT MACKAY 2017A MF emergency xmtr.
1 - ITT MACKAY 5003C Model 2A autoalarm recvr.
1 - ITT MACKAY MSR 5050A MF/HF recvr.
1 - ALDEN Marinfax TR IV facsimile rcvr. w/ NAVTEX
1 - MAGNAVOX MX211A INMARSAT transceiver w/ Qwint MSR-742 terminal.
1 - SAILOR RT2048 VHF transceiver
1 - SAILOR RT144C VHF transceiver
1 - RAYTHEON RAY77 VHF transceiver
1 - RAYTHEON RAY33 VHF transceiver
7 - STANDARD & MOTOROLA handheld transceivers
3 - ACR RLB-14 EPIRB transmitters.
1 - Radar X-band transponder.
1 - CYBERNET CB transceiver (40 channel)

OCEANOGRAPHIC DECK EQUIPMENT:

1 - Multipurpose (LDGO-LEBUS design) core/trawl/deep tow winch with 9000 m of 9/16" dia. 6 X 19 wire rope or .680 dia. electro-mechanical cable. Powered by a 200 HP electro-hydraulic power pack through a dual speed McTaggard Scott motor(0-90 m/min & 0->150 m/min). The winch is equipped with a six channel mercury bath slip ring, Lebus level wind w/a diamond wind follower, driven through an internal elastomer shock obsorbsion/accumulator with full wire monitoring sensors for tension and wire out/speed. This winch can be controlled locally or remotely from the lab(s) or deck walk about stations. Operations are capable from either the stern or the side A'frames.

1 - Hydrographic/camera winch (LDGO-LEBUS design) with 9000 m of .250" dia. 3 X 19 wire. Powered by a shared 50 HP electro-hydraulic power pack with a inhaul speed of >150 m/min.. The winch is equiped with a diamond and roller level wind, 4 channel mercury bath slip ring, full wire monitoring sensors for tension and wire out/speed. This winch can be controlled locally or remotely from the lab(s) or deck walk about stations. Operations are dedicated to the side A'frame only.

1 - C.T.D. winch (LDGO-LEBUS design) with 9000 m of .320" dia. electro-mechanical cable. Powered by a shared 50 HP electro-hydraulic power pack with inhaul speed of >159 m/min.. The winch is equiped with a six channel mercury bath slip ring, LEBUS level wind w/a diamond wind follower, driven through an internal elastomer shock obsorbsion/accumulator with full wire monitoring sensors for tension and wire out/speed. This winch can be controlled locally or remotely from the lab(s) or deck walk about stations. Operations are dedicated to the side A'frame only.

1 - Side A'frame, w/ hydraulically actuated rams. This A'frame is capable of handling 40,000 lb. of tension in its fully extended position. This frame has a clear hanging dimension of 25' below a 32" dia. hanging block, with clear width of 15', outreach is 10'. This unit is designed to handle multiple wire cruises.

1 - Stern A'frame, w/ hydraulically actuated rams. This A'frame is capable of handling 40,000 lb. of tension in its fully extended position. This frame has a clear hanging dimension of 22' below a 32" dia. flag block, with a clear width of 12', outreach is 10'. The stern frame also provides four towing points for air/watergun sound sources on removable arms on the outboard side of the frame for SCS/MCS operations.

2 - Air tugger winches for coring/general operation support.

2 - Magnetometer winches, hydraulically driven.

1 - Removable Single channel seismic streamer reel, with a hydraulically driven 5' dia. fiberglass drum, mounted on 2' centers and quick disconnect hydraulic fittings.

1 - Removable Frazer built M.C.S. streamer reel, with 12' dia. flanges capable of handling 4000 m. of 2.7" dia. digital streamer and cans. The winch is fitted with a remotely operated hydraulic level wind to support recovery operations.

1 - HIAB knuckle boom crane, s.w.l. 1.9 tons at 30'.

1 - Appleton Sealift Crane, Model KB12-20:35 articulated boom marine crane, s.w.l. 11,900 lbs. at 20'.

1 - Slattery stiff boom crane, s.w.l. 4,000 lbs. at 50'.

LABORATORY EQUIPMENT (available):

ECHO SOUNDING:

2 - Hull mounted EDO 12 KHz transducers.

2 - Hull mounted 3.5 KHz transducer arrays.
1 12 bottle EDO array(scientific dome).
1 16 bottle ORE array(thru hull).

2 - EDO 348B, 12 KHz and 3.5 KHz transceivers.

2 - RAYTHEON LSR 19" flatbed recorders.

MULTI-BEAM BATHYMETRY:

1 - Krupp Atlas Hydrosweep multi-beam bathymetric mapping system. Operated as a NECOR shared-use facility.

2 - Calcomp 965 30 X 84 in. flatbed multi-pen plotters for real and post precessing display(shared with L-DGO data acquisition system)

MAGNETICS:

2 - VARIAN V-75 proton precession magnetometers with 600' of tow cable, analog chart recorders, BCD and Serial data outputs.

GRAVITY:

1 - Bell BGM-3 gravity meter with gyro-stabilized platform, and serial data output.

1 - Bodensiverks KSS-30 gravity meter with gyro stabilized platform, serial/and anaolg data output.

DATA LOGGING/DISPLAY SYSTEMS:

2 - MASSCOMP MC-5550 computers
2 - MASSCOMP MC-5400 computers
2 - SILICON GRAPHICS, Personal Iris computers.
2 - AVIV 500 M byte hard disk drives.
2 - CIPHER F880 nine track tape drives.
2 - KENNEDY 2300 nine track tape drives.
1 - APPLE Laser Writer II, Laser printer.
2 - H/P - 7475 plotters.
4 - EPSON 286 printers.
2 - KENIMETRICS True Time GOES satellite clocks.
3 - COMPAQ Deskpro 286 computers(general purpose/data input terminals).
2 - COMPAQ Portable 286 computers(general purpose/data input terminals).
1 - SAIL loop system(Installed on request).

SEISMIC AIR COMPRESSORS:

3 - LMF DC drive seismic compressors capable of 1000 scfm at 2500 psi.

1 - PRICE AGM-200 seismic compressor, hydraulically powered unit capable of providing 175 scfm at 2500 psi.

SOUND SOURCES:

30 - BOLT 1500-C pneumatic sound sources with chambers ranging from 80 to 825 cu. in.

3 - SEISMIC SYSTEMS INC., 80 cu. in. watergun with high speed depressors for 12 knot operation.

MULTI-CHANNEL SEISMIC SYSTEM:

1 - DIGICON DSS-240 digital recording system. The includes a predictive gun timing system, cable depth display, syntron RCL-02 bird control and display, Fluxgate magnetometer compass section control, operators console, test and patch panels, and associated telemetry control computers.

1 - 240 channel digital streamer, configurable into a 160 channel 4 km, or a 240/120 channel 3 km streamer with up to eight compass sections and 20 syntron depth control RCL-02 devices. The 60 digital cannisters each handle 4 seismic groups, with 1,2,4 ms. sample rates(5000 samples max.) and local high and low pass filtering.

2 - Removable towing booms for seismic sound sources. Each 40' boom handles eight sound sources, with retrieval/tow winches and a gun retrieval cart to provide repair service to a sound source without retrieving the entire boom to provide minimum disruption in operation. When used in conjunction with the removable booms on the stern A'frame 20 sound sources can be deployed, with 8,000+ cu. in. arrays available.

SINGLE CHANNEL SEISMIC SYSTEM:

1 - Input module for conversion to DSS-240 data acquisition. System capable of both digital or analog data acquisition. Operation of DSS-240 gun firing system required regardless of style of acquisition.

2 - AMG high-speed hydrophone streamer systems. 12 m, 25m, and 50m sections available in any combination required.

SONOBUOY SYSTEM:

2 - FAIRCHILD Industries STR 74 sonobuoy recievers.
2 - CEI 501A 30-300 MHz continuously tuneable sonobuoy recievers.
1 - Sonobuoy launching cannon.

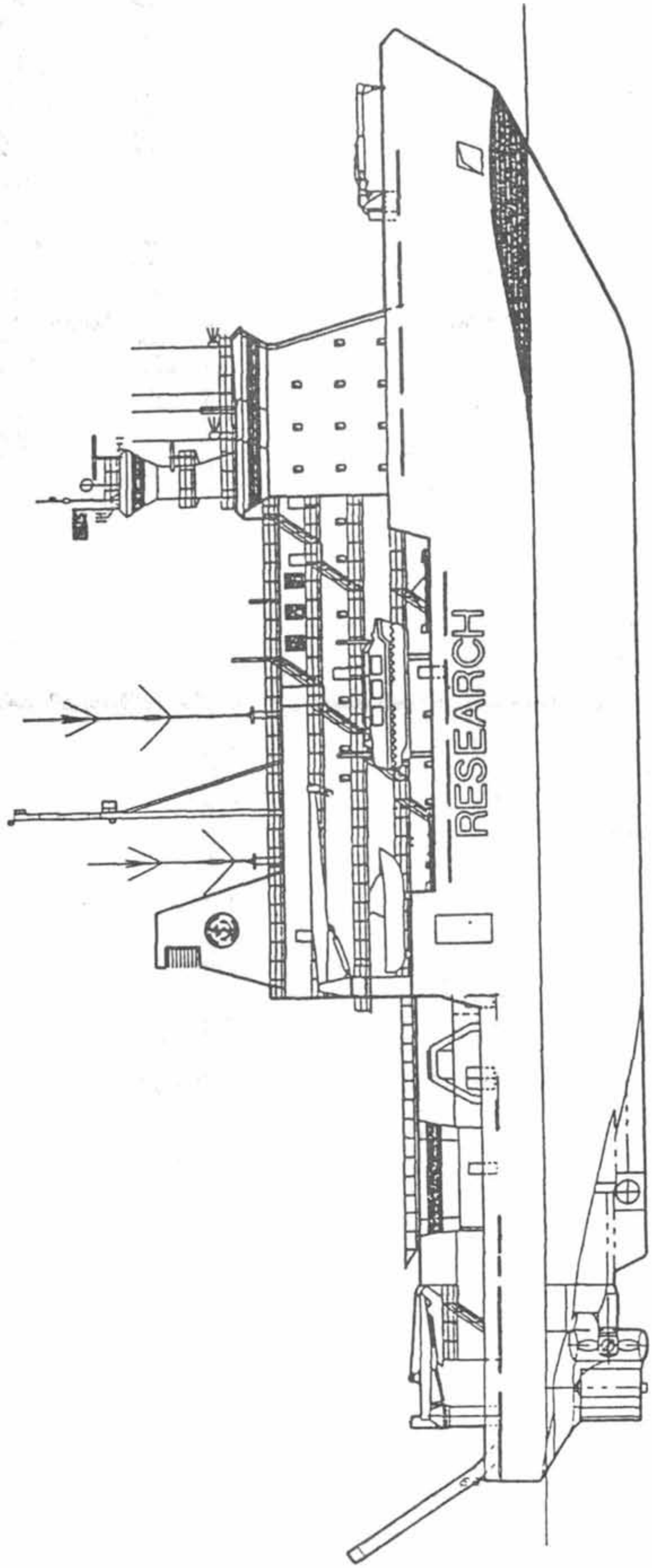
SEISMIC FLATBED RECORDERS:

4 - EDO 550B 19" recorders, with variable sweeps from 1/8 to 10 sec., variable delay program from 0 to 9.9 sec., variable speed constant paper feed 3 to 12 in./hour, and automatic time and delay anotation(every 30 min.).

MISCELLANEOUS:

1 - NOAA "SEAS" XBT/MET reporting system.
Misc. Piston, gravity core equipment.
Intraship PABX telephone system and intercoms.

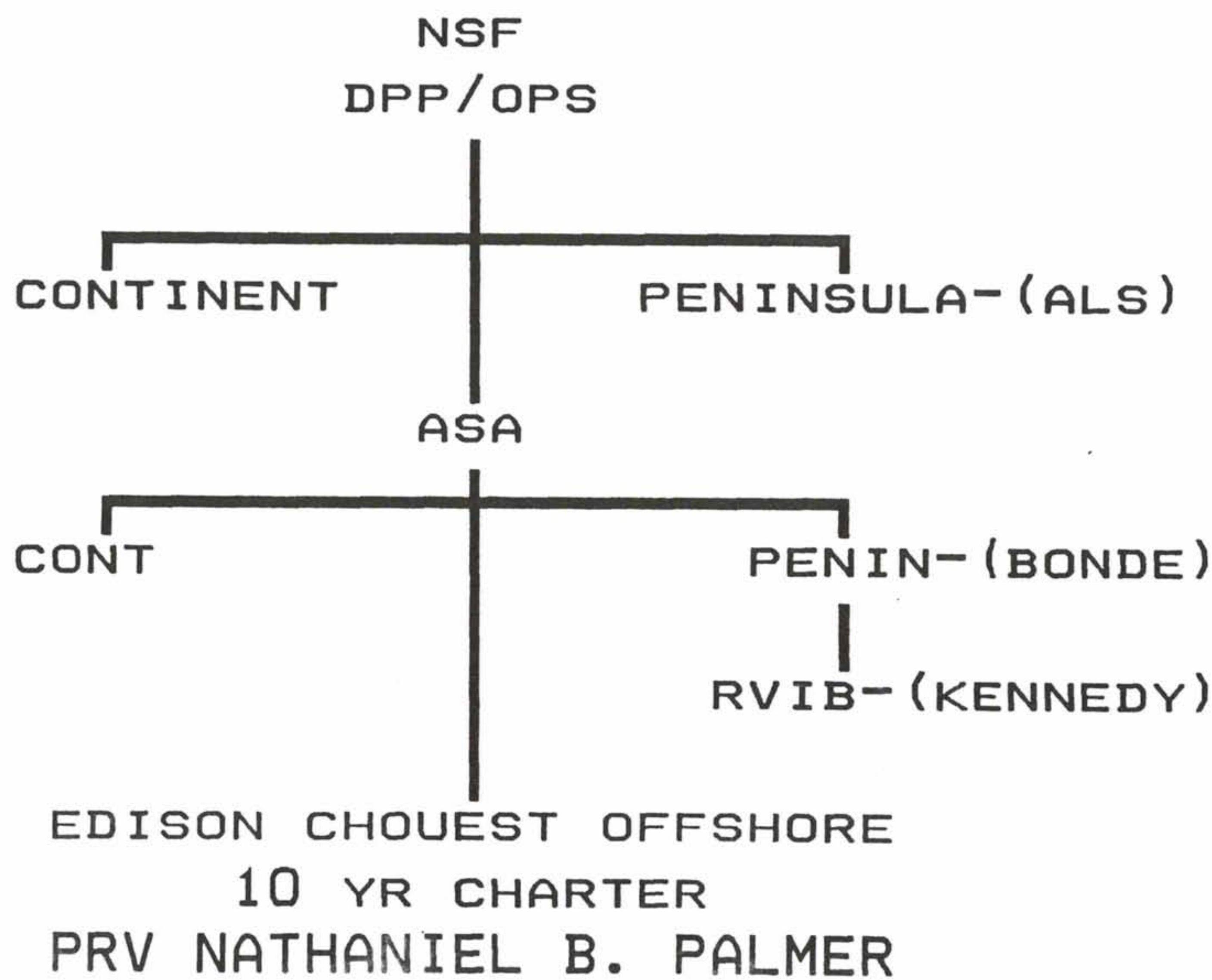
Appendix IX



NATHANIEL B. PALMER

PRV NATHANIEL B. PALMER

ORGANIZATION CHART



NATHANIAL B. PALMER
OVERSIGHT COMMITTEE

COMMITTEE REPORTS TO/ADVISES ASA

- CHMN – BOB DINSMORE – WHOI, UNOLS FIC, ICE W.G.
- SHARON SMITH – BHNL, POLAR BIOLOGY
- DAVE NELSON – OSU, CHEM-O, P.DUKE P.I.
- DENNY HAYES – LDGO, MG&G, EWING
- TOM ROYER – UAK, POLAR PHYS-O, UNOLS FIC ICE W.G.
- DOLLY DEITER – NSF, POLAR SHIP OPS
- TOM ROBERTSON – NAVSEA, P.M. FOR KNORR, MELVILLE, AGOR 23
- ED KARLSON – MARAD, SHIPYARD SPECIALIST

CONSTRUCTION SCHEDULE
NATHANIEL B. PALMER

```
---------------------------------------------------------------------------------------------------------------------
CONTRACT AWARD                 :XXXX                                        :                                                :
FINAL DESIGN                   :XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX            :                                                :
MODEL TEST - OPEN WATER/ICE    :____XXXXXXXXXXXXXXXX                        :                                                :
SUPERSTRUCTURE ASSEMBLY        :________XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX:XXXXXXXXXXXXXXXX                                :
HULL ASSEMBLY                  :____________________XXXXXXXXXXXXXXXXXXXXXXXX:XXXXXXXXXXXXXXXX                                :
JOINER WORK                    :________________________XXXXXXXXXXXXXXXXXXXX:XXXXXXXXXXXXXXXXXXXX                            :
SUPERSTRUCTURE ELEC/PIPING     :____________________________XXXXXXXXXXXXXXXX:XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX            :
HULL ELEC/PIPING               :________________________________XXXXXXXXXXXX:XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX            :
LAUNCH HULL                    :____________________________________________:____________________XXXX                        :
INSTALL MAJOR EQUIPT           :____________________________________________:____________________XXXX                        :
MATE HULL AND SUPERSTRUCT.     :____________________________________________:____________________XXXX                        :
FINAL PAINTING                 :____________________________________________:________________________________XXXXXXXX        :
FINAL SYSTEM TESTING           :____________________________________________:____________________________________XXXX        :
TRIALS                         :____________________________________________:____________________________________XXXXXXXX    :
DELIVERY                       :____________________________________________:________________________________________________:XXXX
                               :FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC :JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC :JAN
                               : 90                                         : 91                                             : 92
```

SPECIFICATION COMPARISONS
UNOLS "LARGE" VS RVIB

	UNOLS	RVIB
SIZE	NTE 300FT	NTE 300FT NTE 30FT DRAFT
ENDURANCE	60 DAYS 15,000MI	90 DAYS DETAILED OPS PROFILE
BERTHING	30-35 SCI LIBR-LOUNGE SCI OFFICE	37 SCI (3W/OFFICE) CONF-LIBR
SPEED	15KTS-SS4 SPEED CONTROLS +/- .1-.2KT	15KTS-SS4
STA. KEEPING	WORK-SS5 MAX-SS7 +/-150FT-SS5	+/- 300FT OR 3%W.D. SS5+
ICE CLASS	ABS 1A (TRANSIT LOOSE PACK)	ICE CLASS 3 (BREAK 3FT ICE @ 3KTS)
DECK AREA	3000 SQFT 12X50 AREA	SAME
CRANES	20,000 LBS	SAME
WINCHES	2-30,000 FT EM 1-40,000FT .068 CONST TENS. ETC.	1-10,000M-.225 WR 1-10,000M-.322 EM (MARKEY DESH 4&5 OR=) 1-10,000M -.680 EM (MARKEY DESH 11-11 OR=)
OVERSIDE	STERN A-FRAME VLPC	STERN A-FRAME
TOW	10,000LBS @6KTS 25,000LBS @2.5KTS	2 LT @ 6KTS 5 LT @ 1-3 KTS
LABS	4,000 SQFT DETAILS	SAME
VANS	4-8X20	SAME
WORKBOAT	2-16FT ZODIAC 1-25 TO 30FT WKB	SAME
SCI. STORE	20,000 CUFT	10,000 CUFT

SPECIFICATION COMPARISONS
UNOLS "LARGE" VS RVIB

	UNOLS	RVIB
ACOUSTICS	12 & 3.5 KHZ SEABEAM	SAME
MCS	COMPRESSORS: 4,000SCFM 2,500PSI 7,500M STREAMER & ACCESS.	BIDDER DEVELOPED SPECS.
HELO PAD	NONE	YES- 2 HELO'S
ICE HOUSE	NONE	YES- 80FT ABOVE W.L.

Enclosure (4)

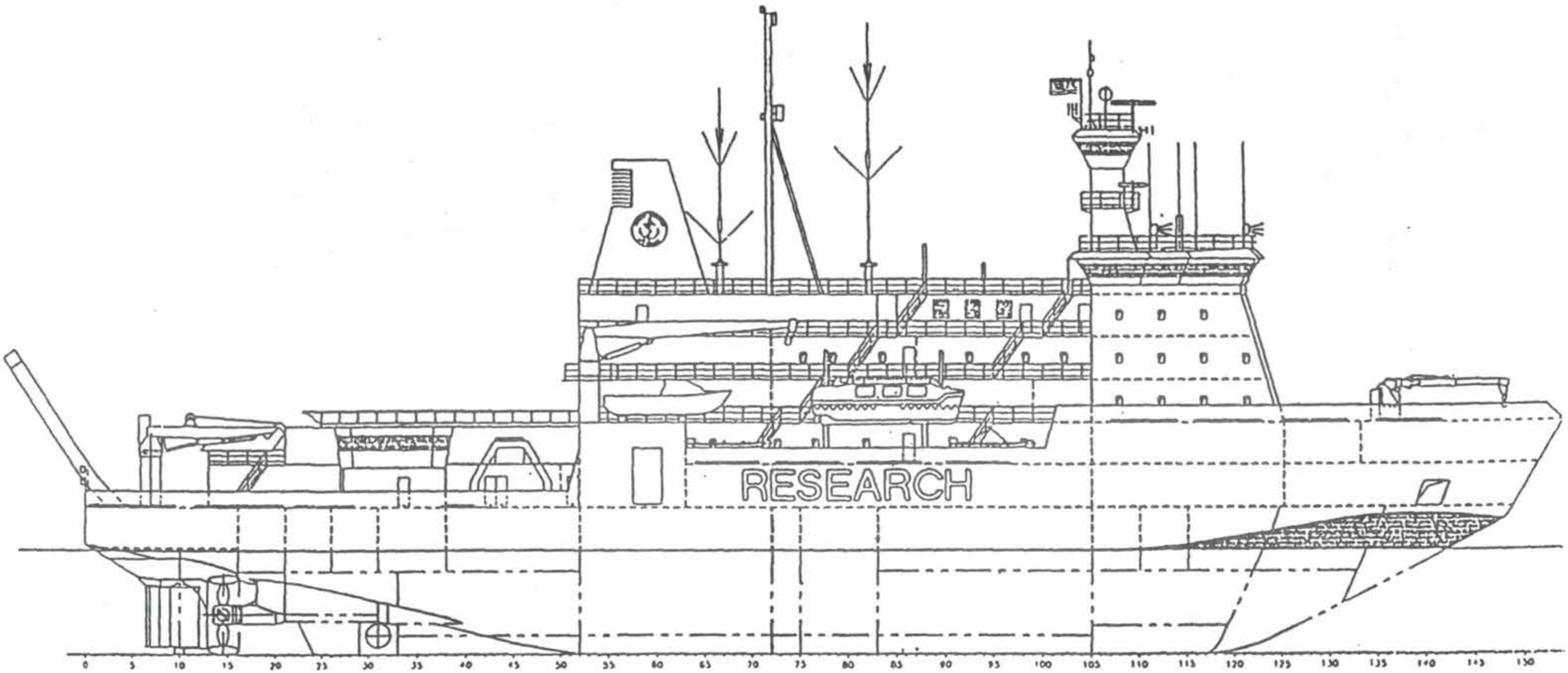
June 7, 1990

RVIB - PRINCIPAL CHARACTERISTICS

Length Overall	308.50 feet
Length at Waterline	279.75 feet
Beam, Maximum	60.00 feet
Beam at Design Waterline	60.00 feet
Draft at Design Waterline	21.75 feet
Depth	30.00 feet
Displacement	6,500 long tons
Shaft Horsepower	12,720
Accommodations	37 scientist 26 crew
Helicopters	ability to carry 2
Endurance	75 days
Diesel Oil Tankage	1683 LT

OTHER CHARACTERISITCS

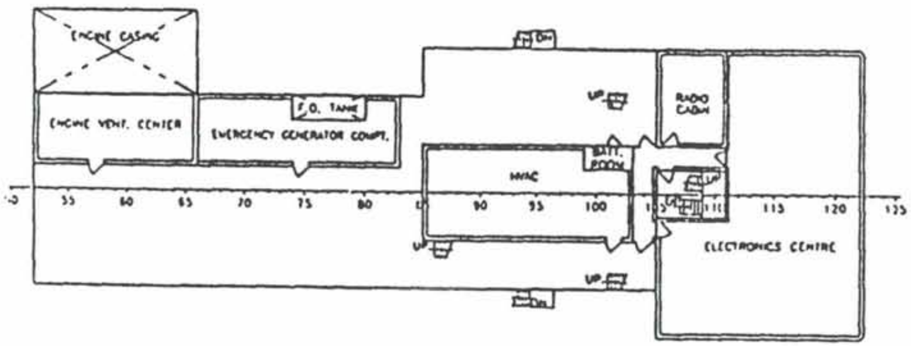
Stem Angle	27 degrees
Main Propulsion Brake Horsepower	13,320 BHP
Number of Main Diesel Engines	4
Horsepower per Main Diesel Engine	3330 BHP @ 1000 rpm 3080 BHP @ 900 rpm
Diesel Manufacturer	Caterpillar
Diesel Designation	3608
Transmission Efficiency (design)	0.96
Number of Shafts	2
Propellers	Controllable Pitch in a Nozzle 4 bladed 4 meter diameter material: stainless steel
Number of Rudders	2
Type of Rudder	High Lift
Number of Ship Service Generators	4
Rating of Each Ship Service Generator	1070 KW
Manufacturer	Caterpillar
Diesel Designation	3512
Bow Thrusters	2
Bow Thruster Horsepower	1500
Prime Mover	Diesel Direct Drive
Type	Water Jet
Stern Thruster	1
Stern Thruster Horsepower	800
Prime Mover	Electric Motor
Type	Tunnel



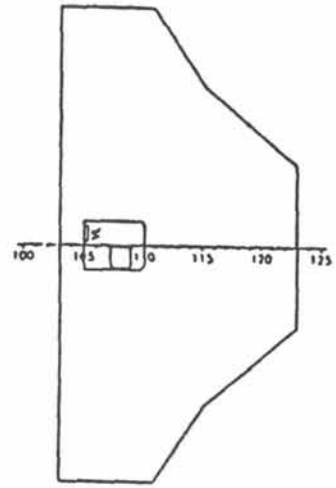
OUTBOARD PROFIL

RESEARCH VESSEL WITH ICEBREAKING CAPABILITY (RVIB)

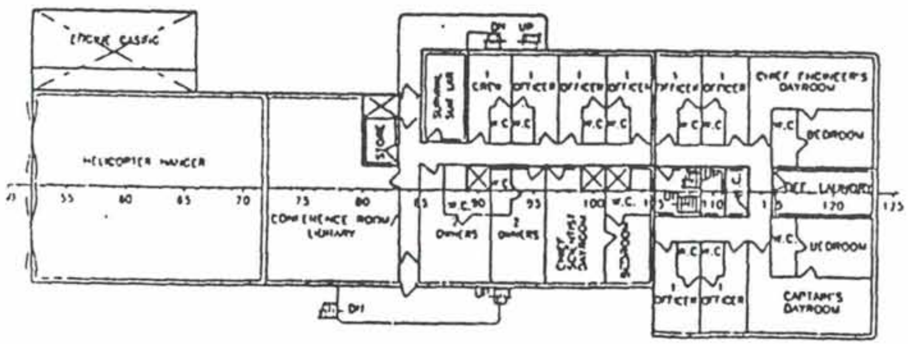
May 25, 1990



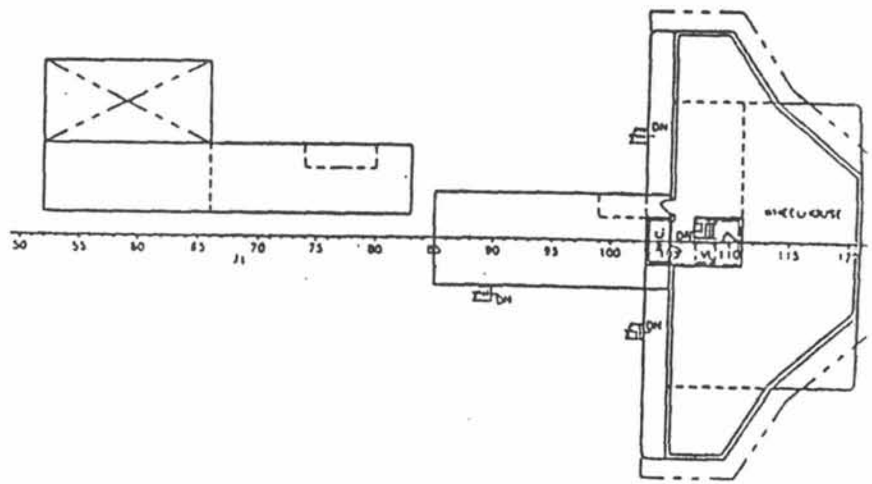
04 DECK 67'-0"



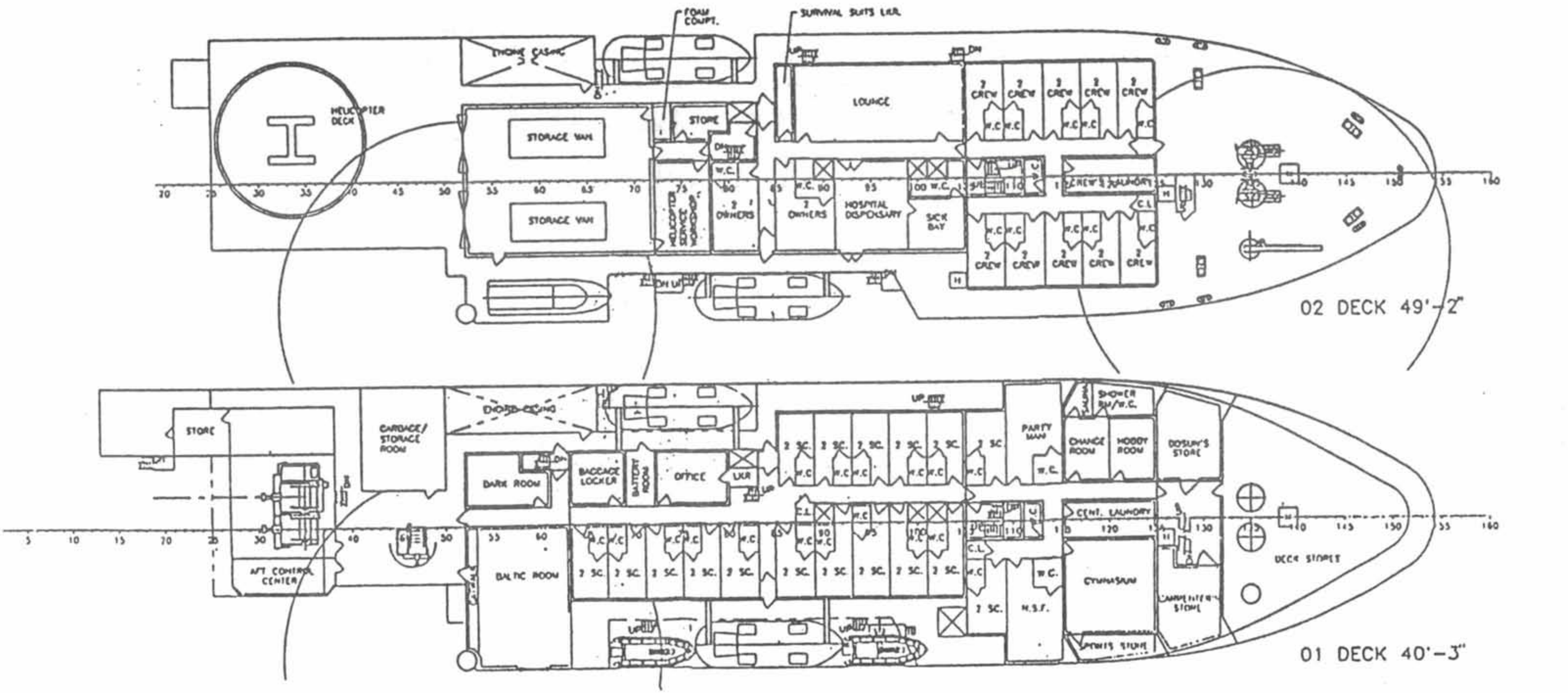
WHEELHOUSE TOP 83'-10"

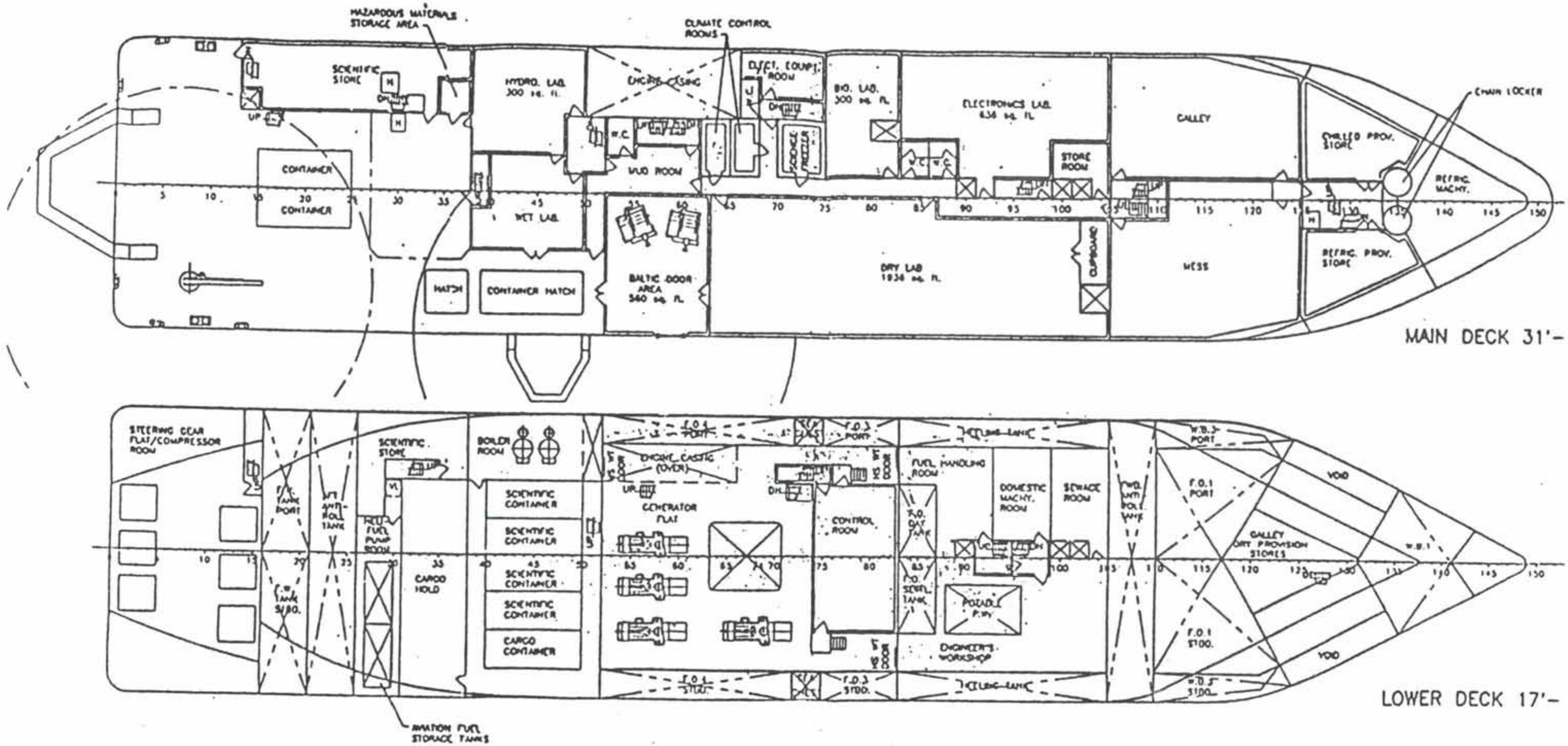


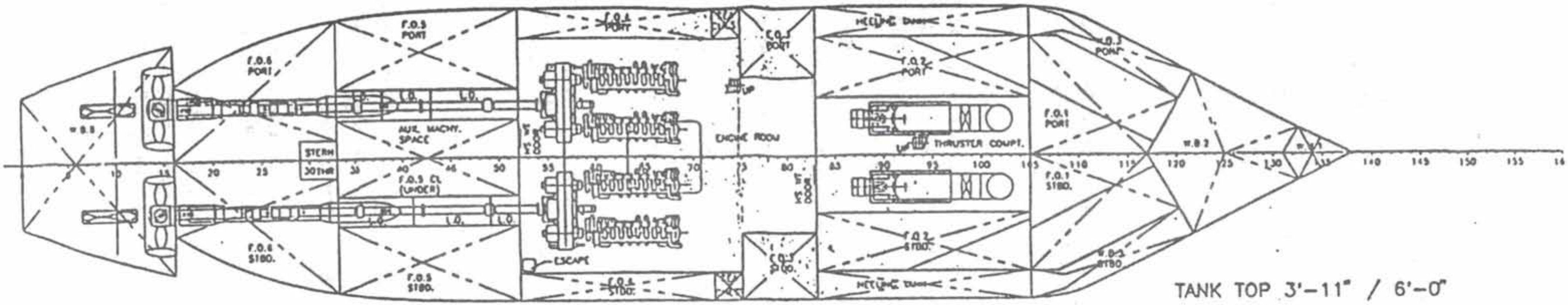
03 DECK 58'-1"



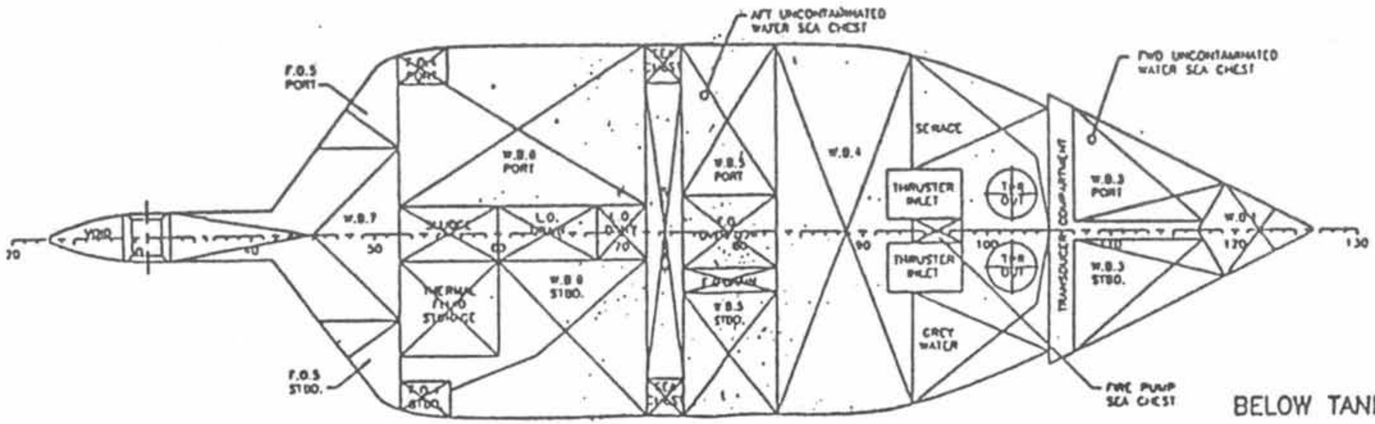
05 DECK 75'-11"


02 DECK 49'-2"
01 DECK 40'-3"
HELICOPTER DECK
ENGINE CASING
FOAM COMPT.
SURVIVAL SUITS LKR.
STORAGE VAN
STORAGE VAN
STORE
HELICOPTER SERVICE WORKSHOP
2 OWNERS
2 OWNERS
LOUNGE
HOSPITAL DISPENSARY
SICK BAY
2 CREW
CREW'S LAUNDRY
C.L.
W.C.
STORE
AFT CONTROL CENTER
GARBAGE/ STORAGE ROOM
DARK ROOM
BAGGAGE LOCKER
BATTERY ROOM
OFFICE
LKR
BALTIC ROOM
2 SC.
PARTY MAN
SHOWER RM/W.C.
CHANGE ROOM
HOBBY ROOM
BOSUN'S STORE
CENT. LAUNDRY
GYMNASIUM
CARPENTER'S STORE
SPORTS STORE
N.S.F.
DECK STORES
UP


HAZARDOUS MATERIALS STORAGE AREA
CLIMATE CONTROL ROOMS
CHAIN LOCKER
SCIENTIFIC STORE
CONTAINER
20 CONTAINER
HYDRO. LAB. 300 sq. ft.
WET LAB.
ENGINE CASING
W.C.
MUD ROOM
ELECT. EQUIPT. ROOM
SCIENCE FREEZER
BIO. LAB. 300 sq. ft.
ELECTRONICS LAB. 636 sq. ft.
STORE ROOM
GALLEY
CHILLED PROV. STORE
REFRIG. MACHY.
REFRIG. PROV. STORE
MESS
CUPBOARD
DRY LAB 1934 sq. ft.
BALTIC DOOR AREA 560 sq. ft.
HATCH
CONTAINER HATCH
MAIN DECK 31'-
STEERING GEAR FLAT/COMPRESSOR ROOM
F.W. TANK PORT
F.W. TANK STBD.
ANTI-ROLL TANK
HELI FUEL PUMP ROOM
CARGO HOLD
BOILER ROOM
SCIENTIFIC CONTAINER
CARGO CONTAINER
ENGINE CASING (OVER)
GENERATOR FLAT
F.O.S. PORT
F.O.S. STBD.
CONTROL ROOM
FUEL HANDLING ROOM
F.O. DAY TANK
F.O. SETTL. TANK
DOMESTIC MACHY. ROOM
SEWAGE ROOM
POTABLE F.W.
ENGINEER'S WORKSHOP
F.O.1 PORT
F.O.1 STBD.
W.B.3 PORT
W.B.3 STBD.
GALLEY DRY PROVISION STORES
VOID
W.B.1
AVIATION FUEL STORAGE TANKS
LOWER DECK 17'-



TANK TOP 3'–11" / 6'–0"



BELOW TANK TOP

Enclosure (7)

RVIB OVERSIGHT COMMITTEE
Comments on General Arrangement Plan

(numbered items with an asterick (*) are considered very important)

1.* Require more than one climate control chamber. It is suggested that two, 8'x8' rooms be provided suitable with temperature control of plus or minus 0.5°C at -1°C. Consider enlarging the existing climate control chamber relocation.

2.* The location of the vans on the stern may interfere with operations. Consider relocating.

3.* The aft crane covers the fantail area, but does not reach beyond the A frame. Reposition the crane to a location further aft and to the starboard side .

4.* The Bio-analytical Lab should be climate controlled.

5.* Relocate the waterfall winches that are currently located on the fantail to a position below deck. This will prolong its life and reduce future operational problems as the equipment will be exposed to below freezing temperatures. If necessary, sacrifice some of the storage area that is provided in the vessel to accommodate the below deck placement of the winches. Assess the impact on the deck height, structural requirements, and fairleading to the A-frame.

6.* Consider alternate uses of the helicopter deck and hanger for science uses such as the storage of vans and the like. Be sure services are provided in the vicinity to service vans or for the alternate uses. The helicopter hanger should be heated and have adequate tie-down fittings. The use of helicopters aboard the vessel will be project dependent and this space may be under utilized for many missions as helicopters will not routinely be carried aboard the vessel.

7.* Check the requirements for the stern A-frame for a 60 ton load. That loading is based on a static load. 9/16" wire rope will be used with the A frame.

8.* Final arrangement drawings should show all deck fittings and these should not interfere with operations on the fantail. Consider relocating the after-most mooring capstan from the starboard side to the port side.

9.* All overboard discharges should be on the port side of the vessel and the starboard side of the vessel should be designated the clean side such that contamination of scientific samples by the vessel is minimized.

10.* Wireways to all science areas should be with bulkhead pass-throughs to provide for ease in stringing science related cable without removing end fittings.

11.* A small staging hanger (court yard) with a Baltic-type watertight door should be provided for conduct of CTD casts, IKMT mid-water trawl, and other towed arrays. The Baltic door should pivot upward such that a sheave can travel on a guide for the deployment of scientific equipment and instrumentation. Direct access to the wet lab from this space shall be provided.

12.* Check to assure controls are adequate for the side hydrographic winches.

13.* Provide computer terminal hook-ups in all scientific staterooms.

14.* Provide a chemical storeroom for the storage of hazardous chemical solutions and products.

15.* Provide methods for EMI (electromagnetic interference) suppression if any SCR's (silicon controlled rectifiers) are aboard the vessel.

16. The vessel should have the capability to handle ROV's. This requires a large door to be located on the aft side of the staging hanger and clear deck aft.

17. Provide a pressurized transducer well with dimensions of about 3' x 6'.

18. The starboard side A-frame should be considered with a bolt down capability with a somewhat higher vertical clearance. The design of bolt down A-frames on other UNOLS vessels should be reviewed.

19. Provide a scientific work shop.

20. Provision should be made for a diving van. There is no requirement for a decompression chamber however.

21. Provide an aft facing ship control panel on the bridge wings.

22. Check that high quality acid resistant (bond strand fiberglass) ventilation ducting is provided in the laboratories to connect to flume hoods.

23. Consider the heating of select portions of the working deck to reduce or eliminate the accumulation of deck icing. Consider the use of warm water wash-down using waste heat from the diesel engines.

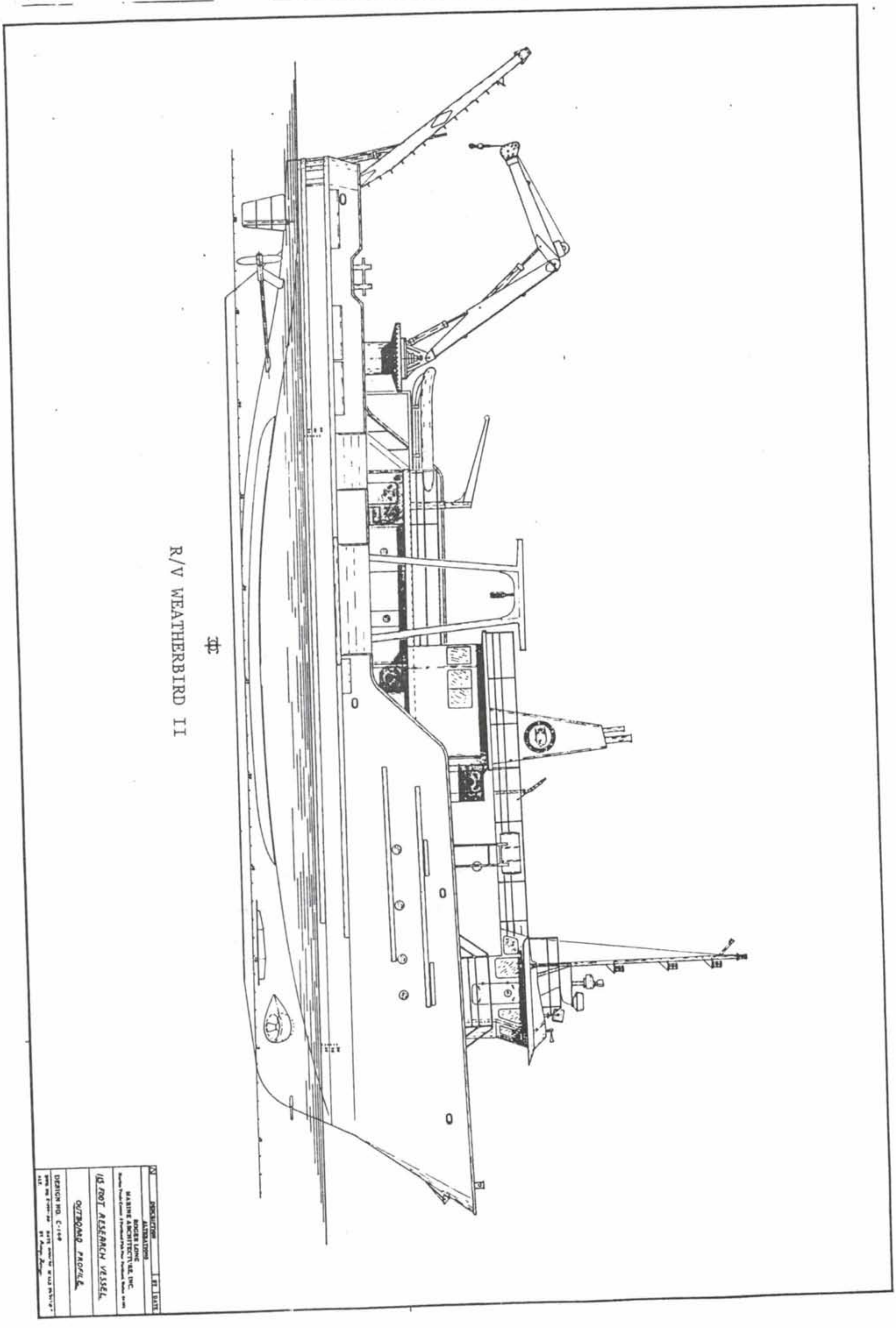
24. A separate HVAC should be considered for the laboratories. The laboratories should be under a positive pressure in relationship to other spaces with air flow equivalent to about 11 changes per hour.

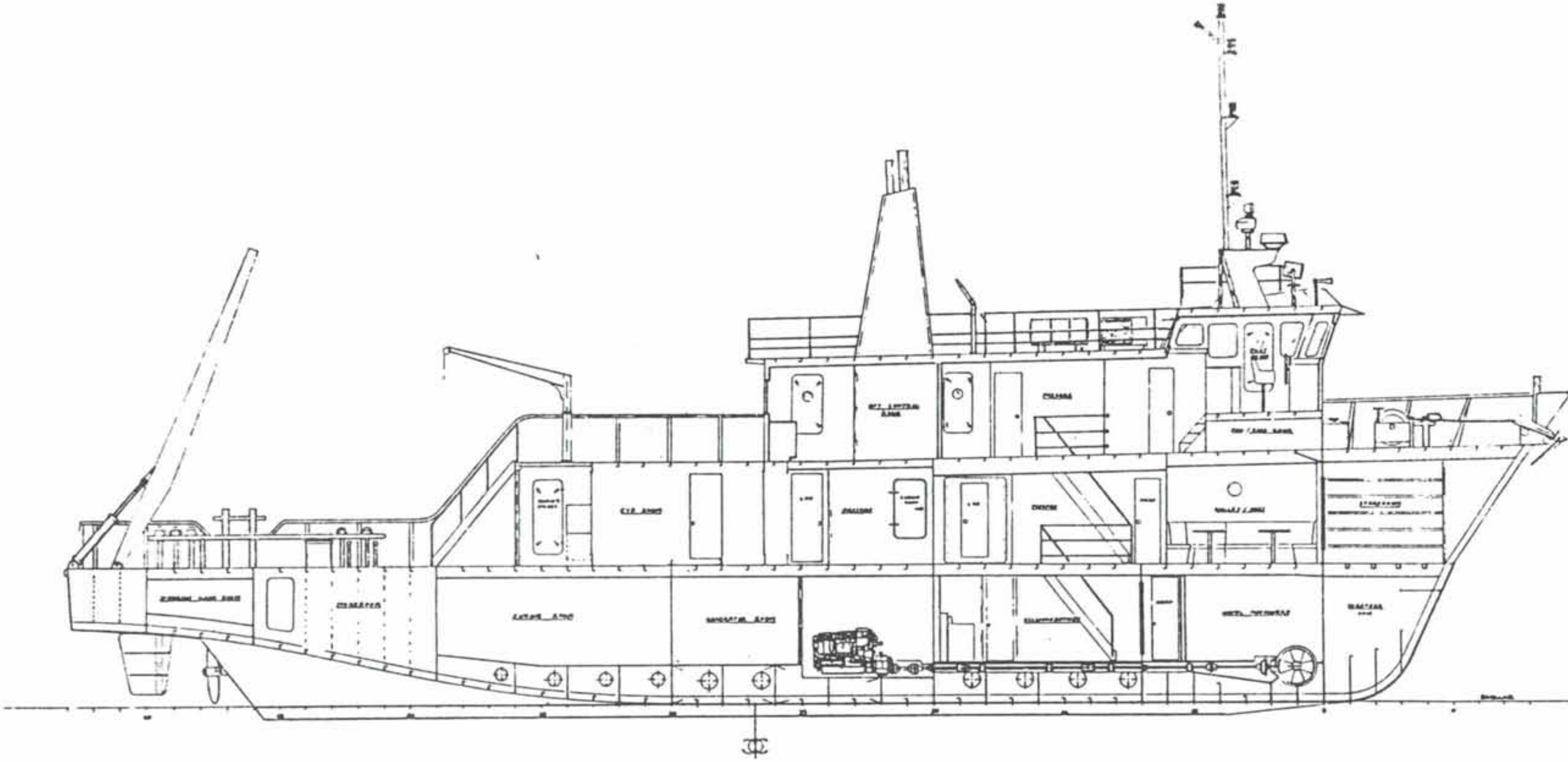
25. Locate the wet lab, climate control chambers, and the isotope van storage close together.

26. Smaller multiple seismic air compressors are desirable as some operations will only require a small amount of compressed air.

27. The impellers in the bow and stern thrusters should be designed in a manner to avoid cavitation.

28. Consider the use of adjustable bulkheads in the dry lab to allow segregation into smaller spaces.


R/V WEATHERBIRD II
115 FOOT RESEARCH VESSEL
OUTBOARD PROFILE
ROGER LONG
MARINE ARCHITECTURE, INC.



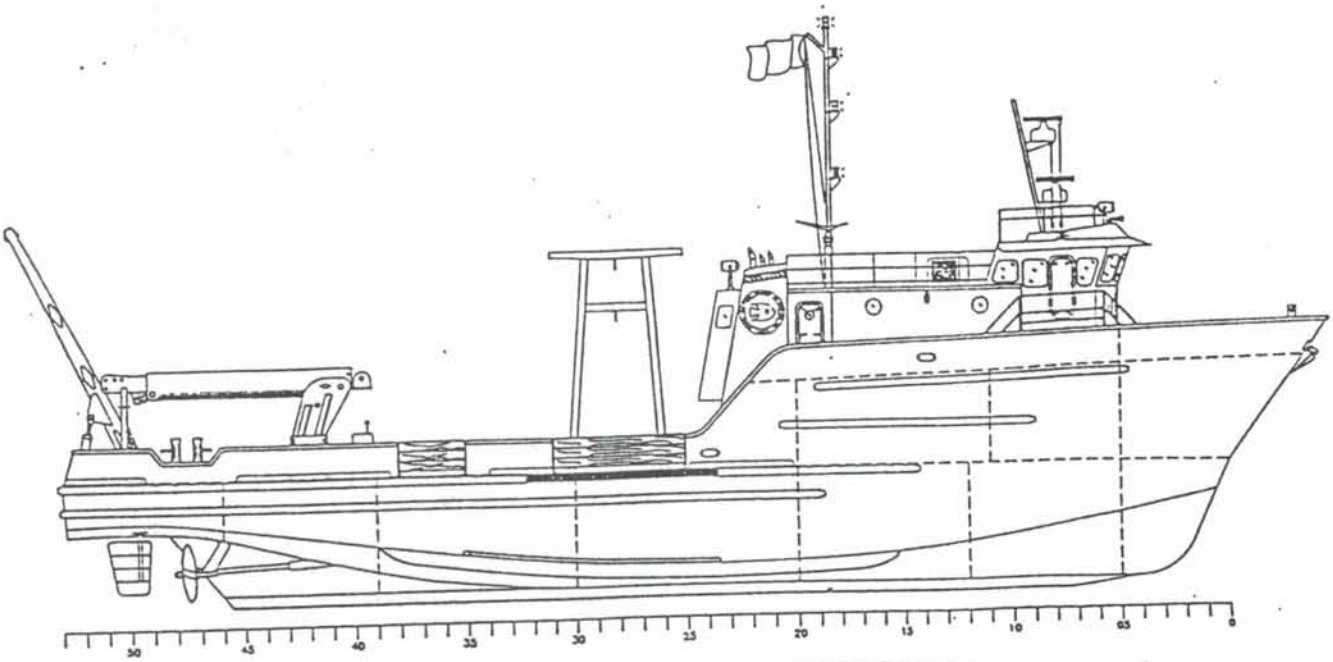
DESCRIPTION	BY	DATE
ALTERATIONS		

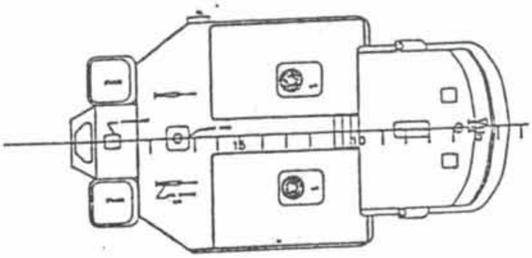
MARINE ARCHITECTURE INC

115 FOOT RESEARCH VESSEL

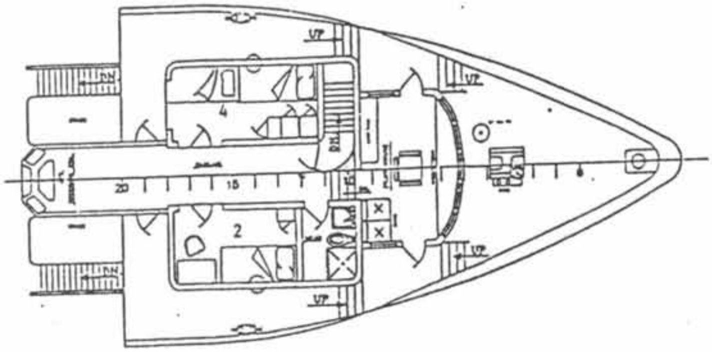
INBOARD PROFILE

DESIGN NO. C-144

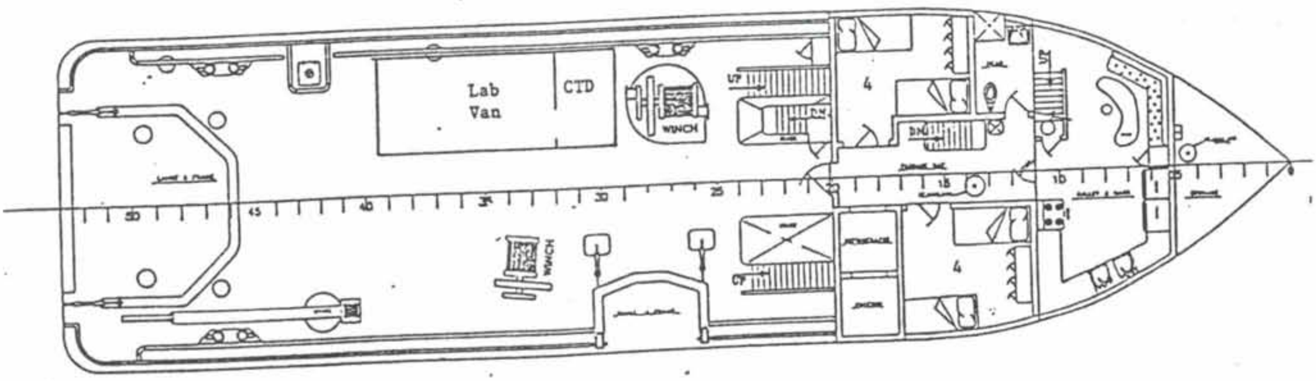




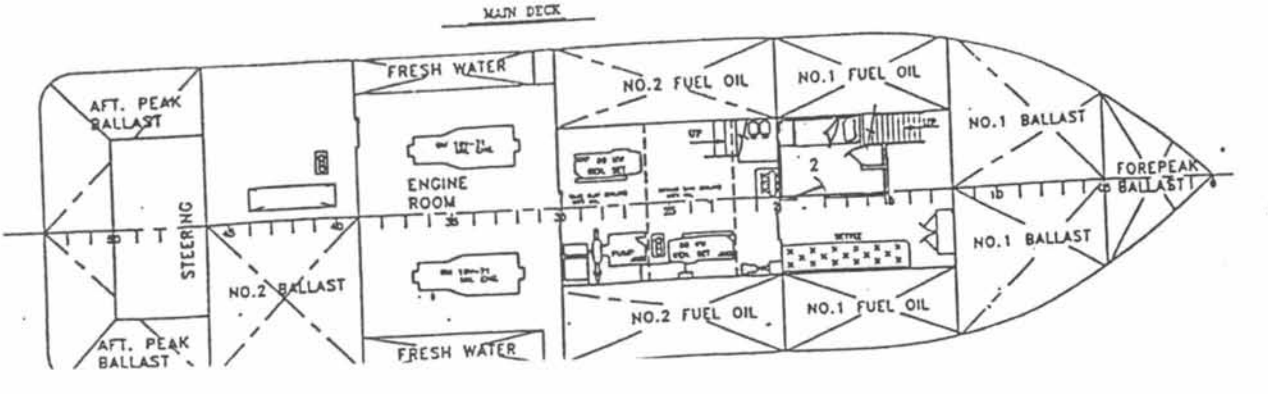
PILOT HOUSE TOP

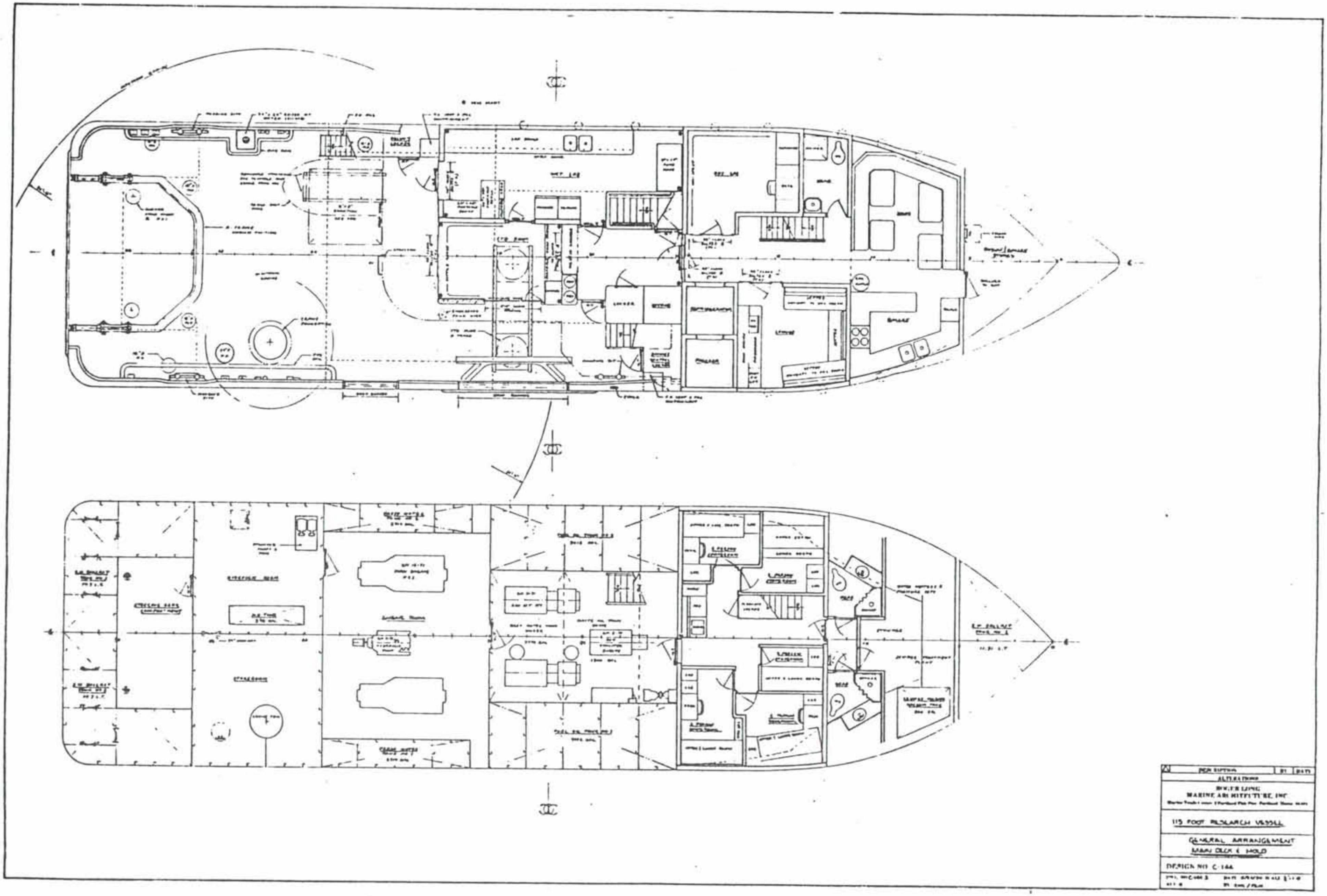


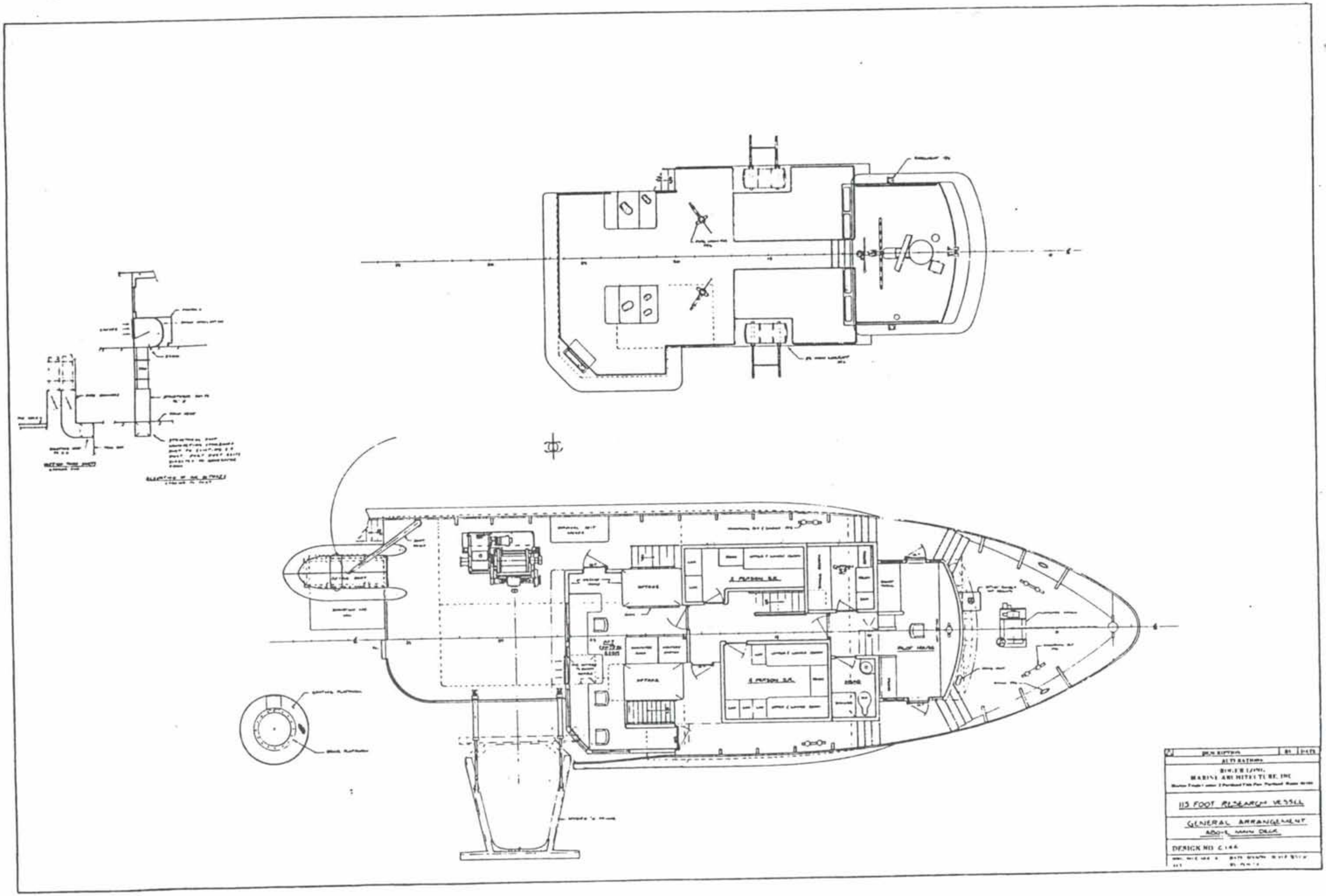
FOCSLE DECK



MAIN DECK

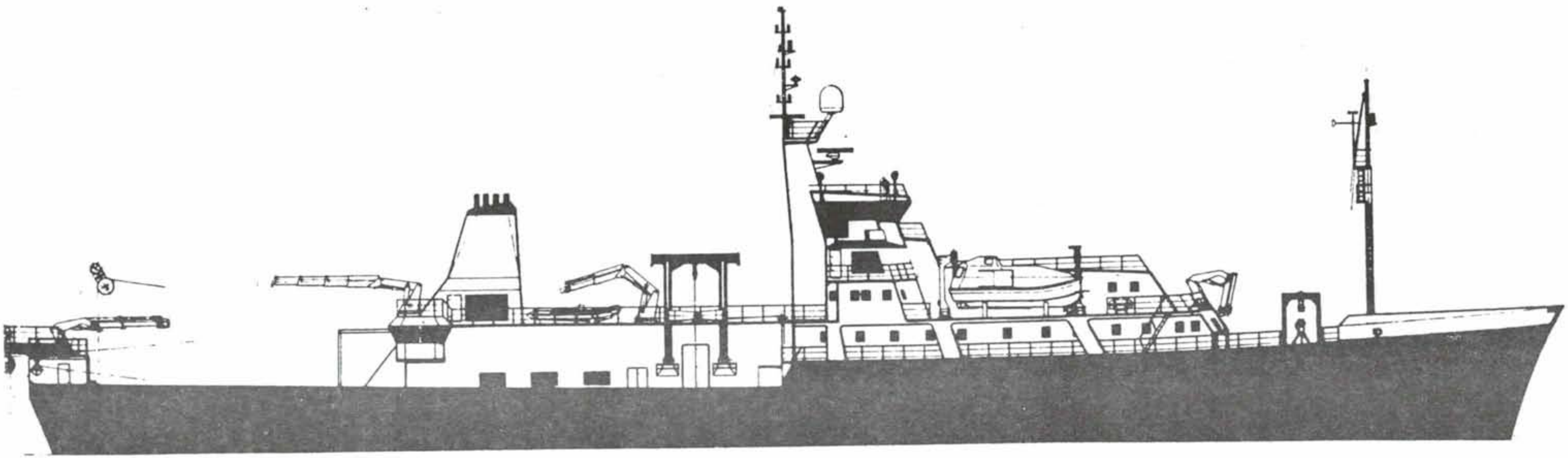



ALTERATIONS
MARINE ARCHITECTURE, INC
115 FOOT RESEARCH VESSEL
GENERAL ARRANGEMENT
MAIN DECK & HOLD
DESIGN NO C-144



DESCRIPTION
ALTERATIONS
MARINE ARCHITECTURE, INC
115 FOOT RESEARCH VESSEL
GENERAL ARRANGEMENT
ABOVE MAIN DECK
DESIGN NO

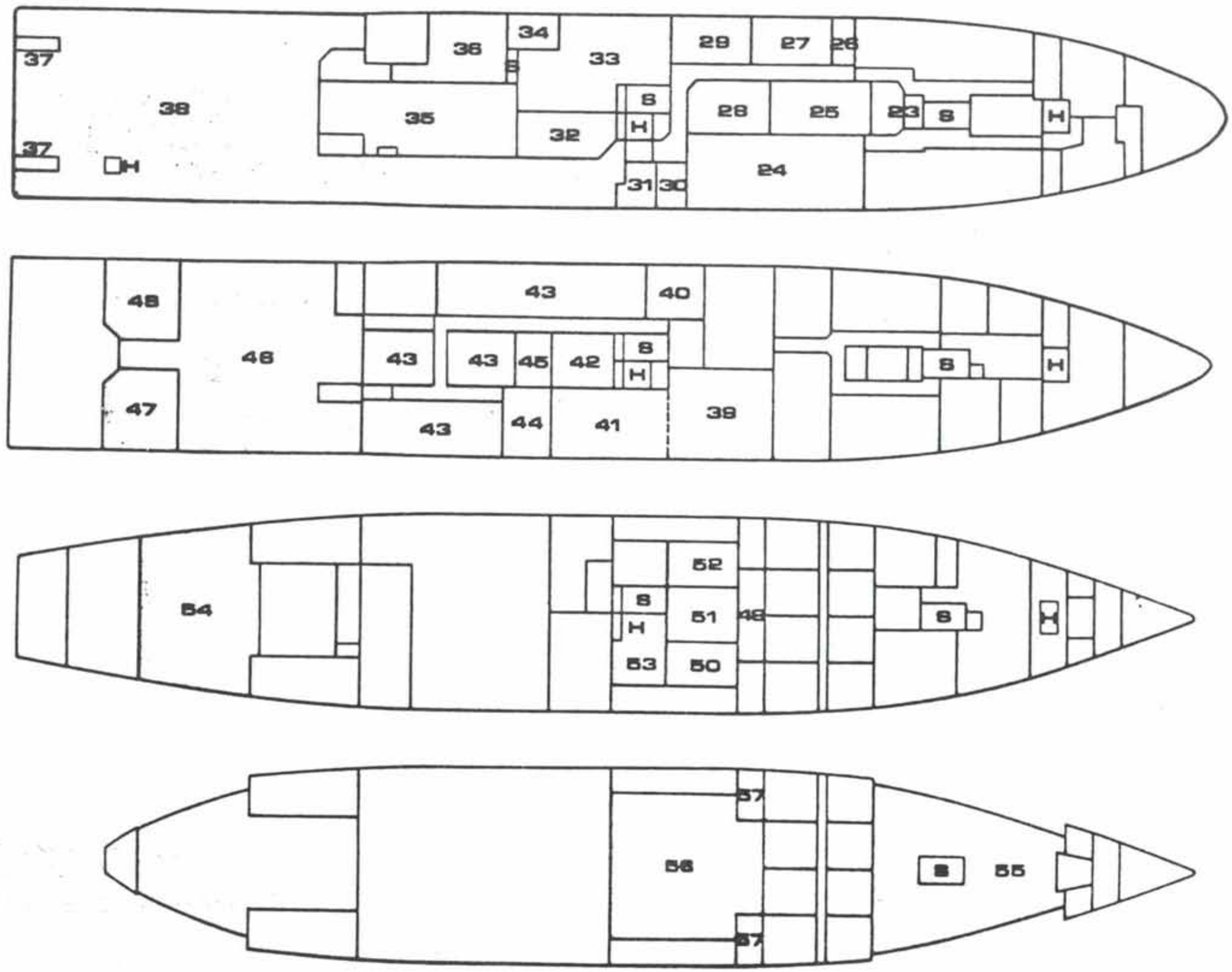
Natural
Environment
Research
Council



R.R.S. DISCOVERY

R.R.S. Discovery Historical Note

The vessel whose details are set out in this leaflet was originally built in 1962, to replace Discovery II which had been built in 1929 to continue research into the habitat of the whale in Antarctica begun by Captain R.F. Scott. The conversion of the vessel in 1990 included lengthening the original hull by approximately 10 metres, fitting a completely new superstructure, fitting a new AC power plant for both propulsion and scientific needs, and many detailed improvements required by changing scientific demands.

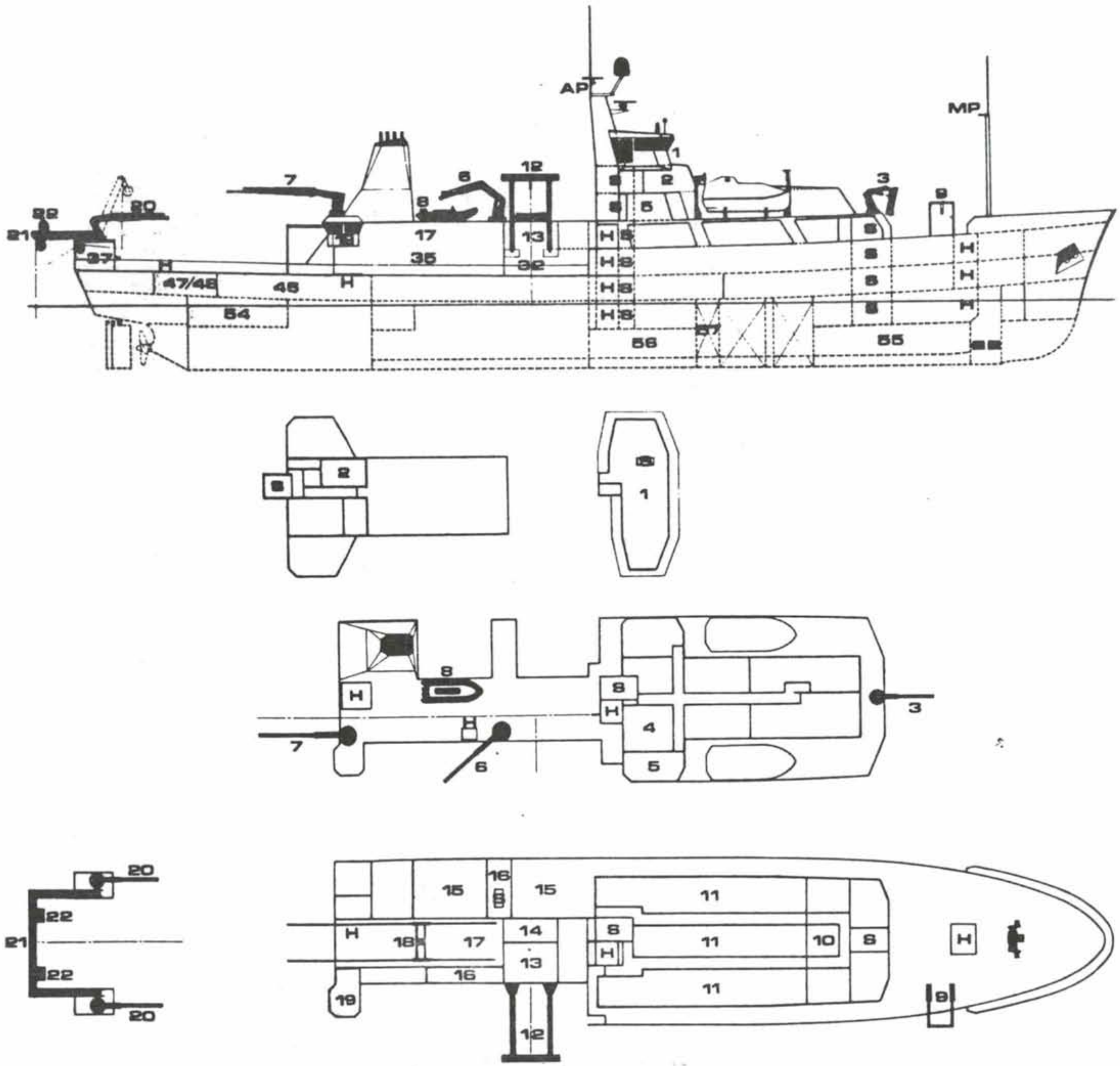


UPPER DECK
23. PHOTO LABORATORY
24. MAIN LABORATORY
25. PLOT
26. CONSTANT ENVIRONMENT LAB. AIR CONDITIONING
27. CONSTANT ENVIRONMENT LABORATORY
28. COMPUTER ROOM
29. CHEMISTRY LABORATORY
30. COFFEE SHOP
31. CHANGE ROOM
32. WATER BOTTLE ANNEX (LOWER LEVEL)
33. DECK LABORATORY
34. CHILL STORE
35. COVERED WORK AREA (LOWER LEVEL)
36. SCIENTIFIC WORKSHOP
37. 'A' FRAME & CRANE PEDESTALS
38. AFT WORKING DECK

MAIN DECK
39. SCIENTISTS & OFFICERS DINING ROOM
40. DUTY MESS
41. SCIENTISTS & OFFICERS BAR
42. LIBRARY/QUIET ROOM
43. SCIENTISTS CABINS
44. VIDEO ROOM
45. MAGNETIC TAPE STORE
46. SCIENTIFIC STORE
47. MAGAZINE
48. HYDRAULIC MACHINERY SPACE

LOWER DECK
49. SCIENTIFIC STORE
50. SCIENTIFIC SPARES STORE
51. STABLE LABORATORY
52. ELECTRONICS WORKSHOP
53. GYM/STORE AREA
54. H.P. AIR COMPRESSORS

TANK TOP
55. SCIENTIFIC HOLD
56. WINCH ROOM
57. STABILISER TANK



KEY TO SPACES & EQUIPMENT

AP AERIAL PLATFORM
MP METEOROLOGICAL PLATFORM
S STAIRWAY TOWER
H HATCH TRUNKS & HATCHES

NAV. BRIDGE DECK
1. WHEELHOUSE AND PLOT AREA

BRIDGE DECK
2. COMMUNICATIONS

BOAT DECK
3. FORWARD KNUCKLE CRANE
4. PSO's CABIN
5. PSO's OFFICE
6. MIDSHIP CRANE
7. MID/AFT CRANE
8. WORKBOAT

FORECASTLE DECK
9. FORWARD 'A' FRAME
10. SCIENTISTS LAUNDRY
11. SCIENTISTS CABINS
12. MIDSHIP 'A' FRAME
13. WATER BOTTLE ANNEX (UPPER LEVEL)
14. CHEMICAL STORAGE
15. CONTAINER SLOT
16. CONTAINER LOBBY
17. COVERED WORK AREA (UPPER LEVEL)
18. GANTRY CRANE
19. WINCH CONTROL
20. AFT END KNUCKLE CRANES
21. AFT 'A' FRAME
22. PENNANT WINCHES

R.R.S. DISCOVERY — KEY DATA

1. SCIENCE SUPPORT

	AREA M²	AREA ft²
WHEELHOUSE		
ALL ROUND VISION INCLUDING ALL WORKING DECK AREAS SMALL PLOT CHART AREA	45	480
BRIDGE DECK		
COMMUNICATIONS ROOM	12	130
BOAT DECK		
SHIPS OFFICE	10.5	113
P.S.O. OFFICE OVERLOOKING WORKING DECK AREAS	11.3	121
FORECASTLE DECK		
WORKING DECK FORWARD	60	645
SCIENTISTS OFFICE	10	110
CHEMICAL STORE	9	97
CONTAINER SLOTS		
4x5T STORE CONTAINERS	-	-
or 2x10T CONTAINER LABORATORIES WITH COVERED LOBBY ENTRY AND DIRECT ACCESS TO LABORATORIES	-	-
GAS BOTTLE STORAGE		
20 - VARIOUS GASES PIPED TO LABORATORY		
WINCH CONTROL CABIN		
WITH CLEAR VIEW OVER AFT AND SIDE DECKS		
UPPER DECK		
STATIONERY STORE	6	65
DARK ROOM	3	33
PHOTO LAB	7	75
COMPUTER ROOM	22	235
MAIN LABORATORY	67	720
CONTROLLED ENVIRONMENT LAB.	17.5	190
CHEMISTRY LABORATORY	17.5	190
DECK LABORATORY	59	635
WATER BOTTLE ANNEX	22	235
COVERED WORK AREA	73	785
SCIENTIFIC WORKSHOP	29	310
FREEZER COMPARTMENT	6.5	71
AFT DECK AREA (2 CONTAINER SLOTS)	300	3200
SIDE DECK AREA	79	845
ALL DECK AREAS PROVIDED WITH A HOLD DOWN BOLT MATRIX AT 1M PITCH		
MAIN DECK		
TAPE STORE MIDSHIPS	10	110
SCIENTIFIC EQUIPMENT STORE AFT	165	1775
HYDRAULIC MACHINERY SPACE	19	205
MAGAZINE 15 TONNES	-	-
STREAMER FLUID TANKS		
LOWER DECK		
ELECTRONIC WORKSHOP	16.5	175
STABLE LABORATORY	19	205
SCIENTIFIC SPARES STORE	16.5	175
STORE AREAS	28	300
COMPRESSOR ROOM	60	645
TANK TOP		
DIRTY SCIENTIFIC STORE	70	750
WINCH ROOM	105	1130

2. SCIENTISTS CABINS

	No.
BOAT DECK	
SINGLE SUITE WITH EN SUITE TOILET	1
FORECASTLE DECK	
SINGLE CABIN WITH EN SUITE TOILET	1
SINGLE CABINS WITH SHARED TOILETS (1 TOILET TO 2 CABINS)	12
MAIN DECK	
SINGLE CABINS WITH SHARED TOILETS (1 TOILET TO 2 CABINS)	14
TOTAL	28

3. AMENITY SPACES

	AREA M²	AREA ft²
MAIN DECK		
QUIET ROOM & LIBRARY	18	190
VIDEO ROOM	15	160
OFFICERS & SCIENTISTS LOUNGE	38	410
OFFICERS & SCIENTISTS DINING ROOM	48	515
DUTY MESS	13	140
UPPER DECK		
COFFEE SHOP	7	75
HOSPITAL		
CHANGING ROOM & DECK TOILET	8	85

4. SCIENTIFIC MACHINERY AND HANDLING SYSTEMS

MAIN TRACTION WINCH SWL 20T

WIRE STORAGE REELS

1 - SUPERARAMID -	8000M
1 - TRAWL WIRE -	15000M
1 - CORING WIRE -	7000M
1 - CONDUCTING CABLE -	10000M

CTD TRACTION WINCH SWL 10T

CTD WIRE STORAGE REELS

1 - HYDROGRAPHIC -	9000M
1 - CONDUCTING -	8000M
1 - SUPERARAMID CONDUCTING -	8000M

OUTBOARD COMPENSATION ON BOTH WINCHES

AFT 'A' FRAME

SWL	20T
OUTREACH	3.5M
INBOARD REACH	4.0M
HEIGHT ABOVE DECK	6.0M
WIDTH	7.6M

PENNANT WINCHES

2 - 2T SWL

1000M WIRE

MIDSHIP 'A' FRAME

SWL	15T
OUTREACH	2.5M
INBOARD REACH	2.0M
HEIGHT ABOVE DECK	5.0M
WIDTH	2.5M

FORWARD 'A' FRAME

SWL	3.0T
OUTREACH	2.0M
INBOARD REACH	2.0M
HEIGHT ABOVE DECK	4.0M

H.P AIR COMPRESSORS (WHEN FITTED)

(4 x 300) c.f.m. free air at 136 BAR

HYDRAULIC EQUIPMENT POWER SUPPLIES

5 POSITIONS ON DECK

2 - 30g.p.m. }
2 - 5 g.p.m. } 200 BAR

CRANES

FORWARD KNUCKLE CRANE 30TM	HARD HOOK AND WINCH
MIDSHIP KNUCKLE CRANE 120TM	HARD HOOK AND WINCH & CONSTANT TENSION
MID/AFT KNUCKLE CRANE 75TM	HARD HOOK AND WINCH
AFT 2 (1P & 1S) KNUCKLE CRANE 30TM	HARD HOOK

ECHO SOUNDERS

P.E.S.

A.D.C.P.

5. SHIP DATA

LENGTH OVERALL	90.25M
LENGTH BETWEEN PERPENDICULARS	82.85M
BREADTH	14.02M
DRAFT	5.3M
DEPTH TO UPPER DECK	7.83M
CRUISING SPEED	11KN
ENDURANCE EXTREME	55 DAYS
ENDURANCE OPERATIONAL	45 DAYS
SCIENTIFIC EQUIPMENT DWT	165T
DIESEL ELECTRIC POWER PLANT	3.75 MW A.C.
MAIN PROPULSION MOTOR	1.50 MW D.C.
BOW THRUSTER 360 AZIMUTHING	0.55 MW D.C.
SINGLE SCREW FIXED PITCH	
SINGLE HIGH LIFT/HIGH ANGLE RUDDER	
CONTROLLED TANK STABILISER	
CALL SIGN	GLNE
SATCOMM CODE	1440673
MANNING	
OFFICERS	9
CREW	13
TOTAL	22

RRS Discovery is operated by:
Natural Environment Research Council,
Research Vessel Services.
No. 1 Dock,
Barry, South Glamorgan, CF6 6UZ
Telephone: 0446 737451
Fax: 0446 720562
Telex: 497101

Appendix XII

TRACTION UNIT WINCH

Ivor Chivers

INDEX

FIGURES

SLIDES

INTRODUCTION

The Natural Environment Research Council (NERC) was established by Royal Charter in 1965. The Council has the responsibility for planning, encouraging and carrying out research in the physical and biological sciences which explain the natural processes of the environment. Groups of scientists, at various locations within the UK are separately engaged in the marine atmospheric and terrestrial aspects of this research.

Within this organisation, the Research Vessel Services (RVS) at Barry, South Wales, was set up to serve the varied and specialist demands of the scientist at sea. A fleet of three fully manned ocean going research ships, RRS Charles Darwin, RRS Discovery and RRS Challenger plus sea going technical staff and a wide range of marine research equipment provide for many of the needs of the physical, geophysical and biological oceanographer. Since a large proportion of the funds which allow RVS to operate comes from the Department of Education and Science it is not only the scientists from within NERC that have access to these facilities, but also UK University departments.

Strong links exist between NERC and many marine research organisations around the world and it has become a regular feature of the annual ship programmes that scientists from other countries take part in the cruise, or in some cases, use the ships with their own teams.

During the past few years there has been a rapidly growing interest in the earth/atmosphere processes and global climatic changes. This has resulted in a number of community research programmes being initiated. Programmes such as the British Ocean Flux Study and North Sea projects, EEZ surveys, Ocean Drilling programme, the future World Ocean Circulation experiment and the British Mid-Ocean Ridge Initiative are placing great demands on scientists, equipment and support vessel capabilities.

WINCHES ON RESEARCH VESSELS

Traditionally winches, wires and their associated sheaves have always been treated as individual components with little concern on their application. This approach was relatively safe when the loads being deployed were relatively light and less complex. In today's oceanography instrument packages have grown in size and are far more complex in their arrangements. Good examples of this are:-

1) the simple 1.2 litre water bottle casts and the CTD package no more than 600mm diameter standing 600mm high has now developed into a rosette/CTD assembly housing twelve 10 litre water sampling bottles, CTD instrument together with an array of clamp on devices such as transmissometers, fluorometers pingers, light sensors etc. 2 metres dia x 2 metre tall and weighing around 400kg.

2) The simple gravity corer weighing 500kg with 3 metre barrels to the more complex French "Stacor" using a head weight of 8 tonne capable of obtaining core sediments in excess of 30 metres.

With the soaring cost of ship time and instruments there is an urgent need to maximise the vessel's scientific time. These factors have placed additional stress on the research vessels machinery and handling equipment and given engineers unlimited scope for design and ingenuity in problem solving.

Because of this and because of future trends indicating larger more complex instrument packages, there is a need to take a detailed look at the facilities provided on our research vessels. When dealing with the evaluation of handling systems such as gantries, winches and wire systems, it is not always possible to achieve the calculated ideal operating conditions and a compromise is inevitable.

WINCH TYPES INSTALLED ON NERC VESSELS

Two designs of winch are currently employed on the RVS research vessels, the single drum direct pull and the double drum traction method, each with its own advantages and disadvantages. Fig 1.

SINGLE DRUM DIRECT PULL

These are currently used on all vessels for CTD/hydrographic operations and on the Charles Darwin and Challenger for deep ocean heavy duty winches. The design possesses two fundamental advantages:

i. the wire path can be termed as "simple".

ii. the machinery is "simple" in design.

The wire is fed onto the winch drum in a succession of turns and layers. With proper attention to drum groove design and spooling mechanism good layering can be achieved. This is of utmost importance when the cable is subjected to high payloads as any cross over of wires during spooling can result in severe deformation of the cable with consequential damage; this is particularly so in the case of conducting cables in which the core is very vulnerable. Interchanging of cables of different diameters can be performed, but resleeving of the drum barrel and gear ratio changes for the spooling mechanism will be necessary. Even then it will only be possible if the overall pitch length across the drum matches the width between flanges and the desired cable entry point.

The major disadvantage of this design is that the wire is permanently stored under tension and is in effect a "live cable". Due to the high stresses within the cable extremely high side loads can be generated and their resultant forces transferred to the side plates resulting in catastrophic failure if not correctly designed.

This retained tension causes considerable problems during wire changes due to the highly loaded lower layers and any attempt to remove these from the drum must be approached with extreme caution. The only safe way to tackle the problem is to employ a traction winch on shore to remove the cable so relieving the tension gradually during reeling. Another important factor when utilising a winch of this design is the careful selection of cables and it is essential that a good torque balanced cable is used to reduce the effects of birdcaging and catspawing. Fig 2.

A fundamental characteristic of the single drum winch is the change in working radius that occurs as the winch drum fills and empties. This effectively produces a varying working radius hence the available line pull and line speed will vary depending upon the fullness of the drum.

TRACTION WINCH

The double drum capstan provides powered drums with multiple rope grooves with the grooves of the second drum offset one half of a rope pitch in relation to the first. This allows a very high total wrap angle by reaving from drum to drum without producing axial friction movement of the rope which is inherent in the single drum traction winch (ships capstan).

The obvious difference between the drum winch and the traction winch is that the traction winch requires some means of pulling off the cable from the traction drum. A storage reel serves the purpose of providing the necessary back tension as well as cable storage.

The major advantages of this system is that the wire stored under a constant low tension and the traction winch provides a constant line pull.

There are disadvantages with the double drum capstan in that very high compressive loads are generated on the drums and the differential action between wraps of the rope can cause heavy and rapid uneven groove wear resulting in the amplification of warp string tensions between the barrels.

A number of variations on the traction winch principle are used to overcome the mentioned problems, these range from slip ring grooves in which the first grooves on the barrel are decoupled, a differential drive system, to the "Cobra" design of Kley France using independent 'puller' wheels. Fig 3.

CABLES USED ON RVS VESSELS

At present the vessels are equipped with a range of cables some of which have very specific uses others general purpose. To satisfy the varied requirements of biology, geology and chemistry it has been necessary to interchange cables which is time consuming and costly particularly if undertaken in some foreign port as the necessary winding device as well as the heavy cable has to be shipped.

CABLES CURRENTLY IN USE ARE:

Coring Wire

7000m x 16mm dia. 3 x 19 torque balanced Breaking Load 18.5 tonne.

Dredging Wire

10000m x 13mm dia. 6 x 19 dia. Breaking Load 13 tonne.

Conducting Cable

12000m x 13.6mm dia. Single conductor torque balanced. Breaking load 13.6 tonne.

Trawl Warp

15000m x tapered 14.5 to 21mm dia. 3 x 19 three sections torque balanced. Breaking load 13/18/21 tonne.

Coring Warp

9000m x tapered 14 x 18mm dia. 3 x 19 three sections torque balanced. Breaking load 14/18/20,

Deep Tow

10000m x 17.4mm dia single conductor. Torque balanced. Breaking Load 18 tonne.

Hydrographic

7000m x 6mm dia. 3 x 19 torque balanced. Breaking Load 2 tonne.

CTD Conducting Cable

7000m x 8mm dia single conductor, torque balanced. Breaking load 5 tonne.

CTD Conducting Cable

7000m x 9.5mm dia single conductor. Torque balanced. Breaking Load 7.5 tonne.

CTD Conducting Cable

6000m x 6mm dia. Single Conductor, torque balanced. Breaking load 2.5 tonne.

Hydrographic

7000m x 4mm dia. 6 x 19 construction. Breaking Load 1 tonne.

Plus auxiliary paired trawl warps on RRS Challenger. 3400m x 22mm dia.

At the time of construction of the Charles Darwin, due to financial constraints, it was decided to remove the existing winches from RRS Shackleton, the vessel which was being replaced, give them a major overhaul and install the equipment into the Darwin until such time that fundings could be obtained to fit new units.

In 1988 this extra cash seemed likely and an investigation took place to review the current winch technology and development. RVS had already set up working groups of scientists to produce statement of requirements for new vessels and this was used to identify the possible trends in equipment demands and subsequent deployment techniques which might be necessary.

The requirement grouped itself into three categories:-

a. Deep water deployment of heavy instruments such as corers, vibrocorers.

b. Deep towed instrument packages requiring special cable characteristics.

c. CTD/Hydrographic and "clean" sampling.

Using existing machinery, RVS had already reached its maximum capability for deep water piston coring using 2 tonne corers and the need to deploy heavier packages had impact on winch capability, cable strength and ships stability. It seemed that the logical approach, if we were to use current sampling devices, was to "gain" cable weight as useful operating margin. By changing to an Aramid cable we could effectively gain 4 tonnes on a 6000m deployment and so serious consideration was given to this approach. Investigations were conducted into suitable suppliers of aramid cables and discussion with existing users took place resulting in a contract being placed with Cousin Freres, France for a 25mm 40T cable.

Work was already underway to locate a suitable conducting cable for towed instrument packages in particular that for TOBI (1) and DASI (2) and a working group identified a Rochester type A301241 as the most suitable.

The third requirement was somewhat more difficult to resolve, we had already moved from 6 to 8 to 10mm cable and even the latest 10mm seemed to have a limited future. Due to financial constraints, RVS have taken the 10mm size as the standard for current work, but realise that developments in this area are necessary. There is also a conficting requirement for that of a "clean" system which would utilise Aramid type cables for STAP (3) and other chemistry work ideally constructed as a conducting cable.

1) *Towed Ocean Bottom Instrument*

2) *Deep Towed Active Source Instrument*

3) *Stand Alone Pump*

WINCH SPECIFICATION

The decision was taken to specify a winch design which could accommodate a range of wire sizes and to replace the direct pull level wind winches with traction type systems. Two systems would be built one to cater for four oceanographic cables, the other for three CTD/Hydro type cables. Brief specifications were:

OCEANOGRAPHIC WINCH

Wires :-	i)	1500m x 3 Section tapered
	ii)	8000m x 25mm Aramid
	iii)	10000m x 17.4mm Conducting
	iv)	7000m x 16.75mm Coring

Line pull	20 Tonnes
Test Load	25 Tonnes
Speed:	0.7m/sec @ 20 tonnes
	1.0m/sec @ 15 tonnes
	2.0m/sec @ 10 tonnes
Creep Speed:	0.01m/sec all loads

CTD/HYDRO WINCH

Wires:-	i)	9000m x 6mm hydrographic
	ii)	8000m x 10mm conducting
	iii)	7000m x 12mm Aramid

Line Pull	10 Tonnes
Test Load	12.5 Tonnes
Speed:	1.0m/sec @ 10 tonnes
	2.0m/sec @ 5 tonnes
Creep Speed:	0.01 m/sec all loads

DESIGN

The total system would comprise:

1 x Traction Unit 20t

1 x Traction Unit 10t

4 x Storage Drums Oceanographic

3 x Storage Drums CTD/Hydro

1 x Power Unit for storage drums (20t)

1 x Power Unit for storage drums (10t)

1 x Power unit for traction winches

2 x Inboard accumulators (20T & 10T)

2 x Outboard accumulators (20T & 10T)

Cable Metering system

20 TONNE TRACTION UNIT

The winch is a special capstan winch built with 5 independent in-line driving wheels. Each wheel is 1100mm dia and constructed as a laminate so providing 3 different grooves profiled to match the specified cables. Each wheel is driven by 1 or 2 hydraulic motors depending on torque requirements. Fig 7.

The wheels subjected to the high loads are fitted with slewring bearings to reduce bearing pressures.

This design eliminates the rope deviation between wheels and minimises sliding between rope and groove resulting in minimum wear and improved cable life. In addition each wheel is cantilevered from a main support frame providing a free access for overhanding cables onto the winch, no threading.

STORAGE DRUMS

These are 4 independent drums, hydraulically driven and controlled to provide a constant back tension, independent of layer, speed or direction of rotation. Each drum is fitted with removeable "Lebus" grooved shells to match the cables used. Each pair of drums are served by a scrolling mechanism mechanically clutched to the selected drum. To ensure that correct positioning is achieved during changes of cables an up/down counter is used to monitor the scroll shaft rotation providing accurate re-positioning. The counter is fitted with a memory device which retains the previous reading of scroll sheave position.

HYDRAULIC POWER UNITS

Three electro hydraulic power units are used:-

a) 300 KW unit available to drive the traction winches and consisting of:
   4 x 75 kW electric motors each driving a 280 litre/min hydraulic pump.
   2 x 11 kW electric motors each driving a 130 litre/min and a 16 litre/min hydraulic pump in tandem.

b) 2 x 37 KW units available to drive the storage drums and consisting of:

2 x 18.5kW electric motor each driving a 78 litre/min hydraulic pump.

ACCUMULATORS

Each traction winch has its own inboard accumulator to provide a constant back tension accommodating cable slack/high tensions which arise from the different response times between the storage drum and traction winches due to drum inertia. Control of this device is from load cells built into the arrangement.

Outboard compensation is also provided between the traction winch and gantry for each winch. This comprises a hydraulic cylinder fitted with a 4 sheave assembly so providing 6m of wire movement. Signals for this are derived using accelerometers fitted to the gantries and coupled to linear displacement transducers installed on the compensation cylinder which identify the amount of displacement necessary to compensate for the movement of the vessel at the head of the gantry.

CONTROLS

Operation of cable winches is from main station in the winch control cabin or from remote positions at the winch itself or the working deck. The main control is provided with the necessary instrumentation for operation but the remote units give only motion levers as they are intended for use during the air/sea deployment or cable winding.

To assist the operator in ensuring that the various winch component assemblies are operating and that cables are correctly running video monitors are provided. These view the selected traction winch, storage drum, inboard and outboard compensators. The full console 'Fig 8' is fitted with:

1 Gantry selection (for compensation)

2 Control console selection

3 Control configuration

4 Compensation selected

5 Auto braking on/off

6 Cable overload payout on/off

7 System pressure adjustment (preset to cable SWL)

8 Motion control hall/veer

The system is designed with flexibility in mind and various operational parameters can be changed. The equipment contains three logic micro processors which provide control for all the information for hydraulic control and sequencing. A facility is available to limit each cable tension both inboard and outboard so matching the cable mechanical limitations. An auto payout function is provided should the cable foul and yield point be approached.

CABLE METERING

Although the winch system is provided with a metering facility for load, wire out and wire rate, it was fitted solely to serve as a backup and is displayed on a small "portable" console, normally stored in the main control pedestal.

Due to numerous problems arising on the NERC vessels with various attempts at providing a reliable cable metering arrangement, it was decided to design a "stand alone" system based around an AT286 style computer which would interface with the new winches and those on other vessels.

The equipment consists of a main control station with keyboard, monitor and computer all housed in a 19" rack, complete with an uninterrupted power supply. This is linked to remote monitors at required locations around the vessel such as bridge and winch control rooms. Keypad for alarm resets and chart recorder connections are also incorporated.

Interface units are located between the winches and the processor to perform the signal conditioning for the input data that carries from the monitoring devices such as load cells, encoders and switches. Each winch has its own interface box.

The software has been written to provide a range of facilities for the engineering technician in the ~~critical~~ initial winch setup and future maintenance and to provide information for the scientific user. It is menu driven commencing with the Main Display, Fig 10, from which 6 sum-menus can be addressed, these are:

1 Logging Display

2 Cruise Information

3 Operational Data

4 Calibration Data

5 Absolute Data

6 Reference and Data files

7 Exit to DOS

The main logging display 'Fig 11' provides the operator with all the necessary data for deployment

Cable Identification	
Cable Out,	(metres)
Rate	(m/min)
Tension	(tonnes)
Back Tension	(kg)
% Power	
Water Depth	(metres)
Heel Angle	(degrees)
Disc 1	% capacity remaining
Disc 2	% capacity remaining
Cable SWL	tonnes
Cable Yield	tonnes
Breaking Load	tonnes
Safety factor	
Max Bax Tension	Kg

Max ~~Hell~~ Heel Angle degrees

Max Power %

Station No

Date

Time

The <u>information menu</u> allows the input of cruise information such as station reference, line number etc.

The <u>operational menu</u> allows alarm settings to be fixed, logging rates, keypad selection depth entry etc.

The <u>calibration menu</u> provides the cable selection of any of the seven cables and creates a sub sub menu to permit the input of the cable calibration factors such as max tensions, counts per metre, back tension setting etc.

The <u>absolute menu</u> provides a sub sub menu to permit the cable parameters to be fixed safe working load, breaking load, safety factors etc.

The <u>reference and data files menu</u> - these provide the data files for the cable in use recording header information eg cruise number, station, line reference etc and time stamped data such as cable tension, cable out, rate, back tension etc and event files for each winch use logging header information and time stamped events such as peak tension, alarm type set and cleared.

VESSEL INSTALLATION

The installation into the Charles Darwin poses difficult problems as the spaces are already defined with the ability only to ~~change a few bulkheads~~ make minor changes. However, a solution was found and the proposals is to house the main storage drums in the present winch room, together with the hydraulic power packs, the traction winches in a container located on the boat deck with the compensation gear raft mounted sitting on top of the container. Leads from the sheaves are then directed to the starboard and stern gantries.

The Discovery equipment will be housed in the winch room with compensation equipment raft mounted on the deck providing good leads to both gantries.

An inportant point which should not be overlooked and has serious implications is that of the extra weight and vessels stability as indeed in the case of both RVS vessels, moreso the Darwin, ~~this has caused numerous headaches.~~

FUTURE

It is difficult to predict the future needs for handling systems during the last decade, RVS have moved from 10T main winch systems to 30 Tonne line pull, from deck mounted conventional fishing winches to sophisticated traction systems. ~~Factors that are~~ It is inevitable are that the scientist is going to demand larger volumes, faster deployments and recovery, deeper activities.

RVS hope to have provided the scope to meet these requirements with a fully flexible arrangement capable of being interfaced to a PC for programmed control and able to cope with a wide range of cables. During 1991-92 it is planned to investigate the developments in conducting and fibre optic aramid cables as already the demand is there. It is the writers view that the limitation will not be technology, but the capability of the vessel itself in its performance, stability and sea keeping ability.

PROGRESS ON GANTRIES

To support the near traction winch systems, RVS have been investigating various gantry geometry in order to provide short pendular retrieval of packages without the need to continually rotate the winch. This is of particular advantage when using the traction style of winches. Because of the need to maintain outboard tension at all times, an independant cable puller is installed prior to the lead over the gantry. This is used only during the deployment and recovery phase on the deck.

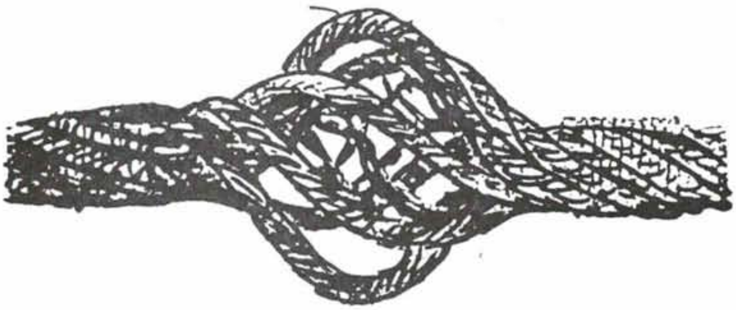
EBSD8.IGC

1 October 1990

Multistrand Rope birdcaged due to torsional unbalance.

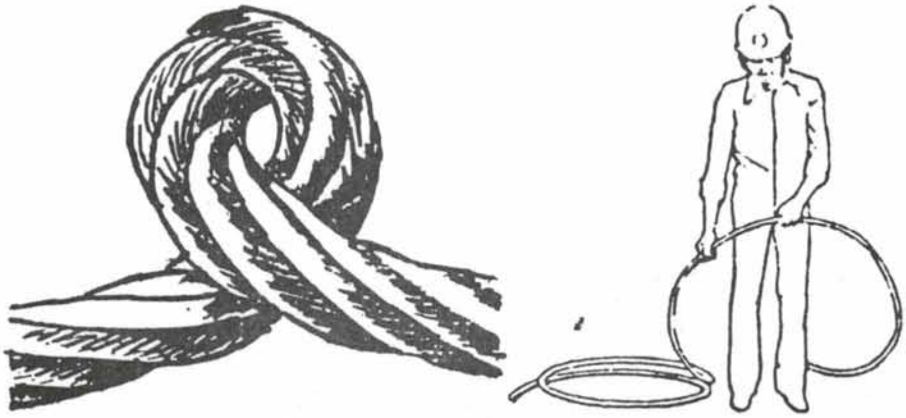
Typical of build up at anchored end of rope.

Birdcage which has been forced through a tight sheave



Birdcage caused by sudden release of tension and resultant rebound from overloaded condition

Birdcaging Effects



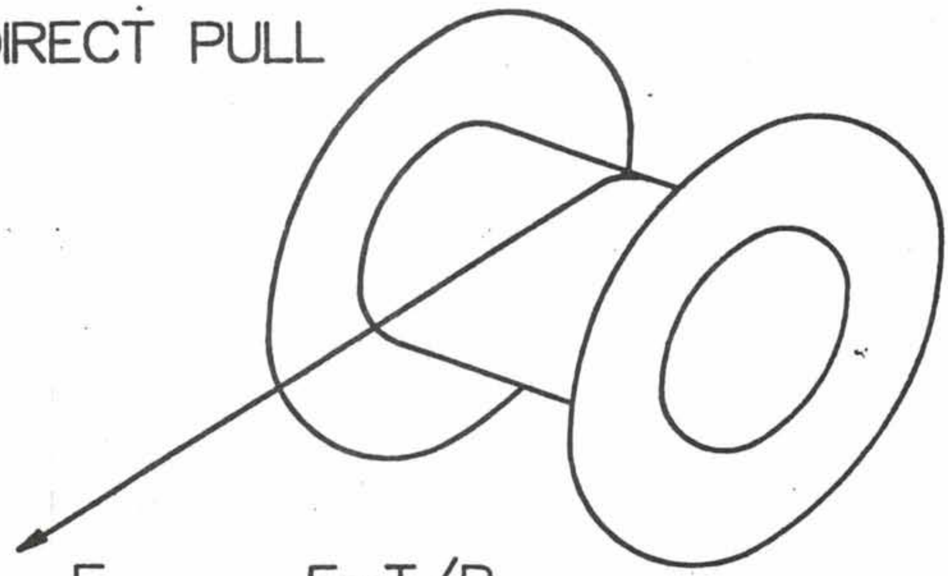
Open kink caused by improper handling and uncoiling.

Core protrusion as a result of torsional unbalance caused by shock loading.

Protrusion of inner core resulting from shock loading

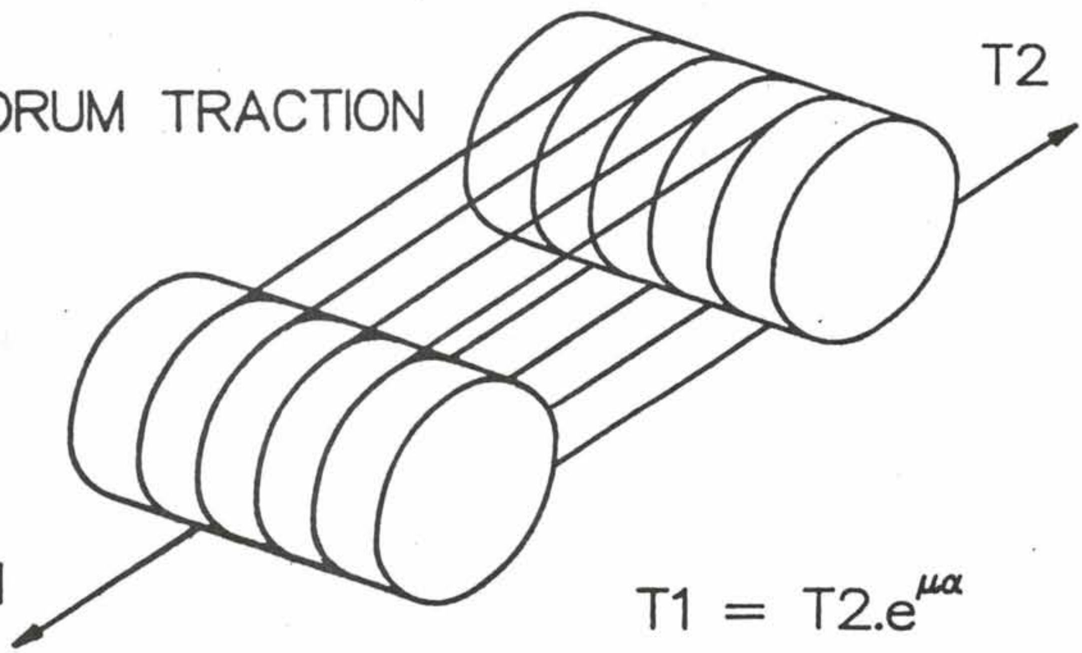
Wire Damage

DIRECT PULL



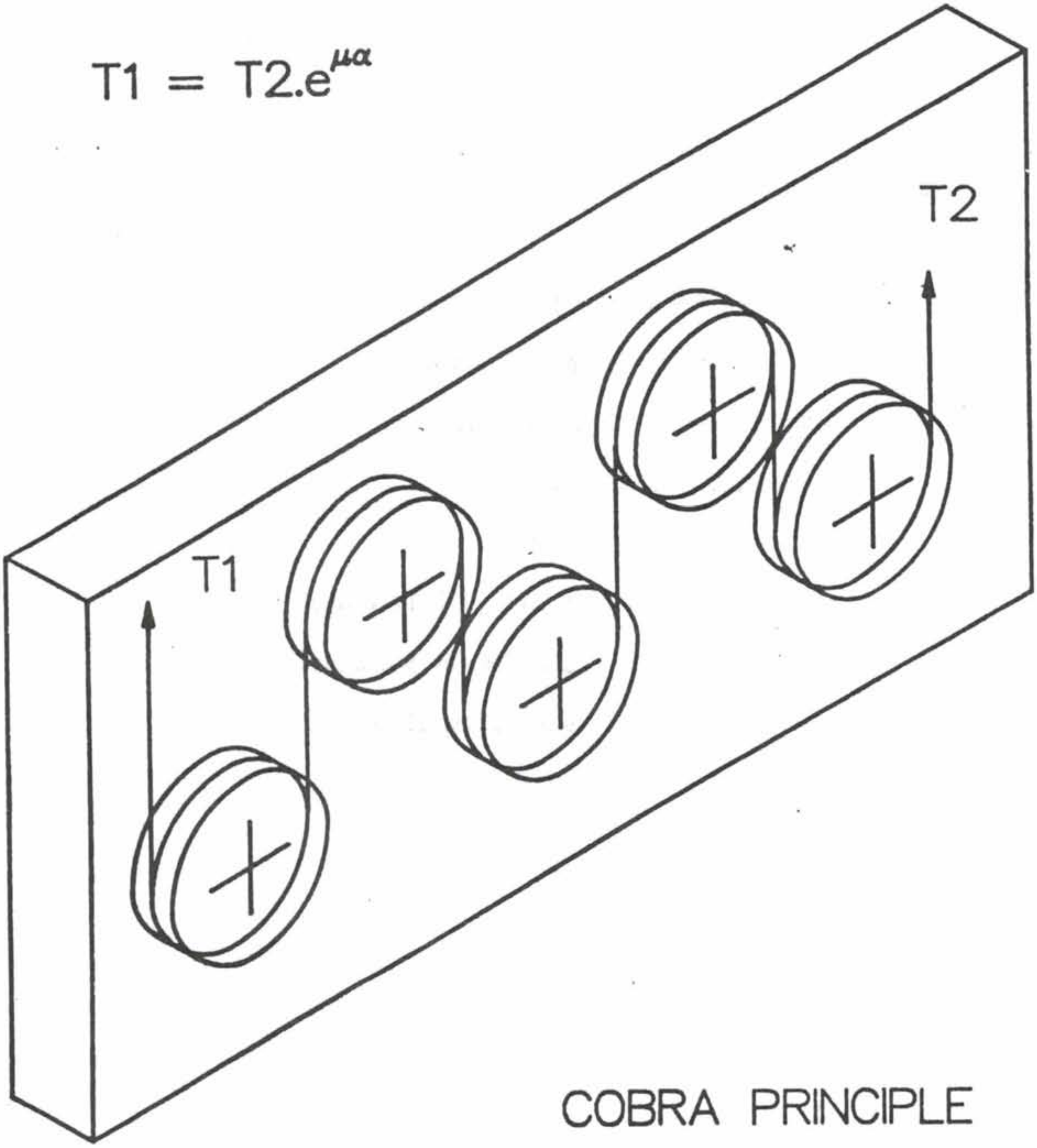
$F=T/R$

2–DRUM TRACTION



$T1 = T2.e^{\mu\alpha}$

$$T1 = T2.e^{\mu\alpha}$$



COBRA PRINCIPLE

CTD/HYDRO WINCH

Wires:-	**i)**	**9000m x 6mm hydrographic**
	ii)	**8000m x 10mm conducting**
	iii)	**7000m x 12mm Aramid**

Line Pull	**10 Tonnes**
Test Load	**12.5 Tonnes**
Speed:	**1.0m/sec @ 10 tonnes**
	2.0m/sec @ 5 tonnes
Creep Speed:	**0.01 m/sec all loads**

OCEANOGRAPHIC WINCH

Wires :-	i)	1500m x 3 Section tapered
	ii)	8000m x 25mm Aramid
	iii)	10000m x 17.4mm Conducting
	iv)	7000m x 16.75mm Coring

Line pull 20 Tonnes

Test Load 25 Tonnes

Speed: 0.7m/sec @ 20 tonnes

1.0m/sec @ 15 tonnes

2.0m/sec @ 10 tonnes

Creep Speed: 0.01m/sec all loads

CABLES CURRENTLY EMPLOYED

USE	LGTH x DIA	CONSTRUCTION	B/LOAD
CORING	7000 x 16mm	3 x 19 TB	18.5
DREDGING	10000 x 13mm	6 x 19 DYEX	13.0
CONDUCTING	12000 x 13mm	SINGLE COND. TB	13.6
TRAWLING	15000 x TAPERED 14.5 to 21.0 mm	3 x 19 TB	13/18/21
DEEP TOW	10000 x 17.4mm	SINGLE COND TB	18.0
HYDROGRAPHIC	7000 x 6mm	3 x 19 TB	2.0
CTD	7000 x 8mm	SINGLE COND TB	5.0
CTD	7000 x 9.5mm	SINGLE COND TB	7.5
CTD	6000 x 6mm	SINGLE COND TB	
HYDROGRAPHIC	7000 x 4mm	6 x 19	1.0

CABLES CURRENTLY EMPLOYED

USE	LGTH x DIA	CONSTRUCTION	B/LOAD
CORING	7000 x 16mm	3 x 19 TB	18.5
~~DREDGING~~	~~10000 x 13mm~~	~~6 x 19 DYEX~~	~~13.0~~
CONDUCTING	12000 x 13mm	SINGLE COND. TB	13.6
TRAWLING	15000 x TAPERED 14.5 to 21.0 mm	3 x 19 TB	13/18/21
DEEP TOW	10000 x 17.4mm	SINGLE COND TB	18.0
HYDROGRAPHIC	7000 x 6mm	3 x 19 TB	2.0
~~CTD~~	~~7000 x 8mm~~	~~SINGLE COND TB~~	~~5.0~~
CTD	7000 x 9.5mm	SINGLE COND TB	7.5
~~CTD~~	~~6000 x 6mm~~	~~SINGLE COND TB~~	
~~HYDROGRAPHIC~~	~~7000 x 4mm~~	~~6 x 19~~	~~1.0~~

DESIGN

The total system would comprise:

1 x Traction Unit 20t

1 x Traction Unit 10t

4 x Storage Drums Oceanographic

3 x Storage Drums CTD/Hydro

1 x Power Unit for storage drums (20t)

1 x Power Unit for storage drums (10t)

1 x Power unit for traction winches

2 x Inboard accumulators (20T & 10T)

2 x Outboard accumulators (20T & 10T)

Cable Metering system

Fig 5a

HYDRAULIC POWER UNITS

Three electro hydraulic power units are used:-

a) 300 KW unit available to drive the traction winches and consisting of:

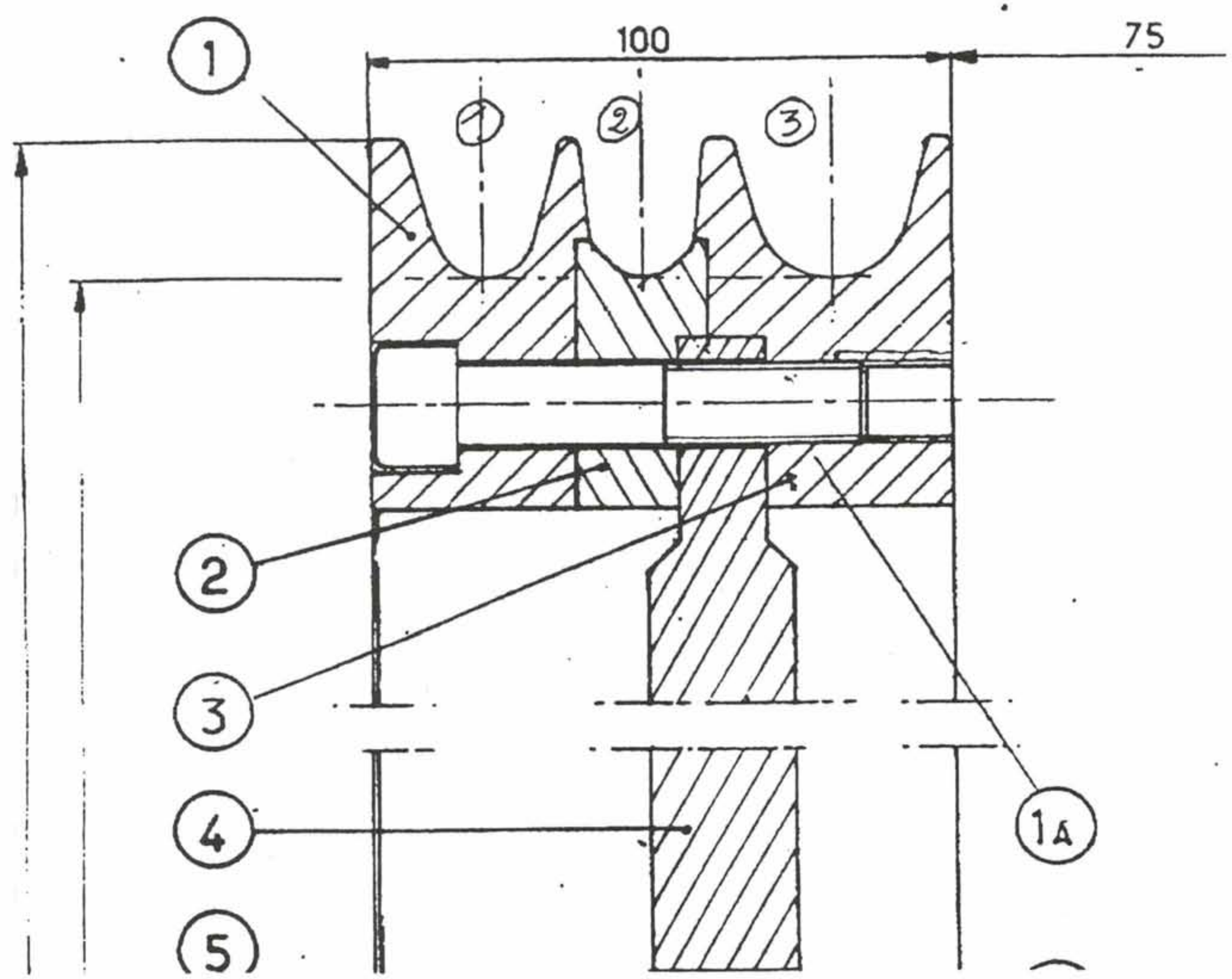
4 x 75 kW electric motors each driving a 280 litre/min hydraulic pump.

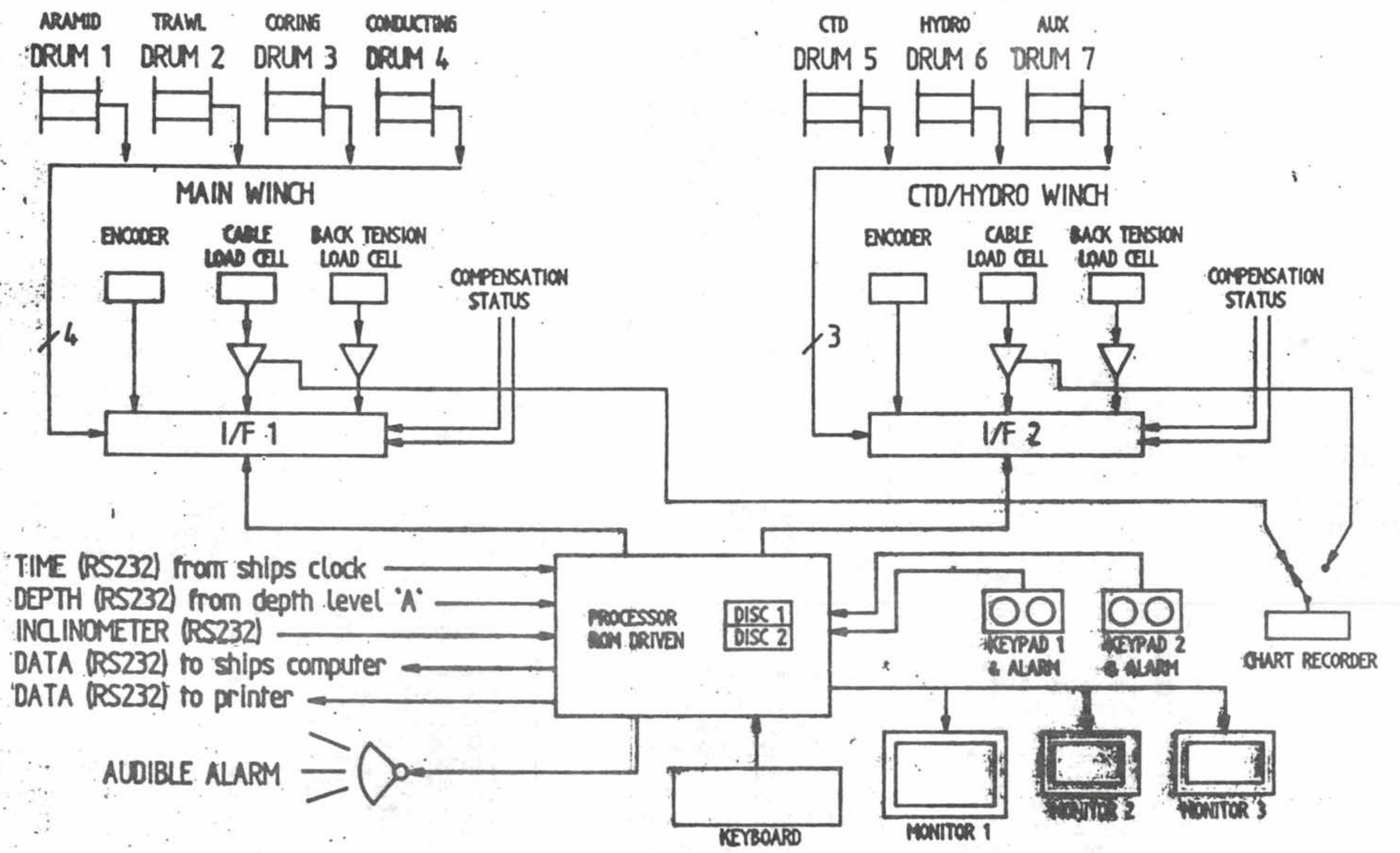
2 x 11 kW electric motors each driving a 130 litre/min and a 16 litre/min hydraulic pump in tandem.

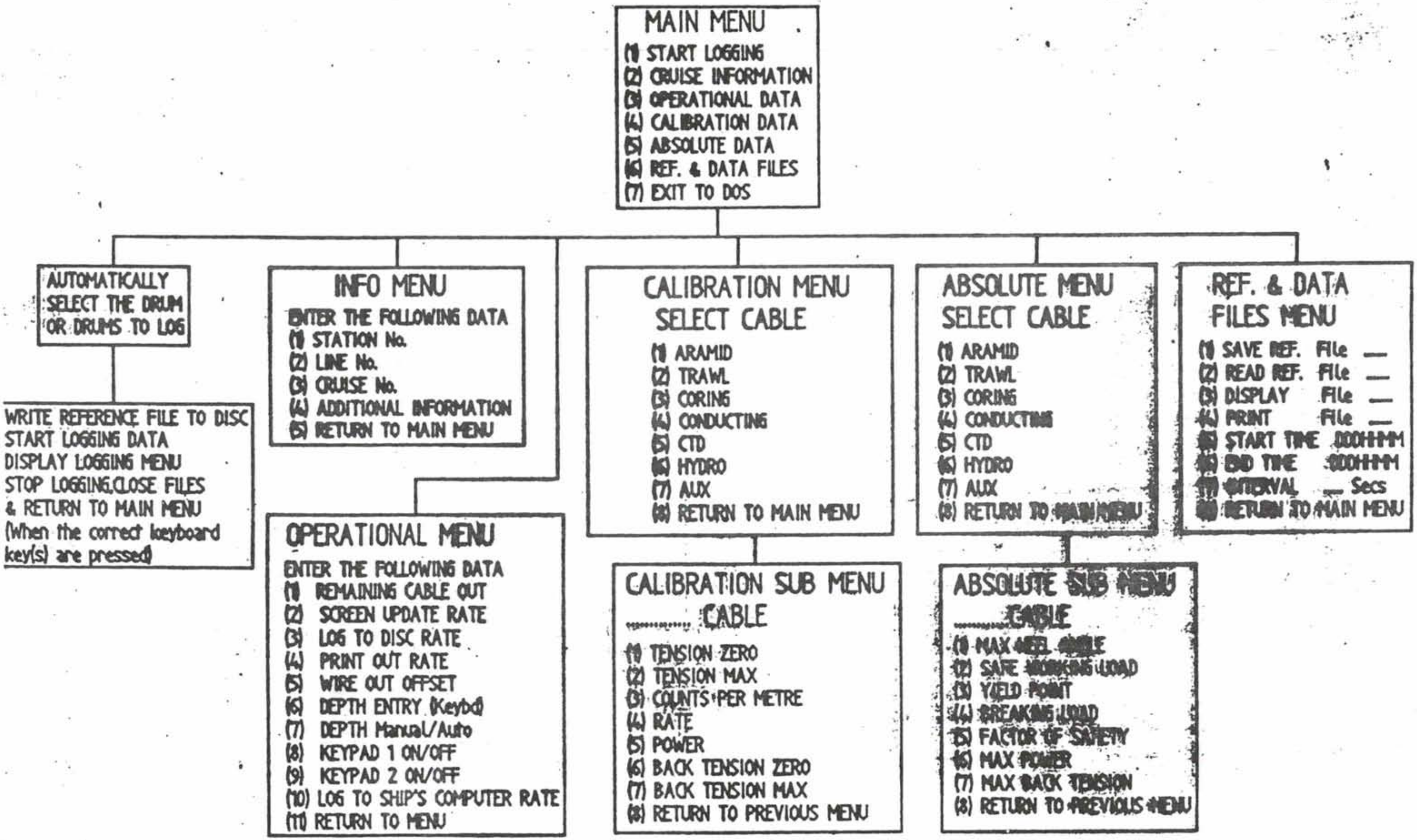
b) 2 x 37 KW units available to drive the storage drums and consisting of:

2 x 18.5kW electric motor each driving a 78 litre/min hydraulic pump.

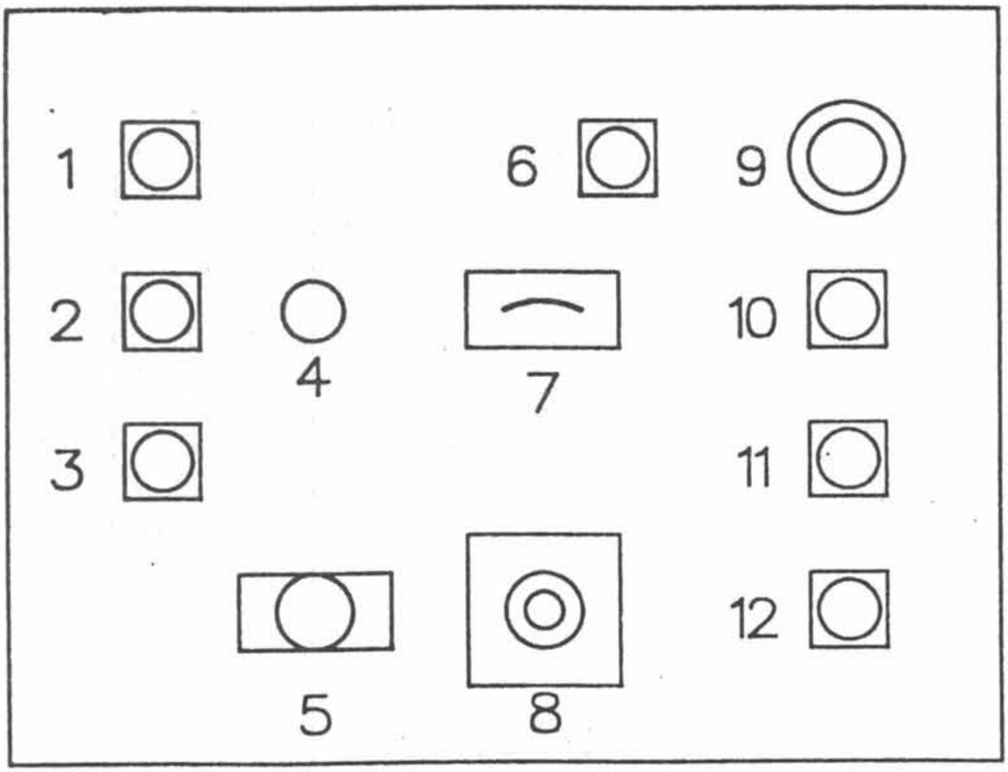
POULIE N° 3 ø 940/990 (moteur MS 35)



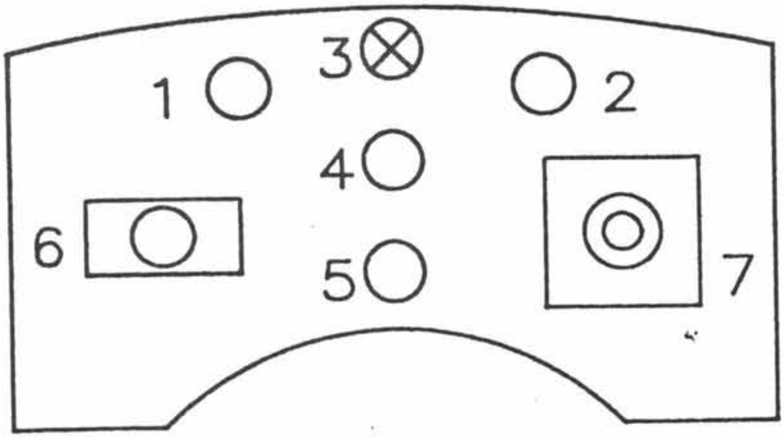

ARAMID
DRUM 1
TRAWL
DRUM 2
CORING
DRUM 3
CONDUCTING
DRUM 4
CTD
DRUM 5
HYDRO
DRUM 6
AUX
DRUM 7
MAIN WINCH
CTD/HYDRO WINCH
ENCODER
CABLE LOAD CELL
BACK TENSION LOAD CELL
COMPENSATION STATUS
4
3
I/F 1
I/F 2
TIME (RS232) from ships clock
DEPTH (RS232) from depth level 'A'
INCLINOMETER (RS232)
DATA (RS232) to ships computer
DATA (RS232) to printer
PROCESSOR ROM DRIVEN
DISC 1
DISC 2
KEYPAD 1 & ALARM
KEYPAD 2 & ALARM
CHART RECORDER
AUDIBLE ALARM
KEYBOARD
MONITOR 1
MONITOR 2
MONITOR 3



MAIN MENU
(1) START LOGGING
(2) CRUISE INFORMATION
(3) OPERATIONAL DATA
(4) CALIBRATION DATA
(5) ABSOLUTE DATA
(6) REF. & DATA FILES
(7) EXIT TO DOS
AUTOMATICALLY SELECT THE DRUM OR DRUMS TO LOG
WRITE REFERENCE FILE TO DISC
START LOGGING DATA
DISPLAY LOGGING MENU
STOP LOGGING,CLOSE FILES
& RETURN TO MAIN MENU
(When the correct keyboard key(s) are pressed)
INFO MENU
ENTER THE FOLLOWING DATA
(1) STATION No.
(2) LINE No.
(3) CRUISE No.
(4) ADDITIONAL INFORMATION
(5) RETURN TO MAIN MENU
OPERATIONAL MENU
ENTER THE FOLLOWING DATA
(1) REMAINING CABLE OUT
(2) SCREEN UPDATE RATE
(3) LOG TO DISC RATE
(4) PRINT OUT RATE
(5) WIRE OUT OFFSET
(6) DEPTH ENTRY (Keybd)
(7) DEPTH Manual/Auto
(8) KEYPAD 1 ON/OFF
(9) KEYPAD 2 ON/OFF
(10) LOG TO SHIP'S COMPUTER RATE
(11) RETURN TO MENU
CALIBRATION MENU
SELECT CABLE
(1) ARAMID
(2) TRAWL
(3) CORING
(4) CONDUCTING
(5) CTD
(6) HYDRO
(7) AUX
(8) RETURN TO MAIN MENU
CALIBRATION SUB MENU
.... CABLE
(1) TENSION ZERO
(2) TENSION MAX
(3) COUNTS PER METRE
(4) RATE
(5) POWER
(6) BACK TENSION ZERO
(7) BACK TENSION MAX
(8) RETURN TO PREVIOUS MENU
ABSOLUTE MENU
SELECT CABLE
(1) ARAMID
(2) TRAWL
(3) CORING
(4) CONDUCTING
(5) CTD
(6) HYDRO
(7) AUX
(8) RETURN TO MAIN MENU
ABSOLUTE SUB MENU
.... CABLE
(1) MAX
(2) SAFE WORKING LOAD
(3) YIELD POINT
(4) BREAKING LOAD
(5) FACTOR OF SAFETY
(6) MAX POWER
(7) MAX BACK TENSION
(8) RETURN TO PREVIOUS MENU
REF. & DATA FILES MENU
(1) SAVE REF. File
(2) READ REF. File
(3) DISPLAY File
(4) PRINT File
(5) START TIME DDDHHMM
(6) END TIME DDDHHMM
(7) INTERVAL Secs
(8) RETURN TO MAIN MENU



1.....TEST LAMPS
2.....COMPENSATION
3.....COMPENSATION
4.....QUICK STOP
5.....HYD PRESSURE
6.....CONFIRM CONTROL
7.....PRESS INDICATOR
8.....MOTION CONTROL
9.....EMERG STOP
10...SELECT GANTRY
11...MANUAL BRAKE
12...AUTO PAYOUT



1......QUICK STOP
2.....CONFIRM CONTROL
3.....RUN LIGHT
4.....BRAKE ON/OFF
5.....AUTO PAYOUT

----- CABLE

CABLE OUT	00000	Metres
RATE	(Mode) 000	M/Min.
TENSION	00.00	Tonnes
BACK TENSION	0000	Kg

POWER	DEPTH	HEEL
000 %	0000 M	DD Deg

DISC 1 000 % Left
DISC 2 000 % Left

CABLE SWL	00.0 Tonns
CABLE YEILD	00.0 Tonns
BREAKING LOAD	0C.0 Tonns
SEFETY FACTOR	NN
MAX BACK TENSION	0000 Kg
MAX HEEL ANGLE	00 Deg
MAX POWER	NN %

COMPENSATION
STANDBY

STATION --------- DATE DD-MM-YY TIME HH:MM:SS

Note

(1) The CABLE in use shall be replaced by 'POWER FAIL' when the system is powered from battery backup.
(2) (Mode) shell be replaced with either HAUL or VEER.
(3) Analogue barograph of tension to be displayed at a suitable position.

N.E.R.C. RESEARCH VESSEL SERVICES
James Clark Ross (Winch monitoring system)
MAIN LOGGING DISPLAY (one winch)
C0700501

RVOC Safety and Orientation Video
Draft Outline - 10/3/90

- Welcome aboard/introduction
  - Safety philosophy
  - Accident causing factors
    - shipboard environment
    - equipment and materials
    - training and experience
    - communications
  - Accident prevention
    - management and supervisory commitment
    - Safety awareness
    - Training
- Orientation
  - Indoctrination
    - either this video or equivalent lecture
    - followed by drills
  - Station Bill
  - General safety precautions
- Seamanship/Deck and Science Operations
  - Small boats
  - Loading and stowage
  - Deck Operations
    - Deck Machinery
    - Frames
    - General rigging
    - General Safety precautions
  - Science Operations
    - Over the side work
    - entanglement
    - safety precautions
- Health and Medical
  - Introduction
    - Attitude
    - Rest
    - Diet
    - Personal hygiene
    - Drugs and Alchohol
    - Proper Clothing
  - Ship Sanitation
  - Medical
    - General precruise medical requirements
    - General information
    - First Aid Kits
    - Seasickness
    - Sunburn
    - First Aid
    - Hypothermia

RVOC Safety and Orientation Video
Draft Outline - 10/3/90

- Lifesaving Equipment and Survival Procedures
  - Introduction
  - Primary Lifesaving Equipment
    - Lifeboats
    - Inflatable life rafts
    - Buoyant Apparatus
    - Rescue boat
  - Secondary Lifesaving Equipment
    - Lifejackets
    - Ring lifebuoys
    - Immersion (exposure) suits
    - Work vests
    - Thermal Protective Aids
  - General Lifesaving Equipment and Information
    - Distress signals
    - Line throwing appliance
    - Epirb
  - Survival Procedures
    - General
    - Abandon Ship
    - Training
- Fire Prevention and Control
  - Introduction
  - Prevention
  - Classification of Fire
  - Firefighting Equipment
    - Portable fire extinguishers
      - Water
      - CO_2
      - Dry
      - Halon
    - Semi portable extinguishers
    - fixed fire extinguishing systems
  - Combating the fire
    - Intitial procedures
    - Precautions in determining fire location
- Stability and Watertight integrity;
  - Stability
  - Watertight integrity
- Electrical Systems & Equipment
  - Introduction
  - Ungrounded electrical systems
  - Personal/scientific equipment
  - Electrical safety precautions
- Engineering Safety and Practices
  - Introduction
  - Fueling
  - Hotwork
  - Confined spaces

RVOC Safety and Orientation Video
Draft Outline - 10/3/90

- Hazardous Materials
  - Introduction
  - Protection
    - Hazard Removal
    - Hazard containment
    - Personal protective devices
  - Laboratory Chemicals
  - Reactivity
  - Compressed gases
  - Paints and Solvents
  - Radioactive Material
  - Marine Sanitation Devices
  - Sources of Information
- Summary
  - Overview
  - reference to safety training manual, Safety regulations and Shipboard procedures or manual

Draft UNOLS Shipboard Safety Standards

15: Diving Operations

15.0 Policy: Scientific diving is a normal part of oceanographic research vessel operations. Such diving conducted from a University National Ocean Laboratory System (UNOLS) vessel must be under the auspices of a diving program that meets the minimum American Academy of Underwater Sciences' (AAUS) *Standards for Scientific Diving Certification and Operation of Scientific Diving Programs*.. Operators without a program may accommodate scientific diving cruises which are under the auspices of an institution with such a diving program.

15.1 Diving Procedures, Rules and Regulations: For all cruises a single lead institution's campus diving administration will be designated. This is usually accomplished by agreement of all campus diving administrations involved. Items which refer to the campus diving administration may, in fact, be the concern of the Diving Safety Officer according to the practices of the institutions involved. The procedures, rules and regulations that govern the diving operation are those of the designated lead institution, subject to the approval of the operator's Marine Office.

15.2 Cruise Planning: In a timely fashion prior to the cruise:

1) The Principal Investigator will insure that a cruise dive plan is supplied to his or her campus diving administration who will forward the cruise plan, once approved, to the lead institution's campus diving administration. The dive plan, prepared in a standard format includes: diving credentials for all diving members of the scientific party, detailed operational plans, emergency plans including accident management and emergency evacuation protocols, a list of needed medical supplies, a specified quantity of medical grade oxygen with a positive pressure demand delivery system, and required diving support equipment (e.g., small boats).

2) The lead institution's diving administration will, after approving this plan, forward it to the operator's Marine Office.

15.3 Cruise Personnel:

1) The Master has responsibility for the safety of all activities aboard including diving (Section 13.4).

2) The Chief Scientist is responsible for the co-ordination and execution of the entire scientific mission (Section 13.5).

3) The Principal Investigator of the diving project (who may or may not be the Chief Scientist) is responsible for the planning and co-ordination of the research diving operations.

4) The On-Board Diving Supervisor will be proposed by the Principal Investigator and approved by the lead institution's diving administration. The On-Board Diving Supervisor is responsible for the execution of the research diving operations in accord

with the cruise dive plan. He or she has the authority to restrict or suspend diving operations and alter the cruise dive plan in consultation with the Master and the Principal Investigator/Chief Scientist. The On-Board Diving Supervisor's responsibilities include:

A) Meeting with the Master and Chief Scientist to review the cruise dive plan and emergency procedures prior to diving.

B) Remaining in regular communication with the Master on the progress of the research diving operation.

C) Assuring that both the lead and operating institution's diving manual are available to the scientists and crew aboard the vessel.

D) Inspecting high pressure cylinders and breathing air compressors to assure that they meet the lead institutions' standards.

5) Research Divers must recognize their individual responsibility for their safety.

Small Boats and Small Boat Operators: Are There Adequate Rules and Guidelines for the Use of Small Boats Launched From Research Vessels?

Prepared by Tim Askew

The primary issue is whether or not adequate rules and guidelines presently exist in the UNOLS Shipboard Safety Standards, the RVOC Safety Training Manual, and/or the *AAUS Standards for Scientific Diving Certification and Operation of Scientific Diving Programs* covering the use by divers of small boats launched from research vessels.

Specific questions are:

1) Are diving-related small boat standards needed?
2) If so, what should these standards cover?
3) What types of small craft are best for the diver/ship?
4) What qualifications should a boat operator have?
5) Should the boat operator be a crew member, a member of the science party, and/or a diver?

Question 1: Are diving-related small boat standards needed?

The consensus is that rules and regulations exist, but these are not consistent or consolidated in one easy format. Most institutions have a manual with a section on small boats, normally outlining small boat operations, boat operator requirements, U.S. Coast Guard required equipment and safety procedures. These procedures often pertain to land-based operations and sometimes ignore small boats launched from larger vessels.

Most vessel operators have rules and regulations pertaining to small boat operations. These are written and unwritten, and are slightly different for each organization. There seems to be a wide range of procedures when it comes to scuba diving activities conducted from small boats launched from larger vessels either in the open oceans or in more protected areas.

The operators, at the workshop, recommend basic written standards pertaining to all small boat operations especially diving-related ones. In addition to these standards, each organization might have certain rules that only pertain to them or their operation.

Question 2: If so, what should these standards cover?

Small boat standards should cover all aspects of small boat operations including the following:

A) Operator Requirements

1) Certification (i.e., U.S.C.G., institutional, other).
2) At sea check-out for operator consisting of launch and recovery, radio operation, emergency procedures, tending divers, approaching another vessel, etc.

3) Show proficiency in establishing relative position of the boat position by using available navigational aids (e.g., use of charts, compass, LORAN, etc.)
4) Demonstrate proficiency with all pertinent operational and safety equipment.
5) Indicate ability to use and negotiate expected environmental features (e.g., negotiate kelp beds and coral reefs, read water colors and depths).
6) Demonstrate expertise in following divers (e.g., following diver bubbles, float lines, etc.).

B) Operational Procedures

1) Launch and recovery

a) Diving equipment in or out of boat during launch and recovery.
b) Operator in or out of boat or skiff during launch and recovery. If so, the tackle must be man-rated.

2) Divers climbing in or out of small boat from mother vessel with gear on or off.
3) Divers entering or exiting the water, to or from a small boat with engine running or not running.
4) Lifejackets for operator and/or divers.

a) Buoyancy compensators, wetsuits and drysuits as substitutes for lifejackets.
b) Small boat size determines whether or not lifejackets can be carried (i.e., not enough room along with diving gear).

5) Radio Communications

a) Reporting when divers submerge and resurface.
b) Reporting if something looks amiss.
c) Reporting status on a predetermined schedule.

6) Special Requirements

a) Blue-water diving
b) Diving out of sight of mother ship
c) Cold water diving
d) Operating in low visibility conditions: fog, haze, and night operations or any other condition that may reduce or hinder line-of-sight visibility.

7) Plans, Dive & Float: Generally up to diving party to fill out and have approved prior to leaving the mother ship; serves as notification to vessel Master that small boat will be required and where it is going.

8) Check List: Used by operator to ensure boat's operational status and presence of safety equipment.

9) Weather report and/or status, including sea conditions.

10) Emergency Procedures

a) Safety Equipment: could include any or all of the following: Radar reflector; Strobe lights; VHF radio with RDF (radio direction finder); Mylar Balloons; EPIRBs (Emergency Position Indicating Radio Beacons).
b) Method or procedure of recalling divers to surface.
c) Assistance to injured diver.
d) Disabled boat.
e) Loss of communications.

Question 3: What types of small craft are best for the diver/ship?

Most operators and divers feel that the inflatable boat is the most suitable for scuba diving operations. The most desirable inflatable is the hard bottom version, which provide a very stable platform. In addition, inflatable boats can take a considerable amount of abuse when alongside the mother vessel. Many operators use small to medium size *Boston Whaler*-type boats to support diving operations. These boats are adequate in most cases, and many vessels carry two boats: one inflatable and one *Boston Whaler*-type. Research divers in cold waters may require a larger boat due to the bulky nature of their protective suits and the amount of lead needed to offset their suits' buoyancy.

Engine/drive designs are available that improve on the relative hazards of propellers, such as jet drives or a protective shroud around a regular propeller. These designs should be considered whenever a motor or boat is replaced.

Question 4: What qualifications should a boat operator have?

Reference Question 2. In addition, qualifications may be determined by operating organization.

Question 5: Should the boat operator be a crew member, a member of the science party, and/or a diver?

The majority of the time, the boat operator is a member of the ship's crew, and therefore the Master of the vessel is assured of his/her qualifications. If a member of the science party is designated as a small boat operator, he/she must be able to demonstrate small boat operator qualifications to the satisfaction of the vessel Master. It is desirable, but not required that the boat operator be a diver. If the operator is a diver, participation in diving operations should not allow leaving the small boat unattended.

Conclusions:

There appear to be two distinct views concerning small boat activities: one is the vessel operator/Masters' point of view, the other the scientists/users' point of view. The Master's concerns are centered around the small boat operator's qualifications, whereas operators from the user's organization may be fully qualified, yet not possess a document stating so. The scientists/users in many cases are competent and qualified small boat operators having been trained by their own organizations. However, their requirements may or may not meet the ship operating organization's requirements. Some science groups furnish their own boats and operators while conducting science missions from another organization's vessel, and in most cases their members do not possess a document stating that they are qualified small boat operators. This leaves the Master in the position of having to decide whether or not to accept a verbal claim that a person is qualified.

UNOLS vessels routinely conduct small boat operations. Each organization should have rules and regulations in place, and while many are similar, none are the same. There is a need for a common set of rules that all organizations can either follow or use as guidelines to further supplement their own regulations. These basic guidelines should be incorporated into the UNOLS Shipboard Safety Standards and/or the RVOC Safety Training Manual.

RESEARCH VESSEL OPERATORS COUNCIL
CHRONOLOGICAL LIST OF MEETINGS

YEAR	DATE(S)	INSTITUTION/FACILITY	LOCATION
1962	April 25	U. S. Coast Guard Headquarters	Washington, DC
	May 17-18	Department of Labor	Washington, DC
	June 5	American Chemical Society	Washington, DC
1963	June 4	Merchant Marine Institute	New York, NY
1964	Jan. 9	Woods Hole Oceanographic Institution	Woods Hole, MA
1965	Feb. 9-10	Institute of Marine Science University of Miami	Miami, Florida
1966	April 21-22	Statler Hilton	Washington, DC
1967	April 12-13	National Academy of Science	Washington, DC
1968	Feb. 15-16	Scripps Marine Facilities Division	San Diego, CA
1969	March 20-21	U. S. Naval Academy Chesapeake Bay Institute	Annapolis, MD
1970	April 30-May 1	University of Washington	Seattle, WA
1971	Oct. 20	Lamont Doherty Geological Observatory	Palisades, NY
1972		Marine Technology Society	Washington, DC
1973	Nov. 27-28	Texas A&M Marine Facility	Galveston, TX
1974	Nov. 20	Oregon State University	Newport, OR
1975	Oct. 21-22	Lathem Smith Lodge Peterson Boat Works	Sturgeon Bay, WI
1976	Nov. 30-Dec. 1	Sweet Meadows Inn University of Rhode Island	Narragansett, RI
1977	Nov. 1-2	Woods Hole Oceanographic Institution	Woods Hole, MA
1978	Oct. 2	Queen Mary	Long Beach, CA
1979	Oct. 22-23	Scripps Institution of Oceanography Nimitz Marine Facility	San Diego, CA
1980	Oct. 27-28	University of Texas Marine Science Institute	Port Aransas, TX

YEAR	DATE(S)	INSTITUTION/FACILITY	LOCATION
1981	Oct. 15	Duke University Marine Laboratory	Pivers Island, NC
1982	Sept. 27-28	Harbor Branch Foundation, Inc.	Fort Pierce, FL
1983	Oct. 4-6	University of Hawaii	Honolulu, HI
1984	Oct. 15-17	Bermuda Biological Station	Bermuda
1985	Sept. 25-27	Moss Landing Marine Laboratories Navy Postgraduate School Monterey Marine Aquarium	Moss Landing, CA Monterey, CA
1986	Oct. 8-10	Oceanografia - Veracruz Mexican Naval Academy	Veracruz, Mexico Anton Lizardo, Mexico
1987	Oct. 12-14	University of New Hampshire	Durham, NH
1988	Oct. 4-6	University of Washington	Seattle, WA
1989	Oct. 3-5	University of Miami	Miami, FL
1990	Oct. 9-11	LUMCON	New Orleans, LA
1991	Oct.	Institute of Ocean Sciences	Victoria, BC Canada

1989

Jim Williams - Chairperson
Bruce Cornwall - Vice Chairman/Secretary

Attendees

Tim Askew, HBOI
Howard Barnes, Bermuda Biological Station
Jack Bash, U. of Rhode Island
Joe Coburn, WHOI
Bruce Cornwall, Chesapeake Bay Institute
Patrick Dennis, Oceanographer of the Navy
Don Gibson, U. of Texas
Thomas M. Hall, MAS
George Ireland, Ireland Consulting Services
Lee H. Knight, Skidaway Institute of Ocean.
Bob Nauta, U. of Michigan
Don Newman, U. of S. California
Wadsworth Owen, U. of Delaware
Mike Prince, Moss Landing Marine Labs
Michael Rawson, Lamont-Doherty Geological Obs.
Frank Verdon, NERC Research Vessel Services
Ernest Wegman, WHOI
Jim Williams, Scripps Institution of Ocean.
Judy Turnbaugh, Zero Tolerance Ombudsman
Frank Willis, Sr. Customs Insp. - Miami
Cdr. Paul Prokop, USCG

Bill Barbee, UNOLS
Capt. Gerard Barton, USCG
William B. Clark, U. of Hawaii
W. Thomas Cocke, U. S. Dept. of State
J. William Coste, U. of Hawaii
L.A. Fitch, Institute of Ocean Sciences-Canada
Linda Goad, U. of Michigan
Ron Hutchinson, U. of Miami
K. W. Jeffers, U. of Washington
Dean E. Letzring, TAMU
Eric B. Nelson, Duke U.
Eugene L. Olson, Florida Institute of Ocean.
Ken Palfrey, Oregon State U.
Steve Rabalais, LUMCON
Thomas D. Smith, Seward Marine Center
E. R. Dolly Dieter, NSF
Lt. Elizabeth White, NOAA
Amy Herlihy, Carrier Initiative Program
Jim Eengleman, Supv. Customs Insp. - Miami
Lourdes F. La Paz, Office of Gen. Consul-UM

1990

Jim Williams - Chairperson
Bruce Cornwall - Vice Chairman/Secretary

Attendees

Christopher Adams, NERC Research Vessel Services
William Barbee, UNOLS
Jack Bash, U. of Rhode Island
Bruce K. Cornwall, Chesapeake Bay Institute
Patrick Dennis, JOI
L. A. Fitch, Institute of Ocean Sciences-Canada
Dale Gibb, Institute of Ocean Sciences-Canada
Linda Goad, U. of Michigan
Robert Hinton, U. of Washington
Ron Hutchinson, U. of Miami
William C. Keefe, U. of Maryland
Lee H. Knight, Skidaway Institute of Ocean.
Quentin M. Lewis, Jr., Duke U.
Bob Nauta, U. of Michigan
Dennis Nixon, U. of Rhode Island
Harold Owen, Antarctic Support Associates
Ken Palfrey, Oregon State U.
Steve Rabalais, LUMCON
Smith, Seward Marine Center
Scripps Institution of Ocean.

Tim Askew, HBOI
Howard Barnes, Bermuda Biologicsl Station
Ivor G. Chivers, NERC Research Vessel Services
J. William Coste, U. of Hawaii
E. R. Dolly Dieter, NSF
Robert Gerard, Lamont-Doherty Geo. Obs.
Don Gibson, U. of Texas
Judith Gray, NOAA
Donald L. Hoffer, U. of Rhode Island
K. W. Jeffers, U. of Washington
June Keller, ONR
Dean E. Letzring, TAMU
Donald Moller, WHOI
Don Newman, U. of S. California
Eugene L. Olson, Florida Institute of Ocean.
Wadsworth Owen, U. of Delaware
Mike Prince, Moss Landing Marine Labs
Roy Scheible, MAS
Al Sutherland, NSF Polar Programs
Capt. David W. Yeager, NOAA Corps Ops.