

RESEARCH VESSEL OPERATORS' COUNCIL

TRANSACTIONS
OF
1974 ANNUAL MEETING

MARINE FACILITY
OREGON STATE UNIVERSITY
20 NOVEMBER 1974

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OCEANUS & WECOMA (DRAFT REPORT BY J. LEIBY)

SECRETARY:
JAMES GIBBONS
RSMAS, UNIV. MIAMI

CHAIRMAN:
JONATHAN LEIBY
WOODS HOLE OCEANOGRAPHIC
INSTITUTION

1 MARCH 1975

RESEARCH VESSEL OPERATORS' COUNCIL

ANNUAL MEETING 1974
OREGON STATE UNIVERSITY MARINE FACILITY
NEWPORT, OREGON
20 NOVEMBER 1974

Convening:

The regular Annual Meeting of the Research Vessel Operators' Council was held on 20 November 1974 at the Marine Science Center of Oregon State University, Newport, Oregon.

Participation:

The meeting was attended by twenty-four participants representing 15 RVOC member institutions, and from NSF, ONR, UNOLS and one consultant. The list of attendees is appended.

Welcome:

A welcome and introduction to Oregon State University Marine Facility and Marine Science Center was given by Capt. Ellis Rittenhouse who described the facilities and operations at Newport.

Agenda:

The proposed Agenda dated October 18, 1974 and previously circulated was adopted with the provision that other business as might arise would be included.

Minutes of Previous Meeting:

The transactions of the 1973 meeting held 27-28 November 1973 at The Texas A&M Marine Facility, Galveston, Texas, were review and approved. It was agreed to again thank Frank Bean for his excellent service as Secretary of the Council and especially the preparation of the complete meeting transactions and the very fine accompanying paper "Costs, Cost Accounting and Cost Control".

"PUBLIC VESSEL CONCEPT" & Associated Rules:

Captain Kerr raised the issue of research vessels operating as "public vessels" and there followed a comprehensive discussion of the meanings and applications of rules wherein that term is applied. It was noted that Hawaii, JHU, URI and Texas A&M, among others in general operate their vessels as "public vessels" and that any regulations exempting public vessels are either self imposed or specified by the owners (Navy) requirements. Key elements in the interpretation of various rules are whether research vessels are documented or undocumented; come generally under the laws specifying "trade and commerce",

or as applied by Titles 51, 52 or 53 of the Revised Statutes. The wide variety of practices reported by various operators made any uniform understandings difficult if not impossible.

SOLAS:

Action by IMCO in reviewing the applications of SOLAS rules was reported by Jon Leiby. He advised that SOLAS was considering the establishment of a new category of vessel - "miscellaneous" which would specifically include research vessels which are not now included under SOLAS by reasons of not being documented. He reported that the Coast Guard has set up a working group to deal with this. It was agreed that this did not appear to be in the best interests of research vessels which already are adequately covered by the inspection laws. RVOC should closely follow this action and Jon Leiby should seek representation on the USCG Working Group.

STATUS OF INTERNATIONAL ADMEASUREMENT CONVENTION:

Captain Dinsmore reported that the 1969 International Convention on Tonnage Measurement of Ships is in the U.S. Senate Subcommittee on Oceans and International Environment of the Committee on Foreign Relations, (Sen. Pell, Chairman) for ratification by the U.S. That subcommittee has posed a number of questions to the Coast Guard based on concern and objections by the industry. The Coast Guard is currently answering, clarifying and otherwise establishing a position on each of these questions. The objections are largely raised by the "offshore industry" - operators of 200-300 ton oil supply vessels engaged chiefly in domestic commerce.

The Coast Guard has thus far given the following assurances:

Existing Ships

The new convention itself provides that existing ships are excluded for twelve years. Thereafter, the old measurement will remain applicable for other existing international conventions. The Coast Guard has agreed that the old measurement also would continue to apply for all CG administered U.S. laws (inspection-manning-licensing).

New Ships

The Coast Guard has agreed that a new vessel, on request, would be measured under the old system to which all inspection, manning and licensing laws would apply indefinitely.

The above Coast Guard agreements are to the Senate which presumably can hold the Coast Guard to its word so long as the Senate (or Congress as a whole) was willing. It is probably reasonable to conclude that the Coast Guard would attempt to get rid of the dual system as soon as it could.

The Coast Guard agreements apply only to its own inspection, manning and licensing laws. Other laws which relate to tonnage (except international conventions in the case of existing ships) are unclear. For example, the EPA penalties for pollution state the "higher" tonnage of a dual system shall be used.

Several measurements using the new convention on ships not using tonnage devices have resulted in a lower tonnage. On the basis of this the fishing industry has withdrawn its objections.

The Convention provides that it will become effective 24 months after 25 nations (representing 65% of world tonnage) ratify the agreement. To date about 15 nations (45%) have signed. Japan is imminent (+15%); six others are also. It is estimated that the U.S. will sign within a year and that the Convention will become effective in about 3 years.

It was agreed that RVOC should continue to express its concern to the Senate Subcommittee on the need for adequate safeguards to insure that existing vessels continue to be measured under the rules to which they were designed.

RESEARCH SHIP SUPPORT:

Captain Dinsmore reported on current funding for ship support tabulated as follows:

	1973	1974	Est. 1975
		(\$M)	
NSF Ship Ops	11.6	12.7	13.3
ONR Ship Ops & Techs	3.8	3.8	3.5
"Other" Ship Ops	1.5	1.2	2.0
tot ship ops	16.9	17.7	18.8
(Est. Ship Ops Costs)	(16.9)	(18.0)	(19.6)
NSF Techs Funding	0.8	1.0	1.1
NSF Equipment	1.2	1.0	1.0

He reported that unless additional funding becomes available, the apparent deficits for 1974 and 1975 will require that some ships be laid up during those years.

Tour of the Facility:

Immediately following the luncheon break participants were given a tour of the OSU Marine Facility and R/V YAQUINA. The courtesy of the OSU personnel was much appreciated.

New University of Delaware Research Ship Construction:

Dr. Inderbitzen described the new ship being constructed by Swiftships, Inc., Morgan City, La. It is due to arrive at Lewes, Delaware in June 1975 and be available for research cruises by August 1975. The name has not yet been selected.

The vessel has been specifically designed for coastal zone and continental shelf research. A cruising speed of 20 knots will reduce transit times between stations and the shore and yet with the controllable pitch propellers, the vessel will retain the low speed maneuverability necessary for trawling and dredging operations. Provisions are being made for the installation of a bow thruster if it becomes necessary.

A double drum trawl winch containing 3000 m of $\frac{1}{2}$ " cable will be located below deck in the aft section. A single drum hydrographic winch with 2000 m of cable is located on the 01 deck. The vessel has four A-frames, one of 10-ton capacity at the stern and 3 of 5-ton capacity. Two of the smaller A-frames are located on the starboard side of the vessel and one on the port side.

Besides the 240 sq. ft. of laboratory space being built into the vessel, an additional 128 sq. ft. of space can be added by use of one of four specialized laboratory vans. Each of the four vans will be outfitted for specialized work in one of the major scientific disciplines. There will be one van each for physical, chemical geological and biological oceanography. The vans will be on-loaded and off-loaded by means of a 5-ton capacity crane aboard ship. The van will mate directly to the bulkhead of the wet lab and become an integral part of that lab. Passage between van and lab is through a 4 ft. wide double doorway.

An innovation to be incorporated into the ship is the exclusive use of prepared frozen foods. The short cruises that this ship will be employed in makes this feature both expedient and economical.

Specifications for the ship are:

LENGTH: 115 ft.	SPEED, CRUISING: 20 kts.
BEAM: 24 ft	SPEED, FULL: 21 kts.
DRAFT: 6 ft. 9 in.	SPEED, MIN.: 0 kts.
GROSS TONNAGE: 160 tons	ENDURANCE: 14 days
DISPLACEMENT: 150L tons	RANGE: 700 nautical miles
CREW: 6	@20 kts.
SCIENTIFIC PERSONNEL: 12	4000 nautical miles
MAIN ENGINES: (2) V16-149TI	@12 kts.
General Motors Diesel	
SHIP'S SERVICE GENERATORS:	LABORATORY:
(2) General Motors	Wet: 110 sq. ft.
471@1200 RPM=45KW	Dry: 130 sq. ft. plus
PROPELLERS: (2) Marine Propulsion	128 sq. ft. porta-
Controllable Pitch -	ble van lab.
3 bladed, 60" diameter	
OWNERSHIP: University of Delaware	

University of Michigan:

Captain Tetzloff described the new R/V LAURENTIAN built in Pascagoula, Mississippi and delivered to Michigan during the past summer.

It is an 80-ft vessel with accommodations for a scientific party of 10 in single, double, and 4-person rooms. This ship has two permanent laboratories (a 144-sq. ft. main deck lab and a 400-sq. ft. below-decks lab) and can accommodate portable laboratories or large, self-contained instrument packages on deck. It is capable of undertaking cruises of up to ten days duration and ranges of 2,500 miles and is ice-strengthened for winter operations.

Specifications:

Length: 80'	Gross Tonnage: Under 150
Beam: 21'9"	Displacement: 175 long tons
Draft: 8' (max)	Crew: 4
Cruising speed: 10.5 knots	

Ship Equipment:

Double-drum main winch with 3600' $\frac{1}{2}$ " diameter wire on each drum, driven by 20 HP hydraulic motor
Two B.T. winches.
Articulate hydraulic crane on main deck can handle 2400 pounds at 16.5' reach or 7000 pounds at 5.5' reach.
Hydraulically operated A-frame on main deck.
Gyro-compass, recording depth sounder, RDF, two VHF-FM radiotelephones and one SSB radiotelephone.

R/V OCEANUS and R/V WECOMA:

Jon Leiby reported on the progress of these two new 177-ft NSF vessels now under construction at Sturgeon Bay, Wisconsin, and scheduled for delivery in the Fall of 1975 and assignment to Woods Hole and to Oregon State University. His report was largely on the history and design criteria of this class of vessel. A draft copy of the report is appended.

Marine Pollution Regulations:

Captain Dinsmore gave a report on the proposed USCG rules for marine sanitation devices following the issuance in the Federal Register of March 1, 1974 of the USCG Notice of Proposed Rules, the Coast Guard held a public hearing on May 1, 1974. Comments at this hearing by industry and the boating public were largely directed against the EPA Rule of an ultimate "No Discharge" standard. Principal comments are summarized by the following:

- Considerations of weight, space stability, capacity, structural and other hard and practical grounds make sewage containment aboard small vessels impractical sometimes dangerous.

- . Pump-out facilities for holding tanks are not available and are not likely to be for years. This encourages (and in many cases necessitates) disregard for the law by those who must empty the tanks somewhere. Also, marine toilet treatments units outperform many municipal systems in the country today.
- . Chemicals to kill odor and bacteria added to a holding tank render sewage unsuitable for treatment and in some cases have disabled small community sewage plants--thus aggravating the water pollution problem.
- . Enforcement of a no-discharge law is nearly impossible.
- . The legality of a no-discharge standard is questionable. The language of the Water Pollution Control Act clearly provides for onboard treatment and discharge.

Following the Public Hearing a joint EPA/USCG Study Group has attempted to work out a compromise change. Although recommendations of the Group are one of the better kept secrets in Washington, all indications are that there may be a relaxation in the current no-discharge regulation to permit flow-through treatment of sewage from at least smaller vessels.

Under the existing EDA rules macerator-chlorinators or other approved devices which are installed on existing vessels within three years following promulgation of the USCG regulations may continue to be used for the life of the vessel so long as the device remains operable. Devices installed between the third and fifth years can be used until the end of the eighth year. New vessels (keel layed) after the promulgation of the regulations have two years to comply with the no-discharge standard.

The Coast Guard has been delaying issuance of the regulations while working out the compromise change with EPA. The new regulations can be expected to issued within sixty days and to come in force the beginning of the month following. Because of the uncertainty of the scope of applicability of the no-discharge rule, any "new vessels" would be in a safer position if construction were started before then.

NSF/ONR Ship Inspection Program:

Bob Elder of NSF described the new aspects of the NSF/ONR SOCC Ship Inspection Program which is now going into effect. This program which is officially termed "MATERIAL CONDITION REVIEW" is aimed at assessing the condition and capability of Federally owned or funded research vessels to meet the requirements of Federally sponsored research. It is intended that each UNOLS vessel will be reviewed each 2-3 years. Reviewers will comprise RVOC consultants and Federal Agency observers. It is intended that the review primarily be a "self-inspection" using a Check Off Sheet and a discussion with the consultants on problems and their corrections. It is not intended to be a game of cops and robbers.

The Check Off Sheet will be furnished each operator prior to the review was examined by the group and a copy is appended. Bob Elder stressed that much of the consideration of NSF support for equipment and repairs will come from the results of these reviews. It is therefore important that all such matters be brought to the attention of the reviewers.

Search for the USS Monitor:

John Newton described for the benefit of the group his work in locating and identifying the wreck of the USS Monitor lost at sea south-east of Cape Hatteras during the Civil War. The methodology described, along with underwater television and photographs, are a remarkable application of marine science and engineering to the field of underwater archeology. The meeting was much indebted to John Newton for the presentation.

Marine Insurance Study:

Mr. Charles Martin of Risk Engineering Services described the ongoing study being supported by UNOLS. The objectives of the study are:

- . An evaluation of the risks both on an individual and fleet basis, and an analysis of these risks for use by UNOLS Members.
- . An analysis and review of the applicable laws and regulations affecting the insurance posture of research vessels and university operators. Particular emphasis shall be given to the status of exchange scientists between institutions, scientific equipment, Federally owned vessels and newly developing pollution regulations.
- . A series of recommendations and related discussions on alternative insurance programs aimed at improving the effectiveness at reduced premium costs of insurance programs.

The study is presently in the fact finding stage and Mr. Martin and/or his associates will be visiting or contacting most UNOLS Members regarding this. A final report of the study will be made to the Annual UNOLS Meeting in May, 1975

Uniform Operations & Cost Accounting Terminology:

Captain Dinsmore reported that the UNOLS Advisory Council, in response to recommendations from many sources, has proposed that a system of uniform terminology be instituted for use in matters dealing with ship operations and cost accounting. Differing applications of the same terms now results in some confusion and no little misunderstanding.

RVOC has been requested to prepare a set of draft terminology which might be recommended for UNOLS use. A chief problem is the term "Days at Sea" which is used in determining the daily rate cost and, correctly or incorrectly, is viewed by many as one of the performance indicators of a ship. Based upon a preliminary set of terms circulated by Captain Dinsmore, and discussions and revisions thereto, the following terms were approved in principle for submission to UNOLS:

OPERATING DAYS - All days away from homeport in an operating status incident to the scientific mission. Includes days in other ports for the purpose of fueling, changing personnel, etc. Includes transit time. Includes day of arrival and day of departure from homeport. Does not include maintenance or lay days described below. Does not include any days in homeport except unusual cases to meet a specific cruise need. Operating Days is the basic unit for ship time funding and support.

DAYS AT SEA - All days actually at sea incident to the scientific mission. Includes day of arrival and day of departure. Includes transit time. Includes time anchored (except port call anchorages), hove to, and drifting. Does not include days in foreign ports.

LAY DAYS - Days in homeport for purposes of fitting out, cruise preparation, crew rest, and upkeep. May in rare cases include similar periods in other ports.

MAINTENANCE DAYS - Days undergoing overhauls, drydocking or other scheduled or unscheduled repairs during which the ship is not available for service.

DAYS OUT OF SERVICE - Periods during which ship is layed up out of service for an extended period for reasons of economy, unemployment or unfit for service.

DAILY RATE - Daily cost factor for a ship arrived at by dividing the total operating costs for the scientific mission (including indirect costs) by the operating days for the same period. Unless otherwise specified, the daily rate ordinarily reflects a one year period.

Foreign Clearances:

The continuing problems with foreign clearances were noted and discussed. Captain Dinsmore reported that revised procedures at the State Department Level are hoped to improve the situation but until conflicting international claims and policies are resolved the situation will remain difficult. The new procedures involve improved and simplified requests and prospectuses which might improve the State Department response to clearance requests. Copies of the new procedures are appended.

Election of Officers:

Jonathan Leiby and James Gibbons were nominated and elected to serve again as Chairman and Secretary of RVOC respectively.

Next Meeting:

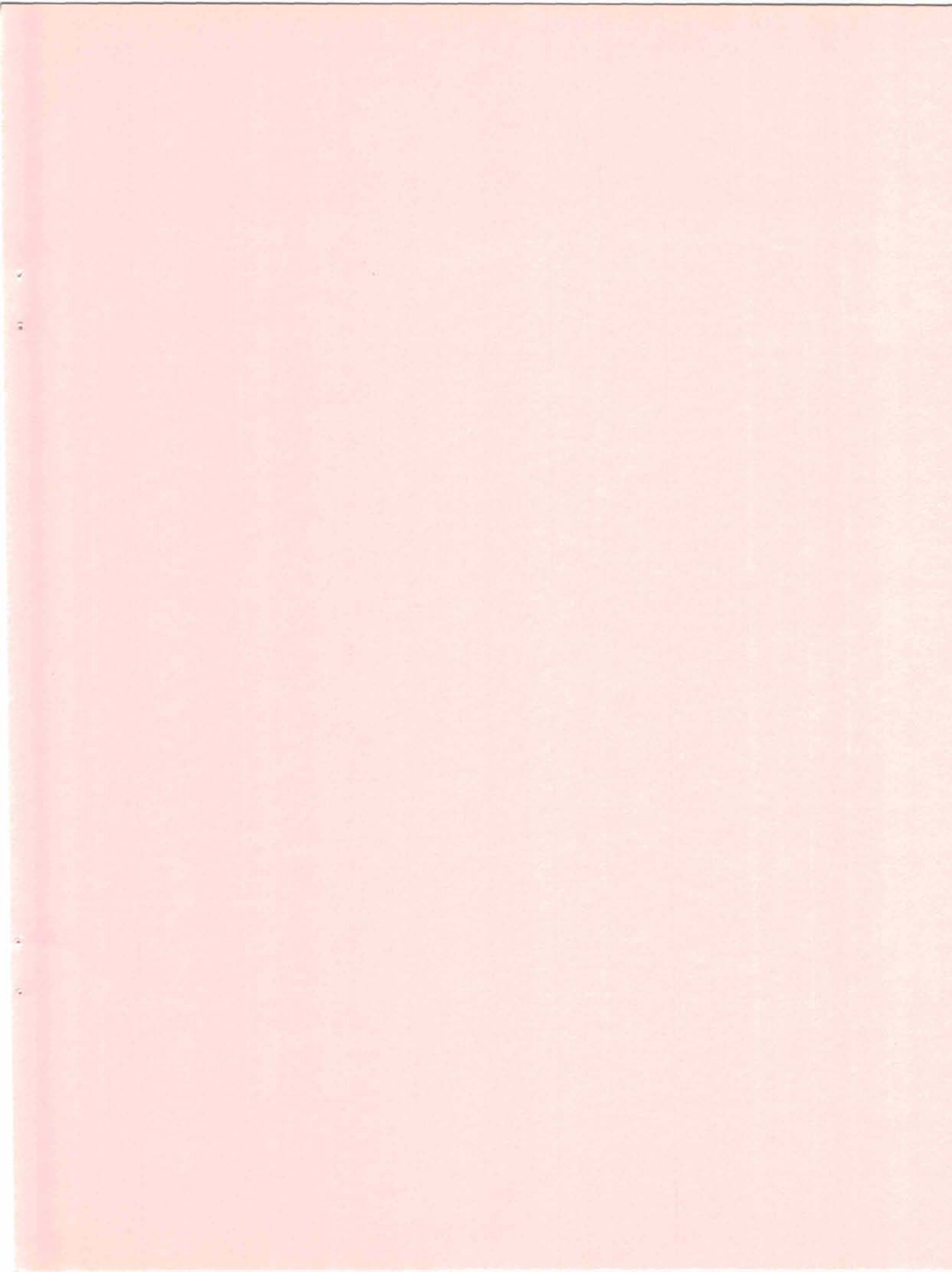
It was agreed that the 1975 meeting would be held at a time and place selected by the Chairman.

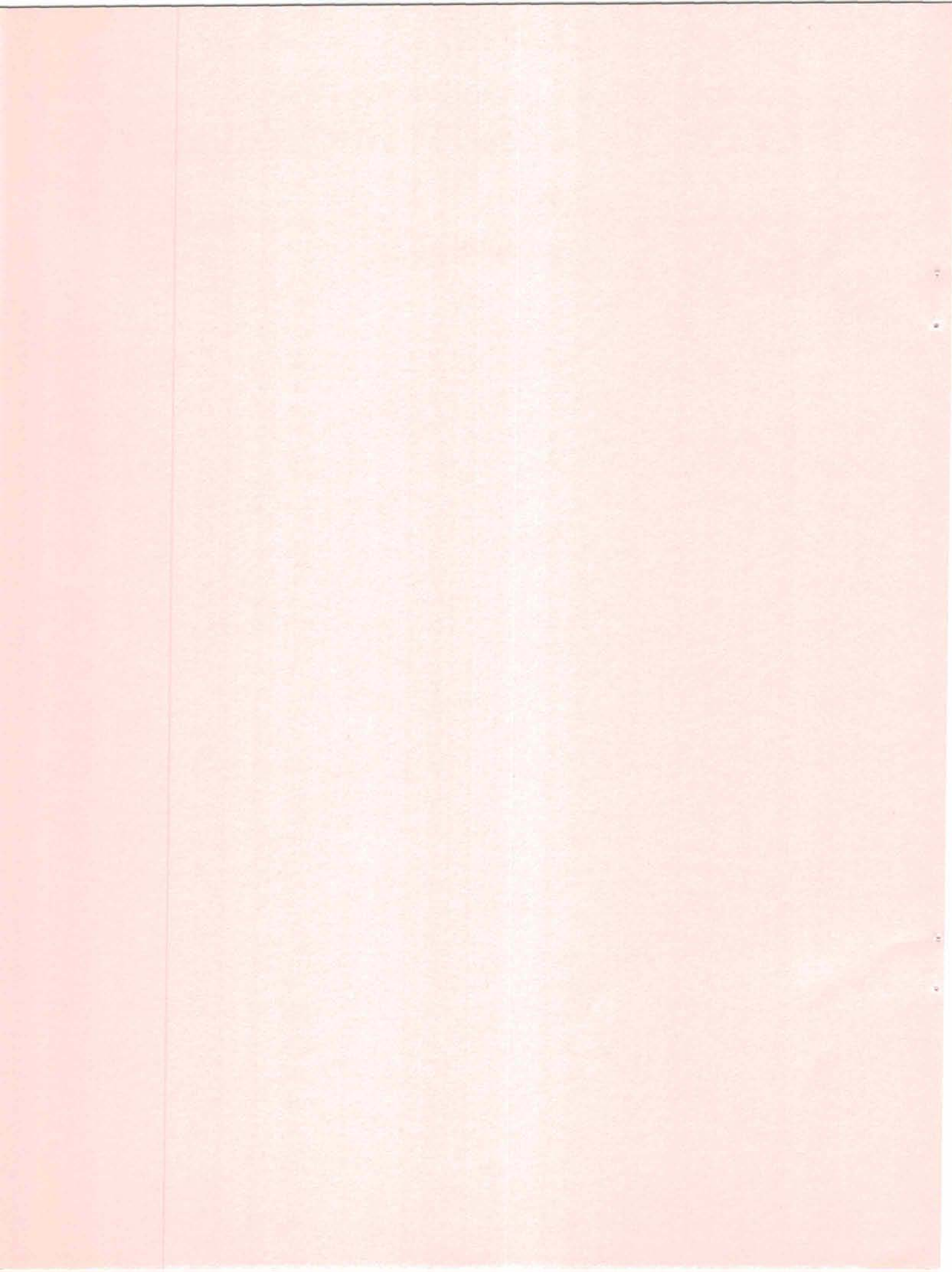
Adjournment:

Business being concluded the meeting was adjourned at 2200 - 20 November 1974, following an expression of appreciation to Captain Rittenhouse and the staff of the Marine Science Center and Marine Facility of Oregon State University.

ATTENDANCE LIST

James Gibbons	University of Miami
Jonathan Leiby	W.H.O.I
R. P. Dinsmore	UNOLS
Clifford A. Buehrens	Univ. of Rhode Island
John G. Newton	Duke Univ. Marine Lab.
Jay T. Katz	Univ. of Michigan
Richard S. Edwards	W.H.O.I.
Clifford Tetzloff	Univ. of Michigan
Peter Branson	Scripps Inst. of Oceano.
Donald Mraz	Univ. of Wisconsin - Milwaukee
William Kerr	Univ. of Hawaii
Charles H. Martin	Risk Engineering Services, Inc.
J. Boyce Watkins	Univ. of Washington
Robert A. Schelling	Univ. of Washington
Harold Screen	C.B.I., Johns Hopkins
Robert B. Elder	OFS, NSF
T. K. Treadwell	Texas A&M University
J. H. Thompson	Univ. of Texas
E. B. Rittenhouse	Oregon State University
A. L. Inderbitzen	Univ. of Delaware
Joseph Bennett	ONR
R. G. Redmond	Oregon State University
B. M. Pierce	Oregon State University





NAVY/NSF PANEL
ON
SHIP OPERATIONS, CONSTRUCTION AND CONVERSION

MATERIAL CONDITION REVIEW

Part 1

SHIP RECORDS DATA AND PROBLEMS: This part to be completed by Institution personnel prior to inspection date.

SHIP	DATE
OPERATING INST.	OWNER

A. VESSEL DATA

LOA _____ ft. LWL _____ ft. BEAM _____ ft.

MOLDED DEPTH _____ ft. NAVIGATIONAL DRAFT _____ ft.

GROSS TONNAGE _____ tons FULL LOAD DISPLACEMENT _____ tons

FUEL CAPACITY _____ gals. CRUIS. SPEED _____ kts. ENDURANCE _____ days

BUILT (year) _____ LOCATION _____

CONVERTED (year) _____ ACQUIRED BY OPERATOR (year) _____

HULL TYPE _____ HOMEPORT _____

CONSTR. MATERIAL _____ NUMBER SCREWS _____ SHP _____ hp.

ACCOMODATIONS:	
Crew _____	_____
Scientists _____	_____

OPERATING DAYS:	
Previous calendar year _____	days
Schedule this cal. yr. _____	days
Planned next cal. year _____	days

DOCUMENTED? _____ INSPECTED? _____

LAST MAJOR OVERHAUL: DATE _____ LOCATION _____

NEXT SCHED. OVERHAUL: DATE _____ LOCATION _____

MANNING PROFILE (usual operating condition)		
MASTER _____ MATE(S) _____ AB'S _____ OB'S _____	CHIEF ENG. _____ LIC. ENG(S) _____ OILERS _____ WIPERS _____	COOK _____ MESSMEN _____ STEWARD _____ RADIO OFF. _____

UNUSUAL OPERATIONAL OR MANNING PROBLEMS (continued on reverse if necessary):

MATERIAL CONDITION REVIEW REPORT _____ (ship) _____ (date)

PART 1 (CONT.): To be completed by Institution Personnel prior to inspection

B. STATUS OF APPLICABLE CERTIFICATES
(Please have all certificates available)

B.1 USCG INSPECTION (Vessels over 300 gross tons)

DATE OF LAST BIENNIAL _____ LAST MID-TERM _____

OUTSTANDING DEFICIENCIES: _____

CERTIFICATE EXPIRES _____

B.2 ABS SURVEY: IS VESSEL MAINTAINED IN CLASS? _____

DATE OF LAST ANNUAL SURVEY _____ LAST SPECIAL _____

OUTSTANDING DEFICIENCIES: _____

B.3 LOAD LINE CERTIFICATE

DATE _____ CURRENT ANNUAL ENDORSEMENT _____

B.4 USCG STABILITY LETTER & STABILITY BOOK

LETTER DATE _____ BOOK DATE _____ REFLECT CURRENT WEIGHTS? _____

B.5 FCC STATION LICENSE

EXPIRATION DATE _____ CURRENT ANNUAL ENDORSEMENT _____

B.6 USPHS CERTIFICATE

DATE _____

B.7 OTHER:

OUTSTANDING PROBLEMS REGARDING REGULATORY CERTIFICATIONS:

MATERIAL CONDITION REVIEW REPORT _____

(ship)

(date)

PART 1 (CONT.): To be completed by Institution Personnel prior to inspection

C. HULL

(* items do not apply to inspected vessels)

C.1 DATE LAST DRYDOCKED _____ LOCATION _____

DATE LAST PAINTED _____ DATE LAST SANDBLASTED _____

TYPE OF PAINT SYSTEM USED _____

C.2 WATERTIGHT INTEGRITY: SUBDIVISION: _____ COMPT. NO.W/T BULKHEADS _____

* LIST ANY ALTERATIONS SINCE LAST USCG APPROVAL OR CONSTRUCTION _____

C.3* HULL & DECK PLATING: LAST AUDIOGAUGING _____

* AVE PERCENT WASTAGE FROM NEW _____% MAX WASTAGE _____%

C.4* RUDDER CLEARANCES: CLEARANCES WHEN NEW _____

* DATE LAST MEASURED _____ MEASUREMENTS _____

C.5* ANCHORS & CHAINS ANCHOR TYPE & WT _____

CHAIN SIZE & LENGTH _____ DATE LAST INSP. _____

C.6* FIXED BALLAST: TYPE _____ TOTAL WEIGHT _____ TONS

LIST ANY BALLAST ADDED OR REMOVED SINCE CONSTRUCTION OR USCG APPROVAL _____

OUTSTANDING PROBLEMS OR PLANNED ALTERATIONS: (includes FW & SW piping, tanks, vents, storerooms, shops, masts & rigging. Pollution control outfitting in Section I; Oceanographic equipment in Section H)

MATERIAL CONDITION REVIEW REPORT: _____
(ship) _____ (date)

PART 1 (CONT.): To be completed by Institution Personnel prior to inspection

D. MAIN PROPULSION MACHINERY

D.1 MAIN PLANT (describe): _____

D.2 MAIN ENGINE	#1	#2
DATE LAST OVERHAUL		
HOURS SINCE OVERHAUL		
D.3 MAIN GENERATOR OPENED AND INSPECTED		
D.4 MAIN MOTOR OPENED AND INSPECTED		
D.5 REDUCTION GEAR BOX OPENED AND INSPECTED		
D.6 TAIL SHAFT(S) DATE LAST DRAWN		
CLEARANCES		
NUMBER & LOCATION SPARES		

D.7 PROPELLER(S): TYPE, PITCH & DIA. _____
DATE LAST CHECKED & BALANCED _____
NUMBER & LOCATION OF SPARES _____

D.8 SPARE PARTS: AVERAGE PERCENT ON HAND: _____
CRITICAL SUPPLY ITEMS _____

OUTSTANDING MAINTENANCE PROBLEMS AND FUTURE REQUIREMENTS: _____

MATERIAL CONDITION REVIEW REPORT: _____ (ship) _____ (date)

PART 1 (CONT.): To be completed by Institution Personnel prior to inspection

E. AUXILIARY ELECTRICAL SYSTEM

E.1 DESCRIBE SYSTEM: _____

	GEN.	#1	#2	#3
E.2 ENGINE TYPE				
DATE LAST O'HAUL				
HOURS SINCE O'HAUL				
E.3 GENERATOR TYPE				
GENERATOR KW				
DATE LAST INSP.				

E.4 OTHER _____

POWER AVAILABLE		A.C.		D.C.	
E.5	SHIPS SERVICE	v.	kw.	v.	kw.
		v.	kw.	v.	kw.
E.6	SCIENTIFIC (Isolated)	v.	kw.	v.	kw.
		v.	kw.	v.	kw.

E.7 AVE. STEAMING LOAD _____ kw. MAX OPERATIONAL LOAD _____ kw.

E.8 IS EMERGENCY GENERATOR ARRANGED FOR AUTOSTART? _____

E.9 SUMMARIZE MAJOR ALTERATIONS OR IMPROVEMENTS SINCE CONSTRUCTION OR CONVERSATION:

OUTSTANDING MAJOR PROBLEMS AND FUTURE REQUIREMENTS:

MATERIAL CONDITION REVIEW REPORT _____

(ship) _____ (date) _____

PART 1 (CONT.): To be completed by Institution Personnel prior to inspection

F. AUXILIARY MACHINERY

F.1 AIR COMPRESSOR(S):

#1 TYPE _____ PRES _____ CAP _____

#2 TYPE _____ PRES _____ CAP _____

F.2 BOILER TYPE _____

PRESSURE _____ FIRE SIDE LAST INSP. & CLEANED _____

F.3 EVAPORATOR: TYPE _____

G.P.D: RATED _____ CURRENT _____ LAST CLEANED _____

F.4 STEERING ENGINE: TYPE _____

LAST OVERHAUL _____ LAST FAILURE _____

F.5 BOW THRUSTER: TYPE _____

HP/KW _____ OP.HRS SINCE O'HAUL _____ DATE _____

F.6 PUMPS:

S/W: TYPE & CAP. _____

F/W: TYPE & CAP. _____

F.7 VENTILATION SYSTEM: TYPE _____

F.8 AIR CONDITIONING: TYPE _____

CAP _____ LAST OVERHAULED _____

F.9 REFRIGERATION: TYPE _____ CAP _____

LAST OVERHAULED: #1 _____ #2 _____

F.10 DECK MACHINERY:

ANCHOR WINDLASS: TYPE _____

LAST OVERHAUL _____ FAILURE RECORD _____

WARPING CAPSTAN: TYPE _____

LAST OVERHAUL _____ FAILURE RECORD _____

* OTHER DECK MACHINERY (less oceanographic gear) _____

MATERIAL CONDITION REVIEW REPORT _____

(ship)

(date)

PART 1 (CONT.): To be completed by Institution Personnel prior to inspection

G. ELECTRONICS

G.1 RADIO COMMUNICATIONS:

TYPE _____ POWER _____ DATE INSTALLED _____ FREQ. RANGE _____
PERFORM *

TYPE _____ POWER _____ DATE INSTALLED _____ FREQ. RANGE _____
PERFORM *

TYPE _____ POWER _____ DATE INSTALLED _____ FREQ. RANGE _____
PERFORM *

TYPE _____ POWER _____ DATE INSTALLED _____ FREQ. RANGE _____
PERFORM *

EMERGENCY RADIO: TYPE _____ LAST TEST _____

RADIO FACSIMILE: TYPE _____ PERFORM *

G.2 RADAR: #1 TYPE _____ DATE INSTAL _____
HEIGHT _____ PERFORM *

#2 TYPE _____ DATE INSTAL _____
HEIGHT _____ PERFORM *

G.3 ECHO SOUNDERS: #1 TYPE _____ DATE INSTAL _____
(Nav.) FREQ. _____ PERFORM *

#2 TYPE _____ DATE INSTAL _____
FREQ. _____ PERFORM *

G.4 NAVIGATION:

LORAN - TYPE _____ DATE _____ PERFORM *

OMEGA - TYPE _____ DATE _____ PERFORM *

DECCA - TYPE _____ DATE _____ PERFORM *

NAVSAT - TYPE _____ DATE _____ PERFORM *

OTHER - _____ DATE _____ PERFORM *

G.5 OTHER ELECTRONICS: DESCRIBE _____

G.6 ADEQUACY OF SPARE PARTS ON HAND _____

OUTSTANDING PROBLEMS & SUPPORT REQUIREMENTS

*PERFORMANCE CODE	
1.	Good Record-no failures
2.	Satisfactory-few failures
3.	Marginal-signif. failures
4.	Poor-high failure rate
5.	Inoperative

PART 1 (CONT.): To be completed by Institution Personnel prior to inspection

H. OCEANOGRAPHIC OUTFIT

	WINCHES	MANF. & TYPE	HP	LAST O'HAUL	WIRE		
					SIZE	LENGTH	REPLACED
H.1	HYDRO WINCH #1						
	HYDRO WINCH #2						
H.2	TRAWL & CORING						
H.3							

H.4 CRANE #1: MANF. & TYPE _____
 CAP _____ DATE LAST TESTED _____

CRANE #2: MANF. & TYPE _____
 CAP _____ DATE LAST TESTED _____

H.5 "A" FRAME: TYPE _____ CAP _____

H.6 OTHER OVERSIDE HANDLING GEAR _____

H.7 LABORATORIES: NUMBER & SQ. FOOTAGE _____
 AIR CONDITIONED? _____ MAJOR ALTERATIONS SINCE CONSTRUCTION OR
 CONVERSION _____

H.8 STOREROOMS: NUMBER & CU. FOOTAGE _____

H.9 SPARE CABLES: _____

H.10 OTHER OCEANOGRAPHIC EQUIPMENT OF A FIXED OR PERMANENT NATURE: _____

OUTSTANDING PROBLEMS & SUPPORT REQUIREMENTS _____

MATERIAL CONDITION REVIEW REPORT _____
(ship) _____ (date) _____

PART 1 (CONT.): To be completed by Institution Personnel prior to inspection

I. POLLUTION CONTROL SYSTEMS

OIL POLLUTION CONTROL

- I.1 DOES SHIP HAVE FUEL DISPLACEMENT BALLAST SYSTEM? _____ IF SO WHAT ARE CONTROL MEASURES? _____
- I.2 DO ANY FUEL TANKS REQUIRE SW BALLAST? _____ IF SO UNDER WHAT CONDITIONS? _____ WHAT ARE CONTROL MEASURES? _____
- I.3 IS OIL SLOP HOLDING TANK INSTALLED? _____ CAPACITY _____ GALS.
- I.4 SHORE CONNECTION(S) INSTALLED? _____
- I.5 OIL-WATER SEPARATOR INSTALLED? _____ MANUFACTURER: _____
TYPE _____ CAPACITY _____
- I.6 OTHER OIL POLLUTION CONTROL MEASURES _____

SEWAGE CONTROL

- I.7 SEWAGE HOLDING TANK(S)? NUMBER _____ CAP _____ gals. ENDURANCE _____ hrs.
- I.8 SHORE CONNECTION(S) INSTALLED? _____ DESCRIBE LIMITATIONS _____
- I.9 MARINE SANITATION DEVICES: DESCRIBE _____

OTHER POLLUTION CONTROL SYSTEMS (solid waste, incineration, galley drains etc.)

- I.10 _____

OUTSTANDING PROBLEMS AND SUPPORT REQUIREMENTS _____

PART 1 (CONT.): To be completed by Institution Personnel prior to inspection

J. HABITABILITY

J.1 BERTHING: SUMMARIZE HABITABILITY IMPROVEMENTS MADE OVER THE PAST TWO YEARS

OUTSTANDING PROBLEMS: _____

J.2 MESSROOMS & LOUNGES: SUMMARIZE HABITABILITY IMPROVEMENTS MADE OVER THE PAST TWO YEARS: _____

OUTSTANDING PROBLEMS: _____

J.3 GALLEY: DESCRIBE RECENT IMPROVEMENTS _____

OUTSTANDING PROBLEMS: _____

J.4 OTHER HABITABILITY PROBLEMS: _____

SUMMARY OF PROBLEMS AND SUPPORT REQUIREMENTS:

MATERIAL CONDITION REVIEW REPORT _____
(ship) _____ (date)

PART 1 (CONT.): To be completed by Institution Personnel prior to inspection

K. SAFETY

K.1 FIREFIGHTING (Not applicable to USCG inspected vessels)

FIXED SYSTEMS: (Describe) _____

PORTABLE EQUIPMENT: (List type & number) _____

DATE OF LAST SERVICE CHECK & INSPECTION _____

K.2 STABILITY (Not applicable to USCG inspected vessels)

DATE OF LAST INCLINING EXP. _____ REFLECTED CURRENT WEIGHTS? _____

DATE OF STABILITY CALCS _____ (have stability book available)

DO CALCULATIONS REFLECT CURRENT WEIGHTS & LOADING? _____

FULL LOAD GM _____ ft. LT LOAD GM _____ ft. ROLL PERIOD _____

LOADING LIMITATIONS: _____

K.3 LIFESAVING EQUIPMENT: (Not applicable to USCG inspected vessels)

BOATS & RAFTS (number, type) _____

LAST SERVICE CHECK OF RAFTS _____

LIFEJACKETS: (Number) _____ WATERLIGHTS (No.) _____

K.4 DAMAGE CONTROL EQUIPMENT (Not applicable to USCG inspected vessels)

DESCRIPTION & LOCATION OF LOCKERS _____

NUMBER OF SUBMERSIBLE PUMPS _____ NUMBER OF OBA'S _____

STATUS OF LABELLING _____

K.5 MEDICAL EQUIPMENT & SERVICES (Describe) _____

(continued on next sheet)

MATERIAL CONDITION REVIEW REPORT _____

(ship)

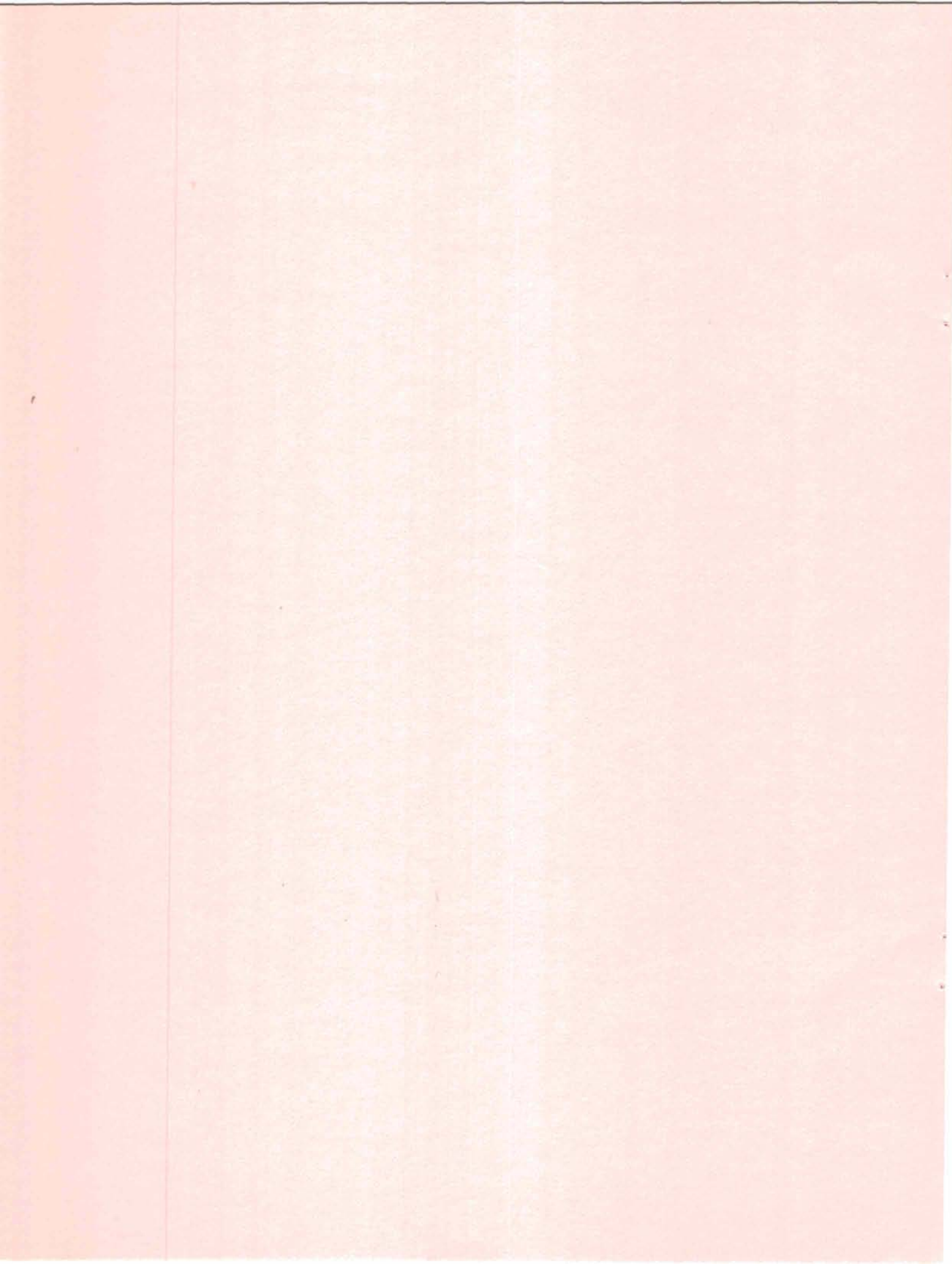
(date)

PART 1 (CONT.): To be completed by Institution Personnel prior to inspection

K. SAFETY (Cont.)

K.6 OTHER SAFETY EQUIPMENT _____

OUTSTANDING PROBLEMS AND NEEDS FOR FUTURE SUPPORT



FOREIGN RESEARCH CLEARANCES AND REPORTS

GENERAL

There has been an increasing need for a set of uniform procedures leading to timely and effective information on research ship scheduling pre-cruise information and planning, cruise reporting and data management. Of special importance is the growing complexity and difficulty of obtaining clearances from foreign nations for the conduct of research in waters under their control, and to insure that obligations incurred thereby are fully complied with. Additional concern over the security of vessels operating in sensitive waters as well as the overall U.S. national posture, and for improving scientific data exchange, have added to the need for a standardized and effective scheme.

In order to meet these requirements in a useful and non-duplicative arrangement there has been developed a uniform system for submitting and handling foreign clearance requests and reports. It is applicable to all U.S. research ships conducting oceanographic research in waters under foreign jurisdiction or controls.

POLICY REGARDING CLEARANCES FOR RESEARCH

The conduct of research in jurisdictional waters of another nation --- either in territorial waters, in contiguous fisheries zones for fisheries research, or on the continental shelf depending on the nature of the research has become increasingly complex.

Clearances are required for research within foreign territorial waters. Since some countries claim territorial seas in excess of the three nautical miles recognized by the United States, special consideration must be given to research planned in such unrecognized areas. This should be discussed with the Department of State during the planning stage. The U.S. recognizes contiguous fisheries zones to a total of twelve nautical miles from the baseline, and recognizes foreign claims to territorial seas to this distance as valid for fisheries purposes only. Clearances are required for fisheries research in such zones; exploratory fishing is not considered to be research, and is governed by local requirements concerning fishing. Clearances are also required for research on foreign continental shelves. For practical purposes, this is research outside the territorial sea and in waters of less than 200 meters depth which concerns the continental shelf and is undertaken there; i.e. physical contact with the shelf is involved as in coring or dredging.

Most requests for foreign research clearances are, and should be, handled through the Department of State. This is necessary for Federally operated ships and most often the case of academic research vessels. Instances may exist where clearances are better handled privately and directly. These generally involve work in the territorial waters of a foreign government with whom a laboratory may have long standing and mutually agreeable arrangements for its ship to visit and revisit. Such procedures can be very effective and their establishment is encouraged -- provided that:

- . *The establishment of such procedures does not contravene existing U.S. policy toward the country involved. U.S. National Policy and interests are not compromised.*
- . *It does not become detrimental to the general welfare of other institutions.*
- . *The State Department is kept informed of these arrangements.*

Occasionally the Department of State will advise a private research vessel operator that direct private clearance requests for a particular country or project are indicated because of local circumstances.

REQUESTS FOR RESEARCH CLEARANCES

Foreign clearance requests are made to the Department of State using a RESEARCH CRUISE PROSPECTUS AND FOREIGN CLEARANCE REQUEST. The CRUISE PROSPECTUS is a summary of key information dealing with a forthcoming cruise. It is presently prepared in various formats by most activities and its effectiveness is well demonstrated. In addition to internal use by an institution its purpose is to:

- . Provide information needed to obtain foreign government clearances (either through the State Department or privately).
- . Provide Federal funding agencies (ONR, NSF, NOAA, etc.) with summary information on research cruises.
- . Provide Department of State and other Federal Agencies with information needed on U.S. research vessels operating in remote and possibly sensitive areas.
- . Provide the UNOLS mechanism with information to improve cruise coordination and to help accommodate, where possible, the projects of other scientists not having available ship time.

The cruise prospectus essentially is an expansion of the ship schedule on a cruise by cruise basis. It should contain, in addition to a description of the intended research projects both primary and ancillary, other pertinent information such as participants, sponsors, data to be collected and equipment to be used, itinerary, ship data and other information to meet the requirements of reviewing and action agencies.

Submission of the Cruise Prospectus and Foreign Clearance Request is suggested for all cruises which involve foreign operations and research clearances (with the exception of short cruises adjacent to U.S. areas for which standing arrangements exist). The request should be prepared and submitted at least 90 days prior to the departure of the cruise or cruise leg on which the intended research is to be accomplished. In some cases even greater lead time is required. Consult the current Department of State "NOTICES TO RESEARCH SHIP OPERATORS". Submission should be made to the Director, Office of Marine Science and Ocean Affairs (OES/OFA/MO), U.S. Department of State, Washington, D.C. 20520, with copies as prescribed by individual agencies. In cases where clearances are being sought privately without Department of State assistance, a copy should be sent to that Department as a matter of information.

RESEARCH CRUISE REPORTS

Generally one of the conditions for a foreign government to grant a research clearance to a U.S. research vessel requires that information and data resulting from the cruise will be furnished to the host government. Delays or outright failure to exchange information that had been promised or which was a requirement for the clearance increases the climate of suspicion in many foreign lands that U.S. scientists are really working toward economic or intelligence goals. This impedes future clearances for all scientists, not just those responsible for the cruise in question. A timely cruise report will serve as a focal point for the future exchange of data and meaningful scientific information. Even when such a report has not been requested or required, submission of one will generally aid in establishing a positive attitude among the local authorities toward U.S. marine science endeavors off their coast.

In order to initiate compliance to requirements by foreign governments which grant research clearances a brief RESEARCH CRUISE REPORT should be prepared and submitted within 30 days following the termination of the cruise or appropriate cruise leg. It need not have any specific format but should include the following elements:

- . Identify cruise, time period
- . Name of vessel
- . Institution
- . Chief Scientist or principal investigator (address)

- . Description of scientific program
- . Measurements and sampling taken
- . Custodian of data and/or samples (address)
- . Track and location of stations
- . Scientific party and specialities
- . Host country's participants
- . Preliminary results, if available

This report would be forwarded by the vessel operator to the Department of State Office of Marine Science and Ocean Affairs. Department of State would then forward this report to the foreign office of the host country for their distribution to designated agencies of their government and scientists as appropriate. Included in the Department of State's cover letter would be the suggestion that interested government agencies or scientists contact the chief scientist directly for data reports or other detailed information as requested.

INSTRUCTIONS FOR THE PREPARATION AND SUBMISSION OF
RESEARCH CRUISE PROSPECTUS AND FOREIGN CLEARANCE REQUEST
(Rev. 10-1-74)

General

The form (two sheets) is intended for use by operators of research vessels for requesting foreign research clearances through the Department of State. It provides the information which that Department advises is necessary in order to obtain most clearances. Where clearances are handled privately (i.e. without the need for State Department assistance), the information serves to keep the State Department informed concerning the operations of U.S. ships in order that the appropriate U.S. Embassy and Consulates can be prepared to assist the vessel if required.

As a CRUISE PROSPECTUS the form further provides other agencies and activities with forthcoming cruise information which is necessary to their needs.

Submission

The clearance request and prospectus should be submitted at least 90 days prior to the departure of the cruise or leg. In some cases greater lead time is required and the current Dept. of State "NOTICE TO RESEARCH SHIP OPERATORS" should be consulted.

Original of the clearance request and prospectus should be sent to:

Director, Office of Marine Science and Ocean Affairs OES/OFA/MSO
U.S. Department of State
Washington, D. C. 20520

Copies should be sent to:

- . Oceanographer of the Navy, (Code N-33) . National Oceanographic Data Center
200 Stovall Street . National Oceanic & Atmospheric Adm.
Alexandria, Virginia 22332 . Department of Commerce
Rockville, Maryland 20852
- . UNOLS Office (UNOLS Ships only)
Woods Hole Oceanographic Institution . Federal Research Sponsor
Woods Hole, Massachusetts 02543

Clearance Request Sheet

- . This is the basic request form which identifies the cruise by ship, dates, project and investigator.
- . Special Information is the precise trackline data to allow State Dept. analysis and determination of clearance needs; also any special conditions or requirements.
- . Action Requested - check the applicable item or items.
- . Note that the request is incomplete without the attachment of the cruise prospectus and track chart.

Cruise Prospectus

- . The cruise prospectus sheet is designed to be used independently of the request sheet for furnishing information to foreign governments and other agencies.
- . The numbered items are for the most part self explanatory. Responses should be brief and additional information, if required, should be continued on the reverse or on a separate sheet.
- . Projects other than the principal work should be accounted for under items 14 & 15 (Ancillary Projects).

Attachments

Append a page size track chart suitable for reproduction and submission to foreign clearance authorities.

Certain clearances require the attachment of a roster of all scientific personnel giving title, citizenship and professional affiliation. Consult the current Dept. of State "NOTICE TO RESEARCH SHIP OPERATORS".

ORIGINAL _____

UPDATE _____

RESEARCH CRUISE PROSPECTUS
AND
FOREIGN CLEARANCE
REQUEST

UNOLS
10/1/74

DATE _____

To: DIRECTOR, OFFICE OF MARINE SCIENCE AND OCEAN AFFAIRS OES/OFA/MSO
U. S. DEPARTMENT OF STATE, WASHINGTON, DC 20520

1. PLEASE BE ADVISED OF THE FORTHCOMING OCEANOGRAPHIC RESEARCH CRUISE AND FOR THE NEED TO OBTAIN THE ASSISTANCE OF THE U.S. DEPARTMENT OF STATE AS DESCRIBED BELOW:

Cruise Data

SHIP NAME	OPERATING INSTITUTION OR AGENCY
REGION OF INVESTIGATION AND PROJECT TITLE	
CRUISE DATES (INCLUSIVE)	PRINCIPAL INVESTIGATOR

Special Information

ANALYSIS FOR POSSIBLE RESEARCH CLEARANCE NEEDS

TRACK CHART ATTACHED

COUNTRY	TRACKLINE DATA				DESCRIPTION OF PROJECT (S)
	POSITION	DATE	DISTANCE OFFSHORE	DEPTH	
UNUSUAL PROCEDURES TO BE USED OR PERMITS REQUIRED					EXPLOSIVES CARRIED AND USE

Action Required

RESEARCH CLEARANCES

- REQUEST STATE DEPT. TO INITIATE
 REQUEST STATE DEPT. ADVICE
 BEING HANDLED PRIVATELY - INFORMATION ONLY
 NONE REQUIRED - INFORMATION ONLY
 OTHER (SPECIFY ON REVERSE)

PORT CALL CLEARANCES

- PUBLIC VESSEL - STATE DEPT. INITIATE
 PART OF RESEARCH CLEARANCE - REQUEST REQUEST STATE DEPARTMENT INITIATE
 BEING HANDLED BY SHIP'S AGENT
 UNUSUAL PROBLEM - REQUEST STATE DEPARTMENT ASSISTANCE (SPECIFY)

FOREIGN PARTICIPATION AVAILABLE
NUMBER OF BERTHS _____
CONSTRAINTS:

SUBMITTED BY (NAME, TITLE, SIGNATURE)

TEL. NO:

cruise prospectus attached

ORIGINAL _____

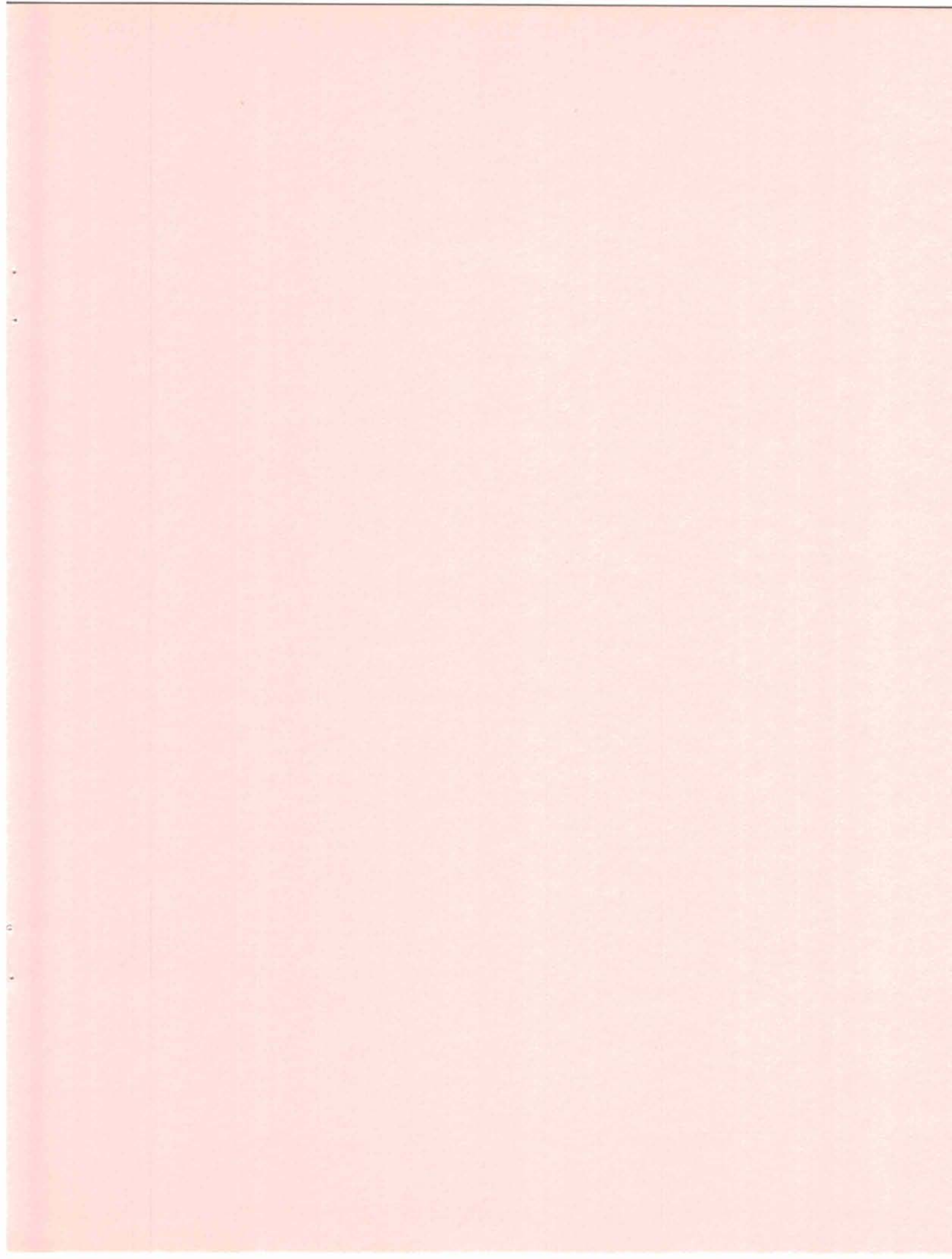
UPDATE _____

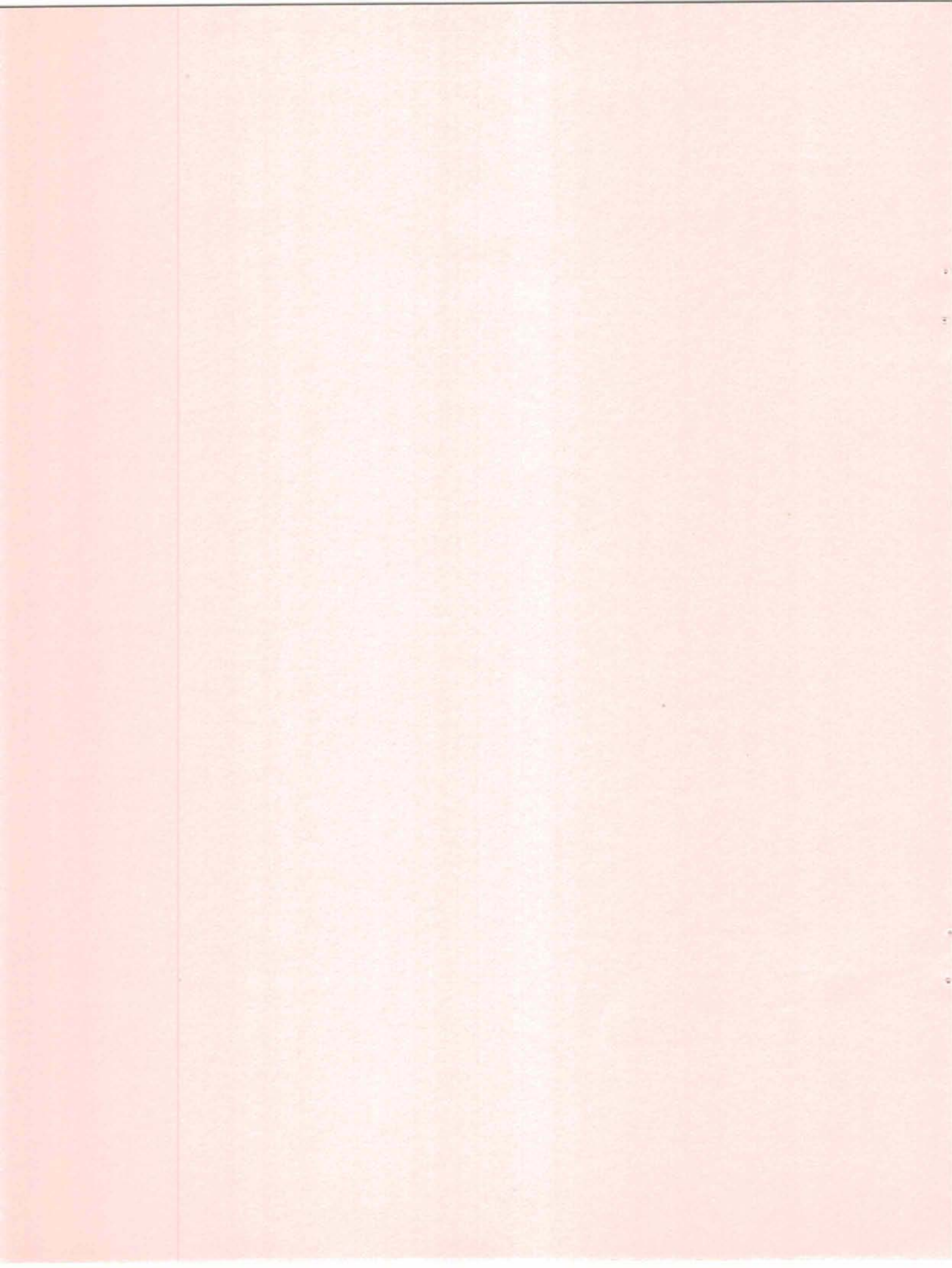
CRUISE PROSPECTUS

UNOLS
10/1/74

DATE _____

1. SHIP NAME	2. OPERATING INST. OR AGENCY				
3. PROJECT TITLE	4. CRUISE COORDINATOR OR CONTACT (name, address & telephone number)				
5. CRUISE DATES (inclusive) from: _____ to: _____	8. PRINCIPAL SCIENTIST(S) (name, title & affiliation)				
6. REGION OF INVESTIGATION (attach track chart)					
7. ITINERARY <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 50%; border-bottom: 1px solid black; text-align: center;">Port</th> <th style="width: 50%; border-bottom: 1px solid black; text-align: center;">Dates</th> </tr> </thead> <tbody> <tr> <td style="border-left: 1px solid black; border-right: 1px solid black; height: 100px;"></td> <td style="border-left: 1px solid black; border-right: 1px solid black; height: 100px;"></td> </tr> </tbody> </table>	Port	Dates			9. SPONSORING AGENCY(S)
Port	Dates				
11. SCIENTIFIC PURPOSE AND DESCRIPTION OF PROJECT (attach sampling plan if available)					
12. DATA TO BE COLLECTED	13. EQUIPMENT TO BE USED				
14. ANCILLARY PROJECT #1 (describe briefly)	15. ANCILLARY PROJECT #2 (describe briefly)				
16. SHIP DESCRIPTION					
GROSS TONS _____ LOA _____ DRAFT _____ NAME OF MASTER: NO. CREW _____ NO. SCIENTISTS _____	RADIO CALL SIGN: SHIPBOARD COMMUNICATIONS PLAN:				





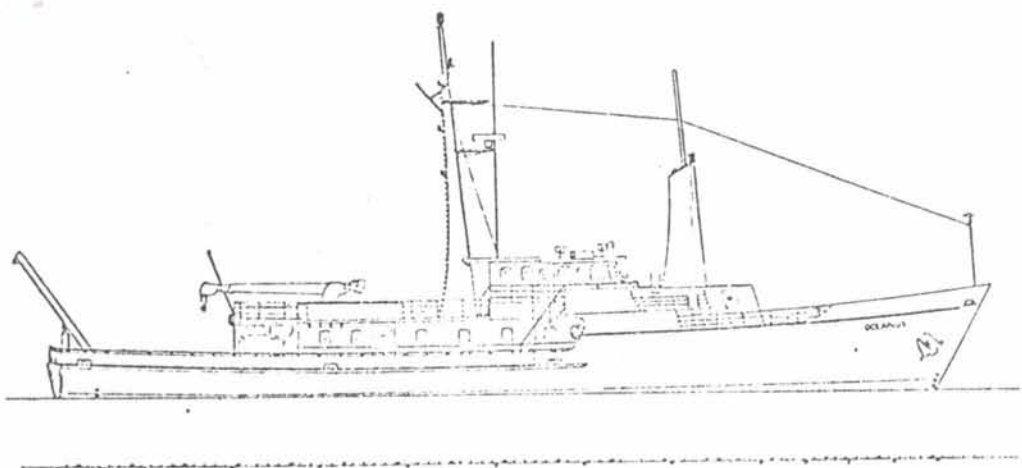
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HISTORY
AND
DESIGN CRITERIA

RESEARCH VESSEL OCEANUS

AND

RESEARCH VESSEL WECOMA



OCEANUS - One of the Titans or Elder Gods, the river that encircled the earth.

WECOMA - The Clatsop Indian name for the sea.

J. Leiby
Woods Hole Oceanographic Institution

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PRESENT SITUATION

Two ships, the OCEANUS and the WECOMA, are under construction at Peterson Builders, Inc., Sturgeon Bay, Wisconsin, funded by the National Science Foundation and will be operated respectively by the Woods Hole Oceanographic Institution and Oregon State University when delivered in the fall of 1975. The design was conceived at Woods Hole as a replacement for the CRAWFORD. Work started as far back as 1963 and proceeded intermittently with strong inputs from our experience in the conversion, design and operation of the various ships such as the CRAWFORD, CHAIN, GOSNOLD, ATLANTIS II and KNORR. The resulting configuration put the living and working spaces in the most comfortable part of the ship, allowed the operators on the bridge to see what was happening on deck, and put major emphasis on good seakeeping qualities with the ability to maintain a fairly high sea speed and with the overriding consideration to keep the vessel, all its equipment, and its operation as simple as possible. Because it was to be an intermediate unit of the fleet a target of 300 gross register tons was used as the upper limit of size.

The hull design and engineering was accomplished by John W. Gilbert Associates of Boston, who have to their credit many vessels which successfully earn their living in the North Atlantic Fisheries in year-round service.

DESIGN OBJECTIVES

In general order of priority the primary design objectives were

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to produce an intermediate sized seagoing ship of less than 300 gross register tons with the following characteristics:

- SEAKEEPING** To have the ability to operate safely in deep-sea service, including the North Atlantic in winter, through an optimum balance of freeboard, weight distribution, range of stability and survival of damage.
- SHIP MOTION** Hull design, weight, trim and stability to be developed for minimum ship motion in a seaway under all conditions of loading.
- COMFORT** Living, working and command spaces to be located in areas of least motion amidships and low in the vessel, and to be removed as far as possible from machinery spaces to reduce effects of noise and vibration
- SPEED** Fairly high sustained sea speed with a minimum loss in heavy weather.
- SIMPLICITY** Arrangements and equipment to be simple and functional as possible with grouping for direct access between command and working areas; permanent spaces located below deck, laboratories with transient equipment on the main deck, and bridge located to oversee working deck aft.
- CONTROL** Maneuvering and speed control to zero speed, with sustained periods at idle or slow speed.

The basic justification for research ships is understood. It is also understood that both in initial cost and operation they are the most expensive instruments used in the science of oceanography. Since operating cost equals construction cost in approximately five years, it is imperative that operational cost be reduced to the minimum consistent with efficiency and safety. Since crew costs approach fifty percent of total operating costs, the major area for cost reduction is in reducing crew requirements. An examination of vessel characteristics, operating practices and maritime laws indicates that there are several plateaus in ship size where significant changes in crew size take place.

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Few new ship designs developed in the past decade have had previous design studies to build upon. In capability and/or size many have been at an uneconomical position on an operating plateau. Often they have been overcomplicated by attempts to make them all-purpose research platforms with too many scientific accessories. Furthermore, many of the smaller ships have been ill configured or too small to do much high seas work in very rough weather.

The requirements for the design of an intermediate size ship presented here evolved over many years. They had their origin in the design study of a series of research ship sizes presented in 1959 by Minot and were further influenced both by operational experience with the CRAWFORD and design, construction and operational experience with the larger more complex ships of the Woods Hole fleet. Since these requirements have been under discussion and given serious thought for such a long period they have probably been distilled to a greater extent than has been customary in the past design projects.

The requirements can be divided into two sections. We purposely made secondary in importance the very specific requirements for details of design, construction and equipage which have been developed from experience with past operations, quality and function of equipment, etc. Such specific detail requirements were the basis for the construction specifications which were developed after the basic design objectives were settled upon and met.

The design objectives dictate the requirements for the basic

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functions of the vessel. These determine the basic characteristics, capabilities and operational efficiencies to be achieved in the design. In essence these objectives were relatively simple and few:

1. To design an intermediate size seagoing ship of less than 300 gross tons to operate as economically and as efficiently as possible.

The intermediate size was an inherent requirement. The limitation of gross tonnage will be a major factor in keeping the operating costs low since this is one of the major boundaries of an operating plateau. Within this limit there is also the advantage that it is possible to use personnel with small ship experience which is more appropriate to our work rather than that gained on more complicated larger ships.

2. The ship is to have comfortable seakeeping characteristics for year-round, rough sea operation such as the North Atlantic and is to have a fairly high sea speed.

Both the seakeeping and speed requirements favor a longer, larger design but a reasonable response to gross tonnage requirements sets a maximum limit on size. This interaction tended to place the design at the optimum end of the economical plateau for this general size of ship while primary attention to seakeeping characteristics helped assure that the hull was properly configured for the service rather than an inappropriate adaption from some unrelated service. Unfortunately, primary attention to seakeeping has not been a major factor in the design of many existing research vessels. Too often past designs have placed more stress on a high packing factor and 'unique' oceanographic features to the detriment of the basic seakeeping ability and comfort of the vessel. The word comfort is important in that we determined to place personnel living and working spaces in areas of minimum motion and maximum comfort. This was an effort to reverse the trend carried from other classes of ships that place inanimate and less densely populated areas - such as storerooms and machinery spaces - in those areas. Furthermore, under the heading of comfort we intended to locate high noise spaces as remotely as possible from the major living and working areas rather than right in the center of such spaces as is too often the practice.¹

1. See App. 3, Critique of Previous Woods Hole Vessels.

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Related to the requirement for a fairly high sea speed we attempted to provide a sufficient and conservative margin of power so that the ship can operate at an economical cruising speed which analyses indicate is considerably higher (14.5 knots) than obtainable in existing ships.

3. To have a minimum of complication in all aspects of design and operation.

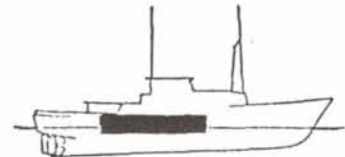
The aim of this requirement is to reduce both construction and operating costs and if realized it would also go far in reducing operating complications and confusion. This requirement implies the minimum number of components consistent with the safety and efficiency. For example, we have attempted to eliminate every point at which operating alternatives require decisions on the premise that the greater the number of decisions required, the greater are the number of personnel necessary to make and debate those decisions.

In addition, reduction of components and unnecessary appurtenances will materially reduce maintenance loads on both the crew and during overhaul periods. Further, the arrangement of the ship has been kept simple and compact; spaces are grouped by function, living quarters and other relatively stable areas of the ship are below the main deck, and laboratories with their transient equipment are on the main deck with good access. The bridge is located near the center of scientific work spaces to centralize work and communications.

MEANS OF MEETING OBJECTIVES

1. General configuration.

The living accommodations are placed amidships and low within the vessel for minimum motion. In addition, they are remote from machinery areas to reduce noise transmission.



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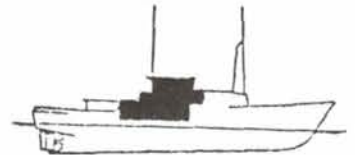
2. Machinery location.

Machinery spaces are located forward of amidships. This permits the amidships area of least motion and greatest space to be used for the more densely populated accommodation, library and control spaces and eliminates interference from machinery uptakes. The engine room incorporates a simplified, straightforward arrangement using standard commercial equipment and is arranged for unmanned operation with complete control from the bridge over all of the main machinery operations involving vessel maneuvering, positioning and winch operations.



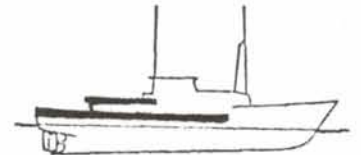
3. Navigation and laboratory areas.

The navigation and laboratory areas are located amidships for reduced sea motion and direct access to the main and upper deck working areas. The centrally located bridge provides maximum visibility of all over-the-side scientific operations as well as around-the-horizon visibility for navigation.



4. Working decks.

The main working deck areas are located amidships and aft for greater flexibility in working over the side and stern, and protection from the weather when going ahead.



5. Seakeeping and seakindliness.

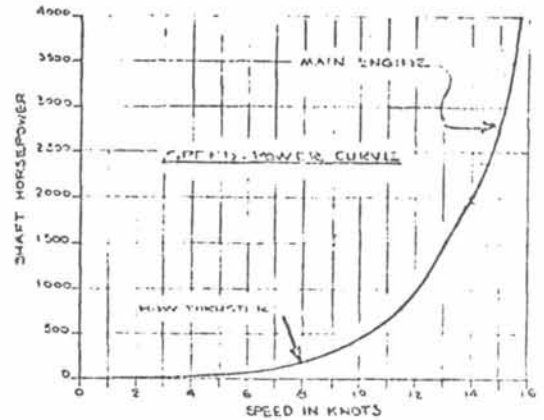
The vessel will be capable of operating throughout the world with special emphasis on the conditions encountered in the North Atlantic. Basic seakeeping and seakindliness characteristics have been developed from those of large American and European fishing trawlers operating in such areas throughout the year.

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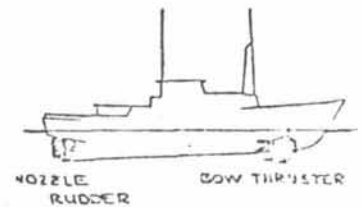
6. Speed and power.

Previous research vessels expended considerable time traveling to stations and from station to station. To reduce time, this vessel has a reasonably high speed of advance which will provide a greater percentage of on-station time. This higher speed will not adversely effect the seakindliness of the vessel because of the hull form and the placement of living and working areas in the central part of the vessel.

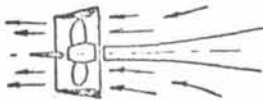


7. Maneuvering.

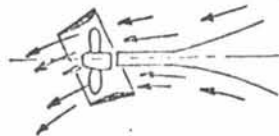
At low speeds the vessel is maneuvered by its steering nozzle rudder aft and the large bow thruster controlled from the bridge. The propeller is controllable pitch permitting a full range of speed control with increased steering torque from the nozzle rudder. The bow thruster provides 360° of thrust and could also act as a come-home standby propulsion unit.



Flow Diagram in straight ahead course showing shrouding of propeller tips which reduces waterborne noise.



Flow Diagram in Turning Mode. The flow of water is directed by the turning nozzle rather than deflected as in ordinary rudders.



Flow Diagram in Reversing Mode. The flow of water is directed forward in whatever direction the nozzle is turned.



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FACTORS THAT INFLUENCED THE DESIGN

Basic arrangement and machinery location - The living and working spaces are located amidships and as low as possible in the area of minimum motion to provide maximum comfort and convenience in the most heavily populated parts of the ship. The bridge is located amidships at the point of maximum observation of working areas both overside and on the main deck aft and the arrangement allows for direct communication and access between the bridge, laboratories and working deck areas.

The arrangement with living and working space amidships dictates that the machinery space be forward since there is not enough depth in the ship to place such a power plant aft without complicated gearing arrangements and the addition of engine room uptakes through the main working deck. The architects have no fear of the length of shaft involved in a forward location due to experience with similar arrangements in fishing vessels, tuna clippers and other commercial vessels.

Prof. F. M. Lewis, who consulted with us on the solution to the shaft vibration problems on the KNORR, has reviewed the machinery, shafting and propeller arrangements of this design.

Engine and propeller arrangement - A single screw-single engine geared medium speed Diesel installation with a controllable pitch propeller leads to greater simplicity in operation, is more economical in space and weighs less than other possible configurations. A single screw arrangement with a Kort nozzle steering rudder and a controllable

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pitch propeller can give adequate maneuverability especially in association with a trainable 360° steerable bow thruster. The planned thruster unit could bring the ship home at 5-6 knots in the event of failure of the main propeller or shafting.

With the addition of a rectifier the shaft driven generator could also be used as an auxiliary propulsion motor powered from the ship's service generators in the event of failure of the main propulsion engine. In this mode it could drive the main propeller to give an estimated speed of 8 knots.

Type of power plant - During the design there was question of the 15 to 16 knot speed requirement in view of the steepness of the speed/power curve. It was felt this requirement dictated an uneconomically large power plant with attendant high fuel costs and high maintenance costs. The following points were made relative to this question:

Part of the reason for the large power is the need for a higher average speed than exists in the present Woods Hole ships. This would save transit time and since use charges to the scientific department are based on a daily cost it would result in lower ship costs. Such a saving in time, of course, must be weighed against higher fuel cost for higher speeds but it was noted that fuel oil costs average approximately 15% of Woods Hole ship operation costs and therefore a substantial increase would not effect total costs a great deal. A calculation was made of the power requirements for the most economic speed for a series of typical voyages. This is summarized in Appendix 4 attached.

Another reason for the selection of a large engine is psychological in that the operating engineers tend to run machinery below full rating while manufacturers tend to over-rate machinery in their advertising. Therefore, a large engine with a high rating is expected in actual practice to run at a more reasonable setting

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which hopefully would correspond to the economical cruising speed of the vessel but still allow a substantial margin of power for rough weather operation and high speed transit on short cruises.

The need to reduce crew costs - in the Woods Hole fleet they amount to approximately 45% of total operating cost - dictates reduced manning requirements which can be the result of a simple power plant designed so a minimum of operating decisions are required.

To accomplish this the power plant was developed around the most simple arrangement possible; a single screw/single engine propulsion system with the capability of also operating auxiliary loads such as a generator for bow thruster drive from the main engine reduction gear box.

The ability to utilize such drives directly through clutch control from the bridge should reduce full-time manning requirements in the engineering spaces. This is in contrast to some present ships where auxiliary power engines must be started and warmed up by the engineers before load can be applied to a bow thruster or winch.

It should be noted that the auxiliary load through a clutch-driven output from the main gear box has been arranged within a standard Lufkin reduction gear box and does not require specialized components.

It should also be noted that we would prefer to compromise or reduce the speed requirement in honor of greater simplicity in the power plant in order to reduce manning requirements. For instance, several of the preliminary design arrangements utilized multiple engines to achieve a 16-knot speed with a margin of power but the complication of such multiple engine arrangements was not felt to be worth the compromises with simplicity which would result. As an example of the opposite approach, the diesel electric power plant of the Research Vessel CHAIN was cited where four 8-cylinder diesel driven electric generators provide power to four propulsion motors which drive twin screws through reduction gears. Thus 32 cylinders, four generators, four propulsion motors and two gear sets provide comparable power to the single 16 cylinder engine, reduction gear and controllable pitch propeller arrangement proposed for the new ship.

Experience has taught us that multiple engines, especially on a single shaft, provide so much "flexibility" that the ship would end up with watch standing engineers to start and stop the flexible plant. We prefer to have one engine and thereby eliminate the

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possibility of a debate on whether the engines should be run, idled or stopped and whether they can be safely started from the bridge.

An electro-motive (GM) engine of approximately 2800 hp at 900 rpm was selected as a reasonable power plant for this ship because it is the type and manufacture of engine most readily available with good maintenance and operational experience. Its large production for the railroad industry (approximately 500 units per year) makes it one of the lowest cost engines in this power range and gives assurance of good parts supplies. Figure 2 gives the estimated speed and power for the design.

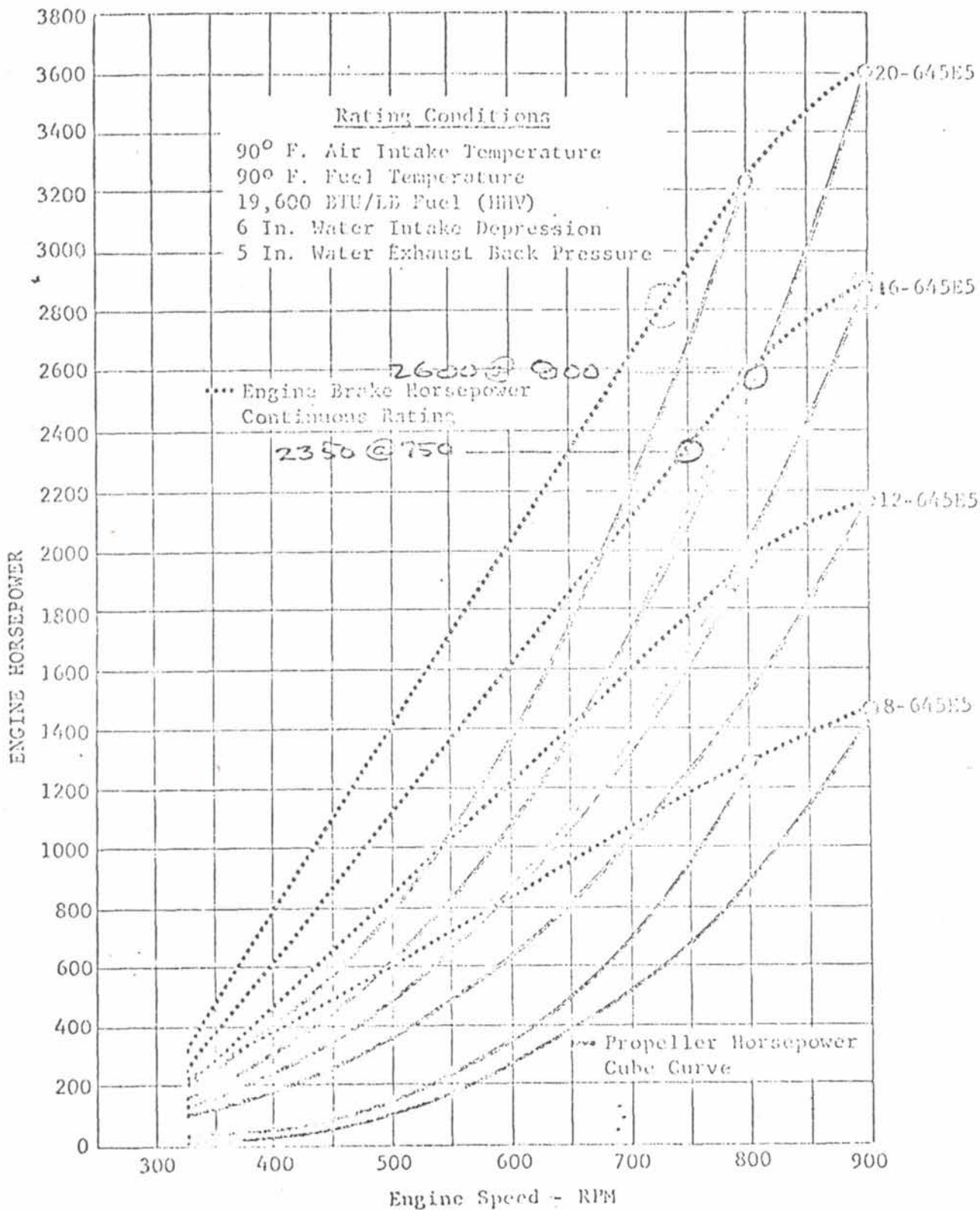
Kort nozzle steering rudder - A Kort nozzle steering rudder also provides a method of shrouding the propeller to protect it from fouling with overboard wires, lines and other equipment and improves maneuvering characteristics. The nozzle rudder is not only more effective in steering in the forward direction but it permits the ship to be steered when going astern or backing. Mr. Gilbert's office has had favorable experience with nozzle installations in a number of their designs for the fishing industry.

Vibration and noise - A Diesel plant cannot be as quiet as a steam vessel such as the ATLANTIS II but the location of the machinery forward, remote from the living quarters and working areas, should tend to reduce noise levels. The auxiliary generators are on acoustic mounts and sound dampening material has been applied to the engineering spaces. Additionally, attention has been paid to the acoustics of the ship's ventilation systems in an effort to reduce noise levels in living and working areas. The Kort nozzle will also give a considerable reduction in propeller noise.

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HORSEPOWER vs ENGINE SPEED CURVES

TURBOCHARGED ENGINES



OVERLOAD RATING DEFINITION - The standard overload rating of the engine permits an output of 10% in excess of full load rating for two continuous hours, but not to exceed a total of two hours out of any 24 consecutive hours of operation.

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Growth potential - The vessel contains sufficient margin in hull characteristics, power and the electrical system for added operational development. The main deck, the aft part of the boat deck, and the laboratories are arranged with a sufficient number of boltdowns to permit the installation of portable vans, various winches, and scientific equipment to allow complete flexibility in preparation for each cruise.

CONTRACTING PROCEDURE

A survey by the Research Vessel Operator's Council in 1967 showed that there was a general need for intermediate size ships at many laboratories which was not reflected in the construction programs of the major funding agencies. The Navy was concentrating on large ships and the National Science Foundation, because of budget limitations, had brought it's construction program to a standstill. As a consequence of this report the Navy instituted an intermediate size class, again for serial production, but unfortunately a hull type was picked which was considered to be unsuitable for year-round North Atlantic operation. This precluded participation in the program by Woods Hole and other high latitude laboratories. In addition, further budget setbacks curtailed the program to the point where construction has only been completed on the first vessels as of this writing (1974).

Because of lack of encouragement and restrictive budgets in the late 1960's no proposals were submitted for construction funding for an intermediate size ship at Woods Hole but the requirements were worked

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on and further distilled and design outline work was continued. The need for the replacement ship was emphasized when operating budget restrictions forced the 41-year old CRAWFORD to be laid up in 1968 after 12 years of service to the Institution.

In 1971 a design grant was received from the Fleischmann Foundation and a preliminary design was undertaken by the office of John W. Gilbert Associates, Inc. of Boston.

1971 (November)

Preliminary design completed.

1972 (January)

Construction proposal submitted to NSF.

1972 (June)

NSF contract signed for 2.8m, title of ship to be retained by Government (NSF).

1972 (August)

Model testing underway at MIT tank.

1972 (December)

Bidding and contracting procedure developed in conjunction with NSF and reviewed by Trustees Advisory Committee. Proposals were to be solicited only from qualified shipbuilders; qualification to result from site visits, evaluation of reputation, financial condition, etc., by Woods Hole team.

Twelve builders originally evidenced interest in the project. Five of these later declined due to other commitments or relatively small size of ship. Two of the twelve were considered not qualified, leaving five potential bidders.

1973 (March)

Proposals received from only two of the five that had taken out plans and specifications:

Peterson Builders, Inc., Sturgeon Bay, Wisconsin (3.8m)

Campbell Industries, San Diego, California (4.7m)

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1973 (April)

Woods Hole representatives negotiated with Peterson and through deletion or reduction in size of certain equipment and consequent reduction in man-hours arrived at a reduction of the P.B.I. bid by approximately \$600,000.

The negotiated price was still in excess of the funds provided by NSF. NSF rejected an offer by Woods Hole to supplement the construction and directed that the proposals be cancelled, the design revised, and new proposals solicited.

1973 (May-August)

Plans and specifications revised. Readvertisement in the Commerce Business Daily resulted in deposits from eleven yards for plans and specifications, five of which received plans in the first round. NSF had requested bids be obtained for one or two ships with the operator of the second ship unspecified.

CHANGES IN REVISED DESIGN

The basic hull and arrangement remained the same. Major changes made during the revision of plans and specifications were:

Smaller main engine - from 20 cylinder 3500 hp to 16 cylinder 2800 hp with consequent change in size of shafting, propeller and nozzle rudder.

Speed - will be reduced about one knot (from 16 to 15) which is acceptable.

Smaller bow thruster - reduction from 500 hp to 300 hp unit.

Elimination of gas turbine auxiliary propulsion and emergency power system.

A small 120 volt battery bank is substituted for emergency generator.

Great simplification in electrical switchboards and distribution system.

Simplification in monitoring system.

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Standard "drop-in" prefabricated refrigerator boxes rather than built-in equipment.

Elimination of communication and navigation electronics from yard purchase and installation. The Operator will install essential equipment from laid-up ships or future purchase after delivery of the vessels.

Elimination of spare parts purchase by shipbuilder, required parts will be purchased by Operators after delivery.

Standard furniture versus custom built-in wooden units.

Reduction in upper deckhouse size by lowering of bridge and elimination of gas turbine room, wet lab and upper deck library location.

Extensive simplification or reduction of detailed equipment such as doors, windows, furnishings, galley equipment, machinery, steering gear, etc.

Reduction or elimination of ambiguous specification requirements.

1973 (October)

Proposals received from two of the eleven potential builders:
Peterson Builders, Inc. (3.46m one ship - 3.13m two ships)
Campbell Industries (3.9m one ship - 3.83m two ships)
Each proposal contained optional prices for certain equipment.

1973 (December)

Contract was approved by NSF and signed between Peterson Builders, Inc. and Woods Hole Oceanographic Institution for two ships at 3.093 per ship by reducing some of the options.

The proposal procedure called for (1) a firm fixed price for each ship as specified; (2) separate prices for optional items; (3) alternate proposals wherein the shipbuilders could propose alternative construction methods, equipment, a longer construction time, or even a complete alternate design. Evaluation criteria were given in the request for proposal to insure that basic requirements were met.

None of the proposers chose to offer an alternate design.

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APPENDIX 1

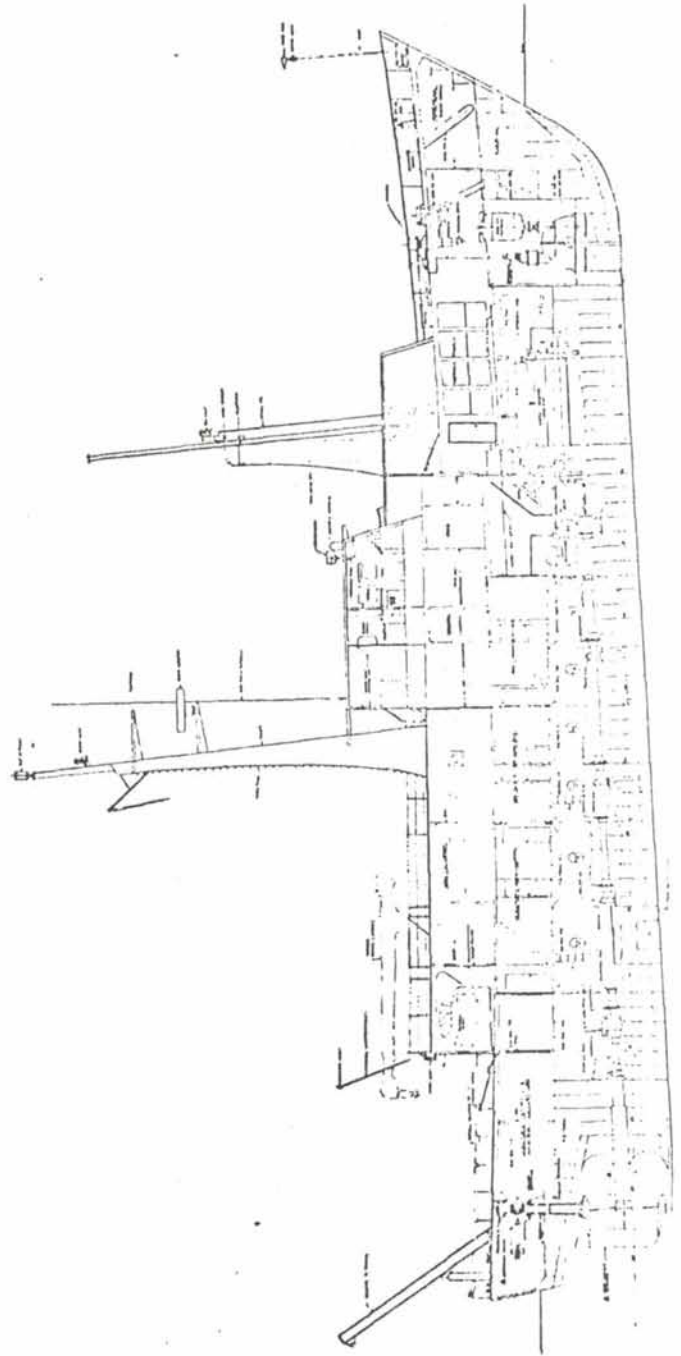
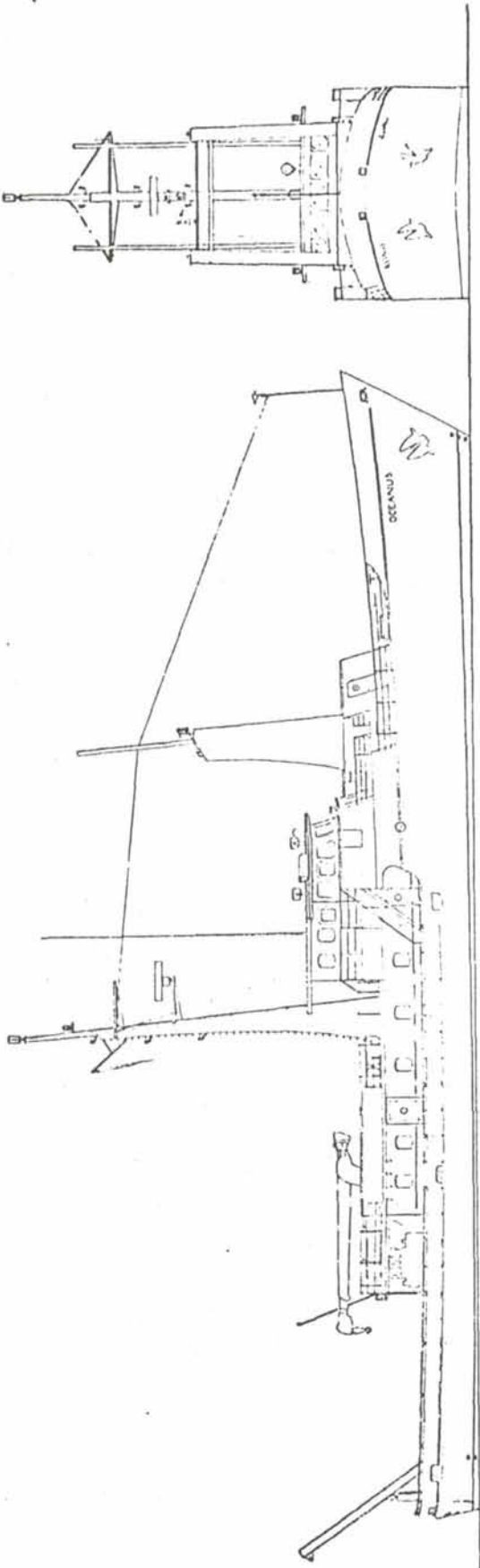
(a) Characteristics

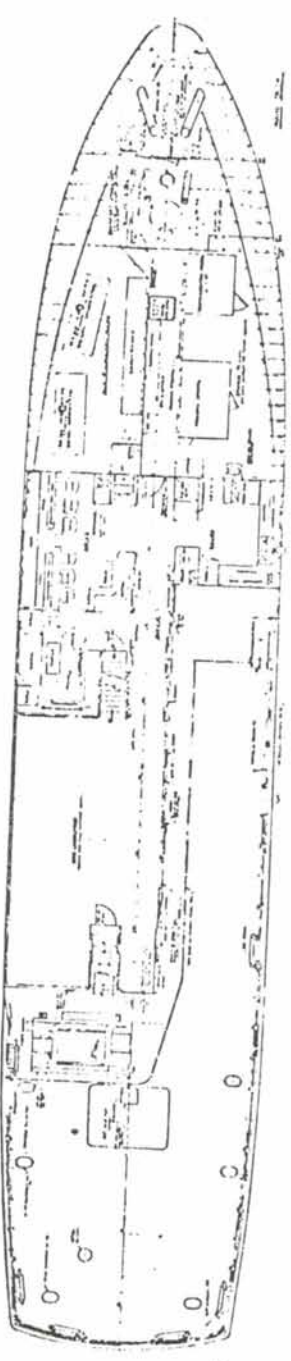
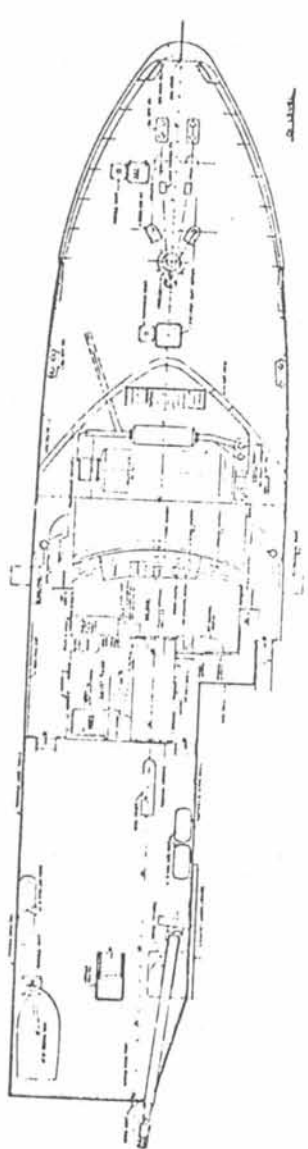
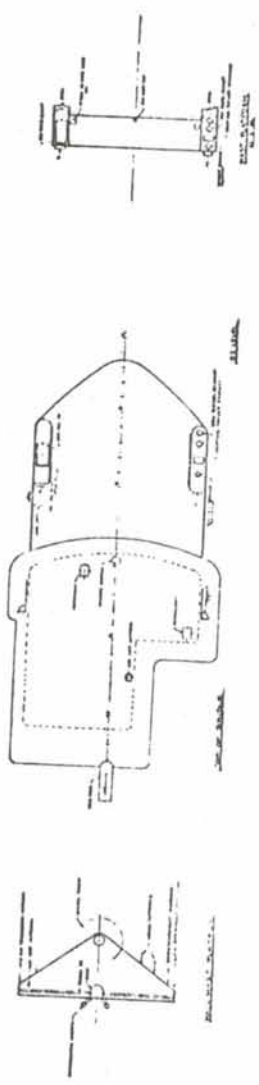
Length overall	177'-0"	
Length on waterline	165'-0"	
Length between perpendiculars	157'-8"	
Breadth molded	33'-0"	
Depth molded to main deck	17'-6"	
Design draft in salt water	12'-6"	
Scantling draft	14'-6"	
Draft, max., with 6'-3" drag	17'-6"	
Displacement molded at design draft	962	tons
Gross tonnage, under	300	
Power, total max. continuous SHP	2,800	
Speed, full power	15.0	knots
Speed, maximum cruising	14.5	knots
Range at 14.5 knots	8,000	naut. mi.
Endurance	30	days
Complement - officers and crew	13	
- scientists	12	
Total	25	

(b) Weights and Capacities (approx.)

Diesel oil	188	tons
Lubricating oil	4	tons
Fresh water	31	tons
Dry stores (approximate)	917	ft ³ molded
Refrigerated stores, chill (approx.)	306	ft ³
frozen (approx.)	360	ft ³
Scientific stores (approx.)	4,000	ft ³ molded
Scientific outfit (including cranes, winches, stores, etc.) centered four feet above the main deck	100	tons

APPENDIX 2





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APPENDIX 3

A Critique of Several Recent Woods Hole Vessels

CRAWFORD

The main deficiency of the CRAWFORD was that she was designed for service as a Coast Guard Cutter which led to a poor arrangement for a research vessel and the inability to carry heavy equipment such as a trawl or coring winch or any other relatively large weights or volumes. This latter deficiency prevented use of the ship by several groups which required heavy weight capacity of coring and trawling operations. The CRAWFORD's deck and lab space arrangement were unsuitable and limited relative to a ship of her size because a large forward deck had been provided for the installation of a gun during Coast Guard service leaving only a small afterdeck where most of our work takes place; the large foredeck had relatively little use for research since it was on the windward side of the deckhouse and was wet at sea. The small afterdeck was taken up by the hydrographic winch and allowed little space for even light but bulky equipment. The center part of the ship, especially the central section of the deckhouse, was taken up by machinery space which relegated the scientific living quarters to the forward end of the ship below deck where the motion was accentuated. The machinery space was surrounded by living and laboratory spaces which led to a relatively noisy situation, especially since the only passage between living and messing and laboratory spaces was through the upper engine room. The machinery space was given so much prominence that the class

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must have been designed by a marine engineer. The wheelhouse was located quite far forward compared to the working end of the ship (laboratories and hydrographic platform, stern working area, etc.) which made it difficult for those maneuvering the ship to observe and coordinate the operations.

On the positive side the CRAWFORD was a fine sea boat which could sustain a fairly high sea speed. She was one of the first air-conditioned ships.

GOSNOLD

The GOSNOLD's main deficiencies were poor arrangement for a research ship and slow speed, the latter primarily due to low power and hull form. The hull form is such that even increased power will not change the speed appreciably.

The major problem with her arrangement was the high poop deck which severely restricted access to the stern of the vessel for scientific equipment handling and winch installations, towing gear, etc. Also, the living space and galley area surround the machinery and are therefore vulnerable to noise, vibration and heat.

On the positive side the GOSNOLD does have a very sea kindly hull which was never known to roll.

CHAIN

The CHAIN has a good hull form and good seakeeping record, but

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suffers somewhat from the complication in arrangement and overly complicated power plant by modern standards and lack of good visibility from the bridge of the after working deck.

ATLANTIS II

The ATLANTIS II was designed from the inside; essentially, the design tried to encompass too many requirements for an all-purpose ship and the relatively tight budget dictated too compact a package.

The hull form was wrapped around these requirements almost as an afterthought resulting in a ship which was too full and too wide for it's length and one that is also underpowered so that it has but a 10-11 knot average sea speed, too low for a modern ocean-going research ship. The design orientation was that of a large merchant ship with all the traditions and complications in the way of arrangements, layout, and machinery operation.

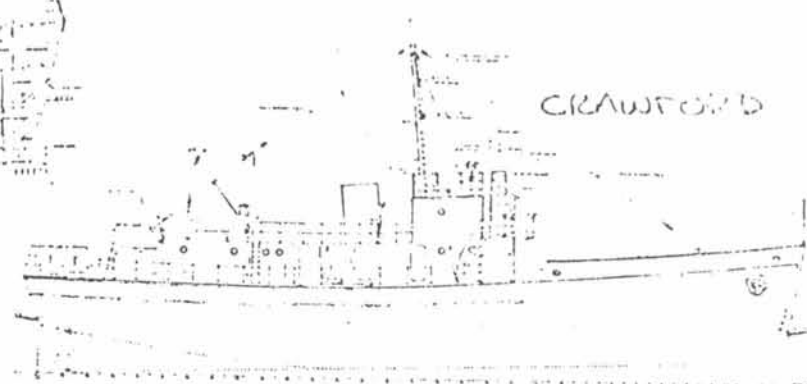
On the positive side the ship has proven to be extremely reliable, very quiet and conveniently laid out.

KNORR

The KNORR was an attempt to improve on the ATLANTIS II design with the same displacement but longer ship and by making improvements in arrangement such as moving the bridge where it could view the working area of the ship's main deck aft. These points were accomplished and in addition, a novel propulsion system gives the ship greater maneuverability.

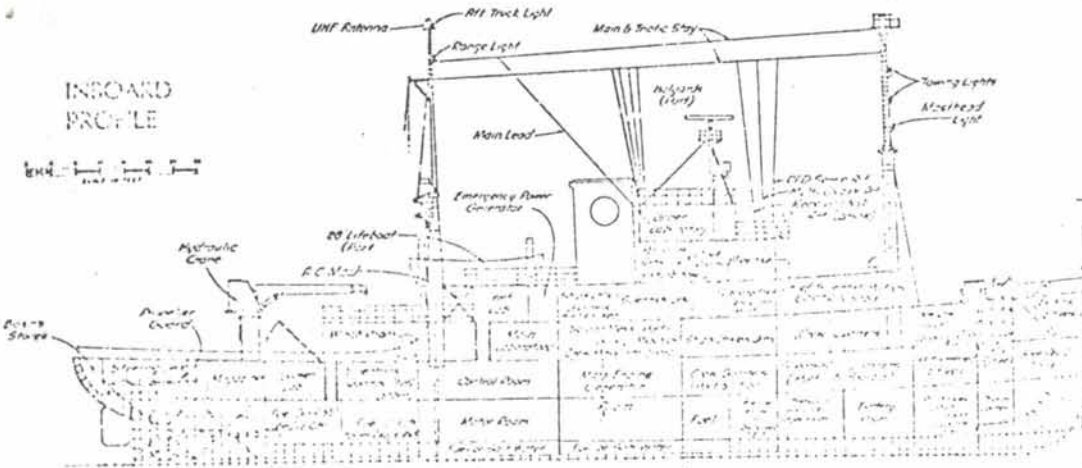


GOSNOLD



CRAWFORD

INBOARD PROFILE



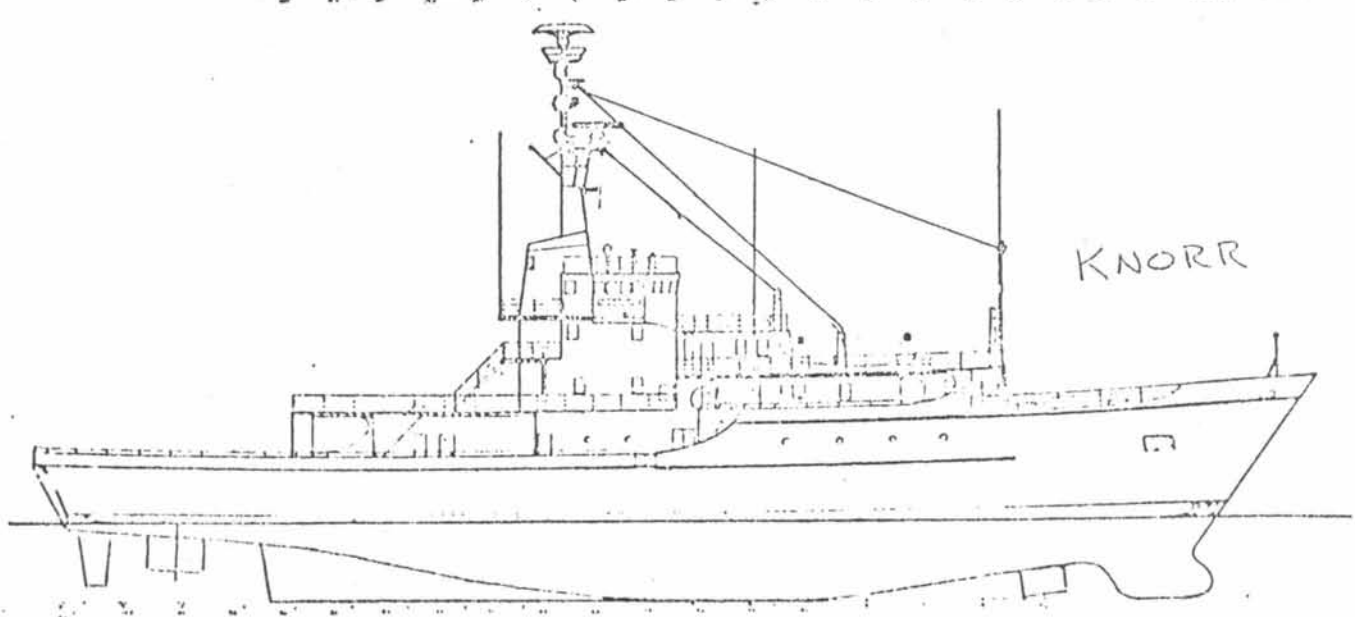
- CHAIN

INBOARD PROFILE

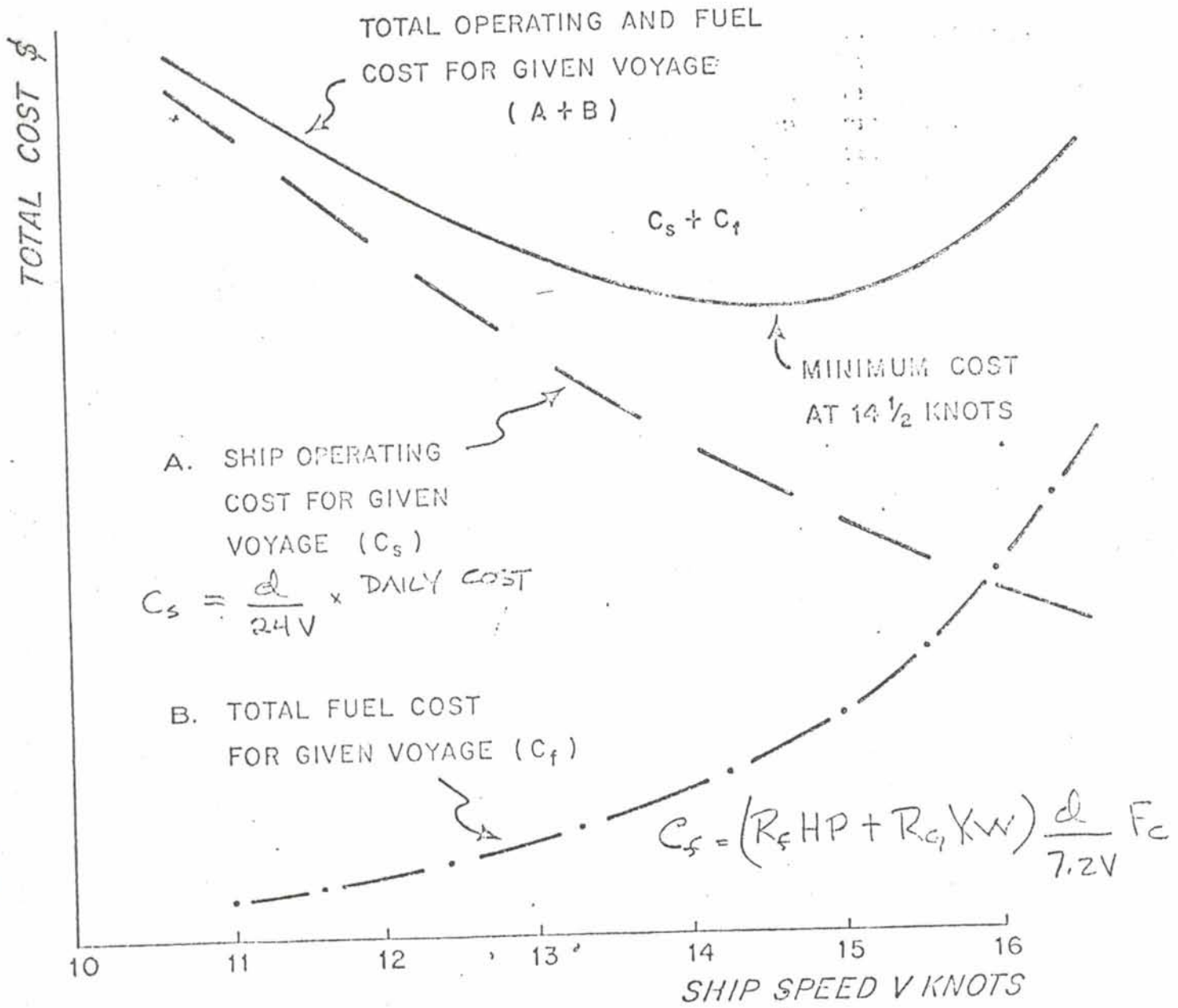


ATLANTIC II

KNORR



TOTAL SHIP OPERATING COSTS RELATED TO SEASPEED



- d = VOYAGE DISTANCE
- V = SPEED
- R_f = FUEL RATE MN ENG
- R_g = " " GENERATOR
- F_c = FUEL COST \$/GAL.

D-158
OCTANUS ETAL
SPEED VS RANGE

