UNOLS Fleet Improvement Committee
Minutes
of
Meeting 28-29 March 1988
Washington, D.C.

The UNOLS Fleet Improvement committee met at the American Institute of Architects in Washington, D.C., on 28 and 29 March 1988. Present were FIC members J. Murray (chairman in the absence of W. Nowlin), R. Barber, D. Gorsline, M. Langseth, B. Robison, F. Spiess, and executive secretary T. Treadwell. Observers were K. Kaulum and E. Mortimer (Navy), and R. West, D. Heinrichs, and G. Gross (NSF). S. Drummond and others from SEACO were present for the second day.

AGENDA

The agenda for the meeting (Appendix 1) was discussed and adopted, and the minutes of the 9-10 November 1987 meeting were adopted.

FUNDING FOR FIC OPERATIONS

Funding for FIC operations as planned have been received from NSF, and prior expenditures made from other sources to cover past operations have been repaid. Funds appear adequate for planned operations; if additional major projects are developed (e.g., design studies), supplemental funds will need to be requested. *Action*: None at this time.

REPORTS

Scientific Requirements for the UNOLS Fleet: The report by J. Murray *et al.* has been approved and distributed, and is a good summary of the situation as of the end of 1987. Unfortunately, since then NSF and other potential sponsors have lost considerable ground in funding, and in some aspects the report is already out of date. Plans call for the report to be periodically updated; discussion revolved around what should be done and when. Heinrichs noted that the NSF Ocean Sciences Advisory Committee would be giving intense consideration to the whole problem at their May 1988 meeting and that the special case of fleet requirements should take into account their recommendations and actions. Murray said this could be done by mail; perhaps an update on the situation might be available for the FIC meeting in July. *Action*: J. Murray to follow up.

History of the U.S. Research Fleet: A near-final third draft was presented by Gorsline and Treadwell. The paper has been expanded to include all known U.S. research ships, since no comprehensive source exists for this subject, rather than an incomplete series of "snapshots" of the fleet. Information is being compiled for the additional vessels, and a series of tables take several different statistical looks at the fleet. The final product would be enhanced by including a selection of significant ships, and consideration should be given to publication as a UNOLS document and elsewhere, perhaps the Oceanography Magazine of the new Oceanographic Society. Gorsline and Treadwell should have a final draft for circulation prior to the next FIC meeting and will investigate potential publications. *Action:* Gorsline and Treadwell will complete final draft.

USS Database: The document covering the need for, and elements of, a UNOLS ship scheduling data base (USS Database) distributed by Nowlin has drawn no additional comments. Langseth reported that the system established at the University of Delaware by

Crease has made very good progress and perhaps should be highlighted more. Questions were raised as to the cost of running such an operation and who should do it. The UNOLS office might, or it could be subcontracted out. It was felt that some modifications to the document's introduction should be made and the University of Delaware operations highlighted. Langseth will consult with Nowlin concerning final revisions, publication, and coordination with UNOLS. *Action:* Langseth and Nowlin will submit manuscript for publication.

Arctic research vessel requirements: At the request of R. Corell (NSF) a FIC subcommittee chaired by V. Alexander prepared a draft report that was forwarded to UNOLs and then to NSF. Gross reported that NSF found the report entirely satisfactory and did not need anything further. Although several FIC members said they had not seen the final draft, the report was formally adopted; Treadwell will send copies to all FIC members. Gross noted that the urgent request stemmed from an interest in the Arctic by both Navy (primarily in the Greenland Sea) and NSF (primarily in the western Arctic) and that there was the potential in the three planned R/Vs for an Arctic ship. Since no recent comprehensive justification existed, the report by Alexander's group was timely. The Alexander report, while generally more comprehensive, was aimed primarily at larger vessels, and T. Royer's subcommittee (see below) will focus on a smaller hull. *Action:* Nowlin will notify Alexander of acceptance of report with thanks and inquire regarding her interest in circulating it as UNOLS FIC report.

Relative benefits and costs of various modes for R/V acquisition: Gorsline reported that he has completed a brief report on the comparison of new construction, charter, and conversion for R/V acquisition; the report is substantially the same one he tabled at the last FIC meeting. It was suggested that DPP experience in this regard be included and likely ODP as well. Gross noted that with budgetary cutbacks possibly imperiling planned construction, consideration of all alternatives was pertinent. He also stated that there were no particular problems with charters from non-U.S. sources, if these were the best opportunity. Gross also suggested that, given the likely continued shortage of Federal funds, past actions taken when no such funds were available might be a good guide to future options. Gorsline's report on this topic will be included as a section in the "History of the Research Fleet" document. *Action:* Gorsline to prepare manuscript for circulation before July meeting of FIC.

OPTIONAL MODES OF R/V ACQUISITION FOR THE UNOLS FLEET

In response to a request by Heinrichs (NSF), a draft letter discussing optional modes of acquisition and operation of research vessels for the UNOLS fleet was sent by Nowlin to UNOLS and then to Heinrichs on 9 January 1988. This study, unlike the report discussed above, did not address the question of conversions. FIC approved the letter, and Heinrichs stated that it met his requirements. Several FIC members noted that acquisition is but the first problem and that operation is much more important since it carries through the entire operating life of the ship. Continuance of the present mode of operation by institutions whose staffs are both concerned and competent is vital. *Action:* None; item completed.

RESERVE FLEET VESSELS AVAILABLE FOR CONVERSION

Nowlin, Treadwell, and D. Letzring (TAMU marine operations) have been keeping abreast of ships available from the reserve fleet. A number of hulls suitable for conversion have been identified; these are off-shore boats that could be converted to R/Vs similar to GYRE, MOANA WAVE, and NEW HORIZON. It was agreed that UNOLS should be kept informed of hull availability, although no action is planned. The FIC can consider this item completed. *Action:* None.

SCIENCE MISSION REQUIREMENTS FOR R/VS

In general, the FIC agreed that the goals set by science mission requirements should be maintained, but that it might be desirable to temper them with engineering realities dictated by experience. The FIC also wanted a consolidated book of science mission requirements to provide a comprehensive scope. A loose-leaf format would allow revisions for individual types without re-doing the whole book. *Action:* Individual items noted below. Nowlin and Treadwell will arrange for consolidation and publication of the compendium.

SWATHs as a type were not an agenda item, but considerable discussion of them had bearing on several potential science mission requirements and designs. Several participants emphasized that since SWATHs are such a specialized and somewhat unproven hull type, science mission requirements may well need to be tempered by engineering and operational realities. As with many innovations, researchers had hoped that SWATHs would cure all their operational troubles, but it is becoming clear that this is not the case. Participants re-emphasized that SWATH hulls are potentially most useful in smaller hull ranges, because small ships are the most vulnerable to bad weather. SWATHs may be most useful in specialized cases requiring ultra-stability (as was FLIP).

Several scientists did research from KAIMALINO, a SWATH-hulled vessel, and Dinsmore did an evaluation report. This report needs wider dissemination. Also, direct reports from the scientists involved would be useful, and Dinsmore might put these together with his report. Robison agreed to talk with prior users of SWATHs and consolidate their feelings. *Action:* Robison will assemble additional information, and Dinsmore will continue his evaluation of KAIMALINO. Result may be distributed as FIC report.

It might also be possible to arrange for further "real science" tests on KAIYO. Navy is interested in operational tests on KAIYO and is talking to G. Grice (WHOI) about science possibilities. NSF might be interested in supporting some piggy-back research tests aboard as well. *Action:* Treadwell and Dinsmore will follow up by contacting Grice and agencies to determine what is planned, and whether studies can be broadened.

Kaulum also noted that Navy is building a 3400-ton T-AGOS, which is designed to tow hardware. This hull might provide additional operating experience pertinent to oceanographers.

Stable, deep-ocean platforms: Spiess reported that a subcommittee meeting was held last summer led by F. Fisher of the Marine Physical Laboratory and that the report should be out in a couple of weeks. The group looked at FLIP-type hulls as well as other possibilities. He noted that there are a variety of problems requiring ultra-stability, as well as other characteristics such as non-disturbance of the water column, and therefore we might wind up with several sub-sets of science mission requirements. Some groups need good axial orientation; others need varying amounts of laboratory space, etc. It was agreed that the report would come initially only to FIC, and that after review, consideration would be given to further distribution. *Action*: Spiess will distribute report to FIC.

Small, general-purpose R/V: Robison's subcommittee prepared a draft set of science mission requirements that were forwarded in November to a large segment of the community. Comments received have been incorporated as pertinent. Many respondents questioned whether all the stated requirements could be met on a standardized small hull. Perhaps there could be given "ranges" for some requirements, or priorities assigned to various factors. Robison will forward the final copy to Treadwell for distribution. *Action:* Robison will provide final version.

Intermediate, general -purpose SWATH: Dinsmore being absent, no new information on this item was available.

Small to intermediate size, ice-capable R/V: T. Royer has been requested by FIC to chair a subcommittee to develop science mission requirements for this class of vessel, taking into account V. Alexander's group report addressing the general requirements for Arctic R/Vs. Subsequent to the meeting, it was learned that Royer plans to convene a meeting and produce a draft report of representation to FIC at its July 1988 meeting. *Action:* Royer to arrange meeting.

Research submarine: B. Robison is chairing a FIC subcommittee to investigate the possibilities of a research submarine, and now that FIC funds are available he will proceed. The Submersible Science Study Committee met recently and is willing to let Robison's group look at the specific case of research submarines (as contrasted to DRVs). Robison's group now includes Hamner and Harbison, and he hopes to add Gordon and possibly others. Robison hopes to have a meeting soon and provide a report to FIC at its July 1988 meeting. *Action:* Robison to arrange meeting.

Robison provided information on their SAGA (ex-ARGYRONETE). It is about 100 feet long with Stirling engines that will eventually be changed to nuclear. SAGA does not have under-ice capability, considered desirable for a research submarine. Desired depth capability is 1,000 meters. Robison said that SAGA will give us a feel for what science can be done from this sort of craft.

There was discussion about what science has been done from research submarines such as DOLPHIN and NR-1. Kaulum identified users, including T. Osborn and J. Brooks, and said he could identify all past users of these Navy submarines. He agreed to provide this to Robison's group, so their feelings could be incorporated. *Action:* Kaulum to provide information to Robison.

In connection with several of the following agenda items, Heinrichs noted the set-backs in the NSF budget and that he had requested the UNOLS Advisory Council to assess the existing UNOLS fleet in the context of level funding. He said that he had asked for a report by June and that it would obviously bear on potential acquisitions as well as operational support.

Multichannel seismic capabilities: The FIC has been reviewing, under the leadership of Langseth, special vessel requirements. It was agreed that these needed particular review and that the large ship requirements stated by the Fleet Replacement Committee need review and likely revision. Langseth tabled a current and projected requirement estimate by academic institutions for MCS (Appendix (2)). Langseth agreed to look at the problem with a small group and report to FIC at the next meeting. In addition to the general constraints that might stem from restricted fleet funding, the following topics must be addressed: type of equipment needed (sources and receivers), transportability, commercial *vs*. UNOLS ship, and probable demand. His report should include estimates of what capabilities are needed, the total demand for ship time, and how MCS should be part of the UNOLS fleet. *Action:* Langseth to draft report before July FIC meeting.

CONCEPT DESIGN FOR INTERMEDIATE, GENERAL-PURPOSE SWATH R/V

SEACO was selected to carry out this concept design study, and the Texas A&M Research Foundation negotiated a contract with SEACO for the work. Dinsmore is the Research Foundation's technical representative for this contract and will be assisted by R. Barber and B. Ryan. A team from SEACO led by S. Drummond made a presentation, the text of which is enclosed as Appendix (3). There was extended discussion of this by FIC members and NSF and ONR observers, and the points made will be taken into account by SEACO. Some major items noted were: There may have to be a practical trade-off between the requirements for heading and station keeping; the positions of the galley and lab areas on the main deck should be interchanged; additional living spaces for scientists to be provided; bridge visibility might pose a problem with the present layout; the requirement for two cranes; and a number of detailed comments. SEACO intends to finish the design by 1 June, and the results should be available for the FIC July meeting. *Action:* SEACO continues.

PRELIMINARY DESIGN FOR A LARGE, MEDIUM-ENDURANCE MONOHULL R/V

A proposal from Glosten Associates for this study was endorsed by FIC, proposed by SIO with Spiess as PI, and funded by NSF. Guidance for the study will be by Spiess (chairman), Langseth, and Murray. Spiess reported that Glosten Associates is proceeding satisfactorily with the study which should be completed by fall. A draft final report to FIC at its October meeting is likely. Glosten is keeping the KNORR/MELVILLE refits (which are first priority) separate from this study but they will be interwoven as feasible to reduce costs. There may be possible savings, for example, on model tests. Subsequent to the FIC meeting, Spiess, Langseth, and Murray met with Glosten representatives on April 8 in Seattle. There was a good discussion of ship motion characteristics and a revision of the bids for the model tests. Spiess will prepare a report on progress for the July FIC meeting, and representatives from Glosten will be present. *Action:* Spiess will keep FIC informed.

AGOR 23 PROCUREMENT

Kaulum provided an update on progress. NavSea is evaluating proposals without participation by the University of Washington. J. Murray, speaking on behalf of University of Washington, expressed serious concern at this procedure. Kaulum discussed in some detail the legal concerns that led to this action and stated that ONR has little ability to interfere. NavSea works from the stated requirements, so it is extremely important that these be clearly and fully formulated. While these constraints are understood, it was agreed that input in some way would be vital to the success of the process, and Kaulum was encouraged to continue to work toward this. Treadwell remarked that this system is not new, applies to oceanographic ships being provided for the Navy as well as for institutions, and has resulted in sub-optimal vessel design for NavOceanO R/Vs in the past.

Present schedule is to award the contract in July and deliver AGOR 23 toward the end of 1990, shakedown and defect correction during partial operations in 1991, and full operations in 1992. As a related matter, Kaulum stated that Navy will retire THOMPSON if NSF does not provide a viable operating schedule, and Heinrichs stated that he doubted there would be one. Murray noted that this would mean a gap of two to three years between retirement of THOMPSON and full operations of AGOR 23 for the Pacific area. Heinrichs pointed out that layups have become a way of life, given the budget constraints, and noted that WECOMA, GYRE, and others have had major year-long layups. Given the very modest growth (if any) that NSF expects in 1989/90, this must be accepted. He visualized that OSPREY (USC) might pick up some of the Pacific ship shortage and that some programs, such as GOFS, TOGA, and WOCE will have to be stretched out. NSF problems, coupled with a likely 3.5% cut next year at ONR, will mean serious rethinking of plans, which is why he has asked the UNOLS Advisory Council to assess the situation as a matter of top priority. Kaulum was requested to give FIC a progress report at the July meeting. *Action:* Kaulum and Murray will keep the FIC informed.

In connection with this discussion, Heinrichs and Gorsline said OSPREY is scheduled to be ready for operation in late 1989 and is being funded privately. The hull seems seaworthy, and a good A-frame is being provided, but the labs will not be completed. Some of the equipment from VELERO IV will be used on OSPREY but not enough to make a complete outfit. It is estimated that OSPREY will be somewhat cheaper to operate than THOMPSON.

NAVY AGOR (SWATH) DESIGN

The proposed NavSea design for the AGOR (SWATH) destined for the academic community was judged to be unsatisfactory by that community. Kaulum reported that because of that, similar misgivings about the hull destined for Navy use, and other factors, it has been decided to not proceed with further design and construction. At this time, an AGOR (SWATH) is not in any active Navy program. Navy may consider a follow-up option for AGOR 23 and will also watch carefully how the T-AGOS 19 (to be competed in 1989) works out. It is possible that a follow-up option for AGOR 23 could be financed with reprogrammed AGOR (SWATH) funds at a considerable saving. It was generally regretted that this action had been necessary, and that NavSea had not been more responsive to community input. However, it is far preferable to have no SWATH than to have an unsatisfactory one for 20 to 30 years. All that can be done at this stage is push for an acceptable design (such as the SEACO study) and gain operating experience on various hulls. *No specific action.*

IMPROVEMENTS AND REFITS TO EXISTING VESSELS

<u>KNORR and MELVILLE refits:</u> Kaulum reported on progress. Major items are re-engining and a 30-foot stretch. The preliminary design has been finished; the contract design phase was delayed 3 months due to budgetary snags but is now underway. KNORR will enter yard on completion of her current schedule. One contract will be let for both ships, running for a 3-year period, with a single institution to manage the contract. KNORR will commence in November 1988 and be back in service June 1989; MELVILLE will commence July 1989 and finish in April 1990. Kaulum noted that there is a need to economize somewhere due to budget cuts; although there is a $1.5 million reserve fund in the budget, the cuts about wipe that out. There is $3 million funding for outfitting in the budget. Kaulum was requested to provide an update for FIC at its July 1988 meeting. *Action:* Kaulum will provide an update for July FIC meeting.

<u>Workshop for refits/improvements to existing intermediate size research vessels:</u> The agenda for this meeting, to be convened by Barber 12-13 July in Washington, D.C., following the UNOLS scheduling meeting, has been approved by FIC. Barber reports that he will invite six users from operating, and six from non-operating institutions; six operator representatives, and representatives from John Gilbert and Rodney Lay in addition to agency observers. Consideration of ISELIN, NEW HORIZON, and GYRE would be appropriate in addition to the OCEANUS class. (A review of the ISELIN refit, which will have just been completed, will serve as a model.) A review of user comments will be provided to attendees, along with operator plans. Treadwell will provide Barber with lists of users; the user comments have been previously compiled and are available. *Action:* Barber to complete arrangements.

Improvements to CAPE-class research vessels: Following the November 1987 FIC meeting, Nowlin prepared a draft charge to T. Johnson of Duke to form a subcommittee to consider improvements to the CAPE class ships. No objections have been received to this by mail. It was noted at the meeting that the costs (day rates) for CAPE class ships have been both rather high and increasing. Some part of this is due to their relatively low number of operating days, which drives up the day rate, but their budgets are also high on an annual basis. It was recommended that the basic question of costs be added to the agenda, in addition to the already-planned look at capital and operating costs for any improvements. It was also recommended that the subcommittee use the science mission requirements developed by Robison's subcommittee as a starting point. *Action:* Nowlin to send letter to Johnson who will then organize a study.

M/V BERNIER:

Langseth discussed the M/V BERNIER in the context of possibly acquiring it at LDGO as a replacement for R/V CONRAD. Appendix (4) is LDGO's tentative proposal to NSF for this acquisition. It also provides documentation on the ship, and comparisons to other ships and to the science mission requirements for Medium and High-Endurance large R/Vs. The ship is 239 feet long, with a draft of 23 feet, a displacement of 2666 tons, a cruising range of 12,000 miles @ 14 knots, and berths for 40 crew and scientists combined. It is fundamentally a geophysical survey vessel, which went to service in 1984, and is ice-strengthened. It is for sale "as is", including the MCS system, and in the opinion of Langseth could be made fit for general MG&G work. It is estimated that modification would run about $3 million; the selling price is not clear, but would probably be in the $7 million range.

Langseth noted that CONRAD is an old, tired ship with frequent breakdowns; it is the oldest ship active in the fleet. Major additions cannot be made due to load-line problems, and it is certainly a candidate for replacement.

The package proposed by LDGO to NSF would include a certain amount of institutional participation but would require substantial NSF funds. Heinrichs stated that funds were very tight and would remain so for at least a couple of years. A formal proposal would be given community review in the normal manner, and this possibility will be among the factors to be considered by the UNOLS Advisory Council during their current review of the UNOLS fleet as a whole.

It was rumored that Texas A&M/University of Texas were also interested in possibly acquiring the BERNIER, but details were not available.

FUTURE MEETINGS OF FIC

The next meeting is scheduled for 7-8 July in Seattle, Washington. The committee noted with thanks Nowlin's offer to host the October meeting in Galveston, Texas. However, it was felt that with the OSPREY coming on line at USC, a meeting there would be appropriate in that it would give the committee a chance to look at the new vessel. 17-18 October was agreed upon for meeting date.

There being no further business and the agenda completed, the meeting adjourned.

Appendix (1)

UNOLS Fleet Improvement Committee Meeting
28-29 March 1988
9:00 a.m.
American Institute of Architects
Conference Room 2
1735 New York Ave.
Washington, D.C.
Tentative Agenda Items

• Consider and adopt agenda.

• Report on funding for FIC operation. Funds have been received from the NSF, and prior expenditures made from other sources have been repaid. Copies of detailed budgets will be available.

• Reports on FIC reports in preparation:

  * Scientific requirements for the UNOLS fleet. The report on this subject by Murray et al. was printed and distributed to the FIC mailing list, which is available for inspection and modification. This report is a good summary of the situation as of late 1987, but since then the NSF has rapidly lost ground in funding. Perhaps plans should be made for a revision, or addendum, to this report to be prepared in late 1988. (Murray)

  * History of the U.S. research fleet. Gorsline and Treadwell have produced a third draft incorporating comments from the community. The FIC should review and approve for distribution as a FIC report. (Gorsline)

  * Computer-assisted ship scheduling. Langseth's draft document, "USS Database", on this topic was revised by Nowlin and sent to the FIC for comment following the last meeting. No additional comments were received. The FIC should approve for publication in the UNOLS Newsletter, and perhaps in Eos. (Langseth)

  * Arctic research vessel requirements. At R. Corell's request, a FIC subcommittee, chaired by V. Alexander, prepared a draft report on this subject which was forwarded to UNOLS, and thence to NSF. The FIC should review and approve this document, and should consider its further distribution.

  * Relative benefits and costs of various modes for R/V acquisition. Gorsline offered for comment a partial draft report on this subject to the FIC at their last meeting. The status should be reviewed. (Gorsline)

• Optional modes of R/V acquisition for the UNOLS fleet. D. Heinrichs requested UNOLS's views on several specified modes of R/V acquisition and operation. A draft reply was prepared by the FIC and sent to G. Keller and Heinrichs on 29 January 1988. The FIC should give final approval to that letter.

• Reserve Fleet vessels available for conversion. Lists of hulls available from MARED for potential conversion are still being received and will be scanned. However, conversions do not seem to be actively considered as an option for acquisition by the NSF. Should the FIC continue active consideration of this item?

- Science Mission Requirement studies in progress:

  * General. Several sets of science mission requirements prepared by the FRC have been (or are being) revised and several new sets are in final preparation by the FIC. Shall we reissue a complete collection?

  * Stable, deep-ocean platforms. In June 1987, a small workshop on this subject was held under the auspices of F. Spiess's subcommittee. Minutes or a meeting report are expected. A decision regarding further action on this subject should be made by the FIC. (Spiess)

  * Small, general-purpose R/V. Draft science mission requirements for a small, general-purpose research vessel were prepared by a subcommittee chaired by B. Robison. These were forwarded by Nowlin on Nov. 10, 1987 to a large segment of the community for comment. Comments received have been forwarded to Robison. A final draft, incorporating those comments should be approved by the FIC. (Robison)

  * Intermediate size, general-purpose SWATH R/V. At the last FIC meeting science mission requirements for this class, as revised by R. Dinsmore, were considered and tentatively approved. It was agreed that Dinsmore would circulate this revised set to the community for suggestions which might be of assistance in guiding the concept design study of this class being undertaken. (Dinsmore)

  * Small to intermediate size ice-capable R/V. The FIC has requested a group chaired by T. Royer to continue with the development of science mission requirements for this class of vessel, even though another subcommittee has completed a draft report on general requirements for R/Vs in support of Arctic research.

  * Research submarine. A first meeting of the FIC subcommittee to consider potentials in oceanographic research for research submarines should be scheduled. (Robison)

  * Multichannel seismic capabilities. The special vessel requirements imposed by underway geophysics, especially MCS, has been reviewed by the FIC, under the leadership of M. Langseth. The science mission requirements for large vessels prepared by the FRC should be reviewed, and perhaps revised, in light of these further considerations. (Langseth)

- Concept design for intermediate size, general-purpose SWATH R/V. FIC at its November 1987 meeting and by subsequent correspondence ranked 11 proposals received by R. Dinsmore for a concept design of this vessel class. SEACO, Inc. was the unanimous selection as top proposer. The Texas A&M Research Foundation has negotiated a subcontract with SEACO to initiate this study. Dinsmore is the Foundation's technical representative, and will be assisted by subcommittee members R. Barber and B. Ryan in providing guidance to SEACO. Dinsmore will make status report.

- Preliminary design for a large, medium-endurance monohull R/V. A proposal for this study to NSF from SIO with F. Spiess as principal investigator was endorsed by the FIC at the November 1987 meeting and has subsequently been funded. Guidance for the design study will be from a subcommittee of Speiss (chairman), M. Langseth, and J. Murray. An announcement will be made that the model tests will be open to the community. Status report. (Speiss)

- Navy KNORR/MELVILLE refits. Status report. (Dinsmore)

- Navy AGOR 23 procurement. Status report. (Kaulum)

- Navy AGOR(SWATH) design. The proposed NavSea design for the AGOR(SWATH) to be constructed by Navy for the UNOLS community was found unsatisfactory by that community. What follow up action on this matter has been taken by the ONR? (Kaulum)

- Workshop for refits/improvements to existing intermediate R/Vs. R. Barber will convene this workshop in Washington, D.C. beginning July 12, 1988. The agenda has been approved by the FIC, and the FIC office has offered logistic support. Status report. (Barber)

- Improvements to CAPE class R/Vs. Following the November 1987 FIC meeting, Nowlin was to summarize discussions and prepare a charge to a subcommittee chaired by T. Johnson of Duke: to consider desirable improvements to the CAPE class vessels, to assign priorities, to assess capital and operational costs of such improvements, and to reconsider science mission requirements for small, general-purpose R/Vs. The FIC should consider the draft charge to the subcommittee. (Nowlin)

- LDGO has interest in procurring the M/V BERNIER, a geophysical vessel, for possible modification and addition to the UNOLS fleet. Vesssel capabilities will be presented by Langseth.

- Next FIC meetings. Our summer meeting is scheduled for 7-8 July 1988 in Seattle, WA. The fall meeting must be scheduled. I suggest Galveston as a location; I could easily handle arrangements.

PROJECTED UTILIZATION OF MCS BY ACADEMIC INSTITUTIONS

SOURCE	CURRENT	1992
NSF		
Core Programs	1-2 mos.	2-3 mos.
New Initiatives*	-0-	2-3 mos.
ODP Geophysics	1-2 mos.	2-4** mos.
ONR	0.25 mos	?
USGS and Other agencies	?	?
Commercial support* **	0.25 mos.	.25-.5 mos
TOTALS	2.50 to 3.00	6 - 10
BEYOND 1992		8 - 12

* Depends on the RIDGE initiative and Continental Margin programs being fully funded.

** If survey funding is doubled as requested in USSAC 1988 prog. plan.

*** Industrial support is often in the form of matching or supplemental funds for an NSF program.

CONCEPTUAL DESIGN
OF A

INTERMEDIATE SIZE SWATH
OCEANOGRAPHIC RESEARCH SHIP

STATUS BRIEFING

29 MARCH 1988

BY

SEACO
A DIVISION OF SAIC
2560 HUNTINGTON AVENUE
ALEXANDRIA, VIRGINIA 22303

UNOLS SWATH DESIGN TEAM

SEACO

- SCOTT DRUMMOND
- ED CRAIG
- CAROLYN JUNEMANN

MARITIME APPLIED PHYSICS INC.

- MARK RICE

CONSULTANT

- DON HIGDON

UNOLS SWATH

- REVIEWED / CLARIFIED REQUIREMENTS
- HULL FORM ANALYSIS
- GENERAL ARRANGEMENT
- EQUIPMENT DATA COLLECTION

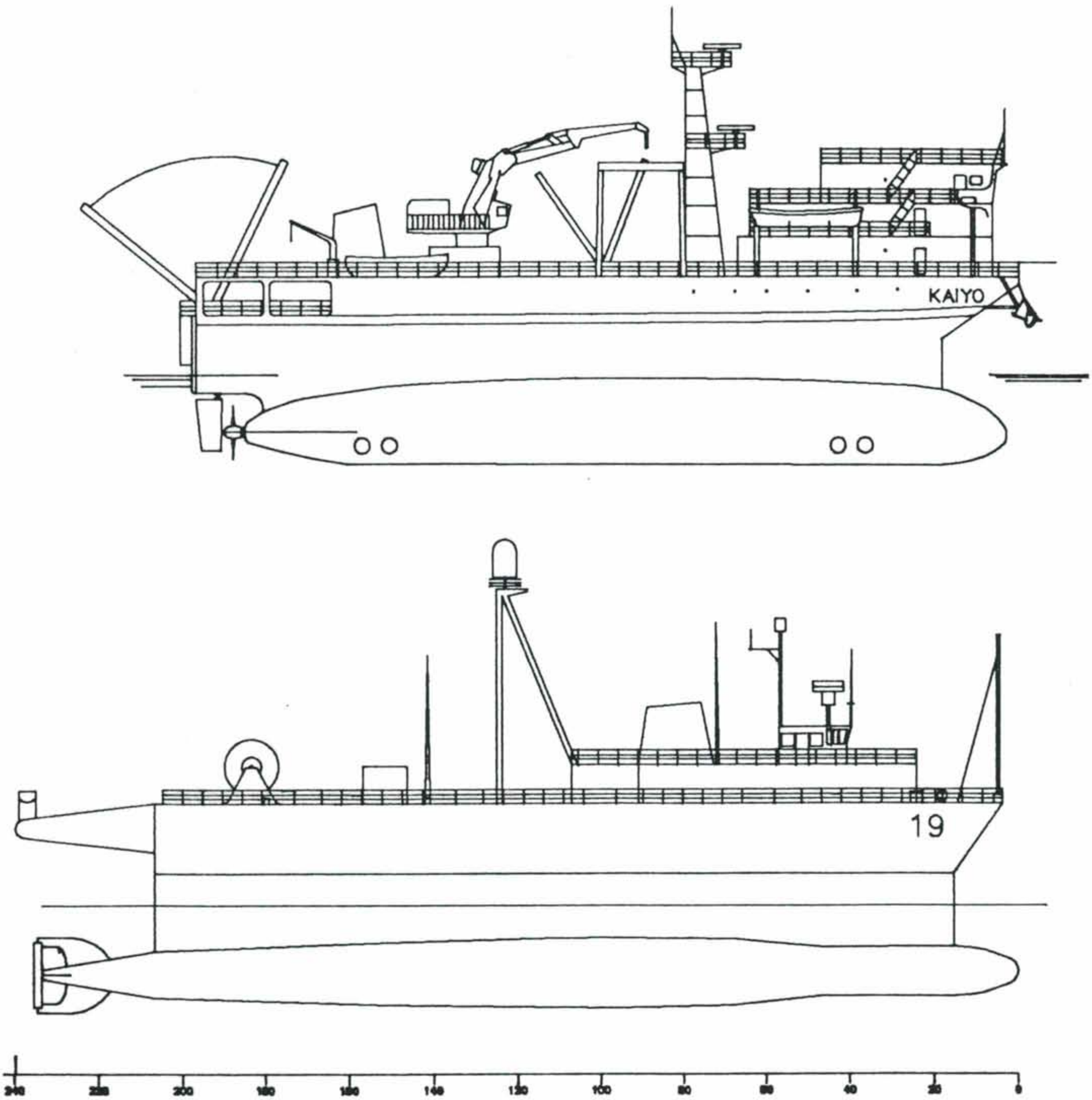
UNOLS SWATH OCEANOGRAPHIC SHIP

OPERATIONAL REQUIREMENTS

LENGTH OVER ALL	150
BEAM	OPEN
DRAFT (HARBOR, FULL LOAD)	16-18
DISPLACEMENT	600-800
SPEED (CRUISING)	12 kts/SS4
SPEED (MAXIMUM FOR 2 HOURS)	14 kts
ENDURANCE:	
TRANSIT	15 DAYS
ON STATION	15 DAYS
RANGE	15 DAYS
STATIONKEEPING +/- 150'	
WIND	35 kts
CURRENT	2 kts
SEA STATE	5
PAYLOAD	50 TONS + MISSION EQ

COMPUTER TOOLS IN USE

COMPUTER ADDED DESIGN	AUTOCAD
DRAG	MODIFIED CHAPMAN MODEL MODIFIED LOCKHEED MODEL
HYDROSTATICS AND DAMAGE STABILITY	SHIP HULL CHARACTERISTICS PROGRAM (SHCP)
SEAKEEPING	STEVENS INSTITUTE "JOHN DAHLZEL" MODEL


KAIYO
19
200
140
120
100
40

COMPARATIVE NAVAL ARCHITECTURE

	SSP KAIMALINO	MESA-80 (SEAGULL)	USCG 750 WHEC	UNOLS 150 FOOT	T-AGOS 19	KAIYO
DISPLACEMENT	220	345	750	1070	3,300	3,500
LENGTH	88	110	165	150	233	197
BEAM	48	53	62.7	75	94	92
LENGTH/BEAM	1.8	2.1	2.6	2.0	2.5	2.1
PROPULSIVE POWER	5,000	8,100	13,000	2,000	1,600	4,610
MAXIMUM SPEED	18	27.1	25	14.0	12+	14
STRUT CONGFIG.	4	2	2	4	2	2
WATERPLANE AREA	250	700	730	980	2,678	2200?
HULL CLEARANCE	5.2	8	–	10.5	–	11.5
DRAFT	15.25	10.3	16.4	17	24.8	20.7
MATERIAL	A/S	A	A/S	A/S	S	S

STRUT CONFIGURATION CONSIDERATIONS

	TANDOM–STRUT	SINGLE–STRUT
RESISTANCE	COMPLEX LOWER HULL	SIMPLER LOWER HULL
BEAM	LARGER	SMALLER
LENGTH	SHORTER	LONGER
WATERPLANE AREA	SMALLER	LARGER
OVER–SIDE LOAD	MORE SENSITIVE	LESS SENSITIVE
OVER–STERN LOAD	LESS SENSITIVE	MORE SENSITIVE
CENTERWELL LOAD	MORE SENSITIVE	LESS SENSITIVE
LENGTH/BEAM	1.8 TO 2.1	2.1 TO 2.6
AT–REST MOTIONS	BETTER	WORSE
STATIONKEEP. DRAG	BETTER	WORSE
TURNING DIAMETER	BETTER	WORSE
DRIVING FACTORS	AT–REST MOTIONS STATIONKEEP. DRAG	

UNOLS 150 FOOT SWATH OCEANOGRAPHIC VESSEL
TARGET WEIGHTS AND MOMENTS

SWBS NUMBER	DESCRIPTION	WEIGHT (LBS.)	L.C.G. DISTANCE FROM F.P. FEET	LONGITUDINAL MOMENT LB-FT	V.C.G. DISTANCE ABOVE B.L. FEET	VERTICAL MOMENT LB-FT	T.C.G. DIST. OFF C.L. STBD IS POS FEET	TRANSVERSE MOMENT LB-FT
100	HULL STRUCTURE	1079680.00	74.00	79896320.00	21.00	22673280.00	0.00	0.00
200	PROPULSION PLANT	160000.00	40.00	6400000.00	32.00	5120000.00	-2.00	-320000.00
300	ELECTRIC PLANT	50000.00	45.00	2250000.00	13.00	650000.00	-2.00	-100000.00
400	COMMAND AND SURVEILLANCE	10000.00	70.00	700000.00	52.00	520000.00	0.00	0.00
500	AUXILIARY SYSTEMS	180000.00	120.00	21600000.00	32.00	5760000.00	25.00	4500000.00
600	OUTFIT AND FURNISHINGS	97000.00	90.00	8730000.00	42.00	4074000.00	0.00	0.00
	TOTAL LIGHTSHIP	1576680.00		119576320.00		38797280.00		4080000.00
700	FUEL AND LUBE OIL	358400.00	60.00	21504000.00	5.00	1792000.00	-1.83	-655872.00
800	WATER	21000.00	40.00	840000.00	22.00	462000.00	-30.00	-630000.00
900	FOODSTUFFS	30000.00	50.00	1500000.00	35.00	1050000.00	0.00	0.00
1000	PERSONNEL & PERSONAL EFFECTS	15000.00	70.00	1050000.00	45.00	675000.00	0.00	0.00
1100	ITINERANT OCEANOGRAPHIC EQUIPMENT	112000.00	110.00	12320000.00	40.00	4480000.00	-25.00	-2800000.00
1200	MARGIN	126920.00	75.00	9519000.00	21.00	2665320.00	0.00	0.00
	FULL LOAD	2240000.00	74.25	166309320.00	22.29	49921600.00	.00	-5872.00
	LOWER HULL TOTAL DISPLACEMENT	1869056.00						
	STRUT TOTAL DISPLACEMENT	370944.00						
	TOTAL WATERPLANE AREQ IN SQ. FT.	960.00						
	ATHWARTSHIP STRUT CENTERLINE DISTANCE	29.00						
	TRANSVERSE WATERPLANE INERTIA	807360.00						
	BM	23.21						
	KB	6.97						
	KM	30.18						
	GMT	7.90						

GROUP 200 - PROPULSION MACHINERY
CATERPILLAR DIRECT DRIVE VARIANT

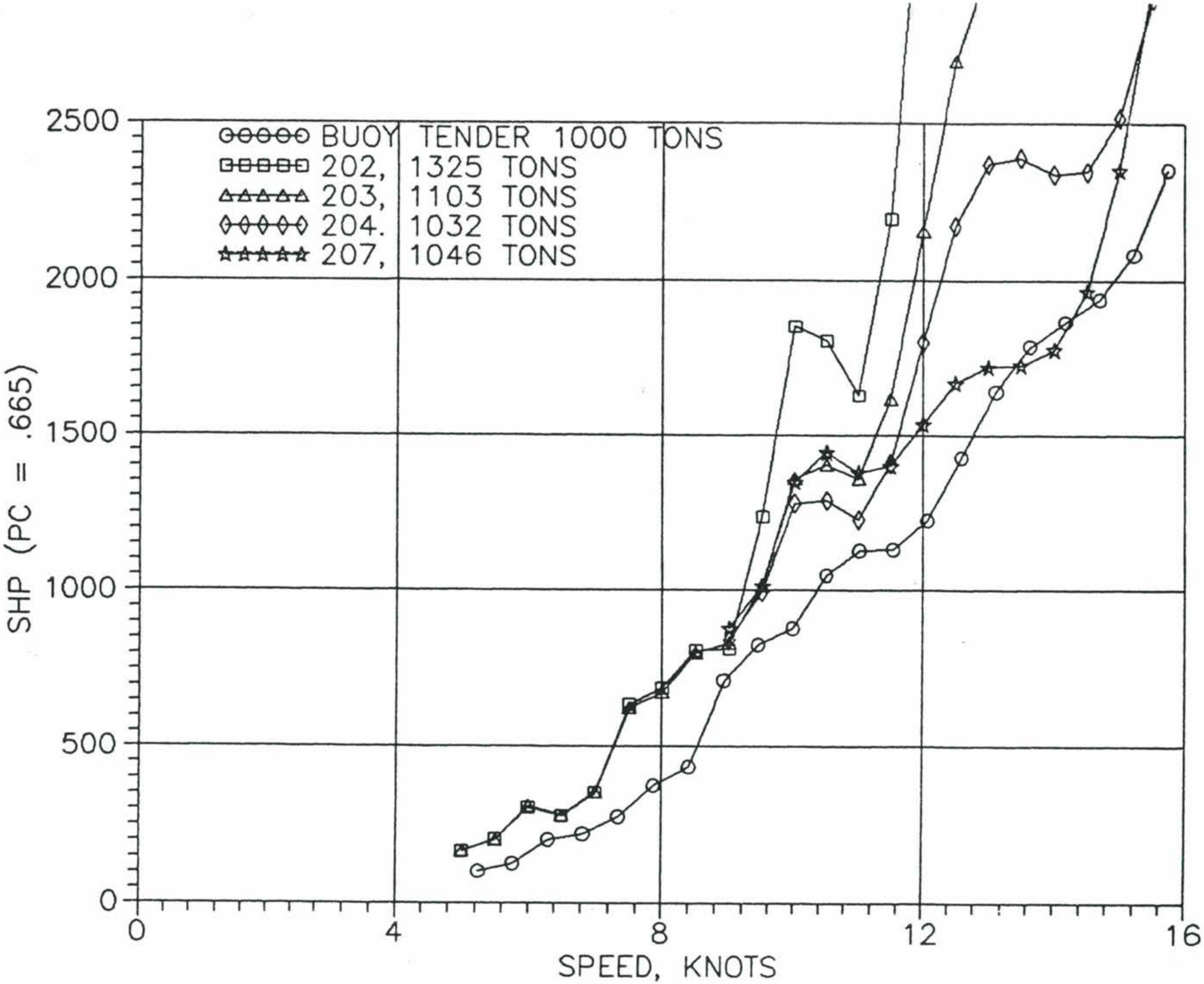
SWBS NUMBER	DESCRIPTION	WEIGHT (LBS.)
201	MAIN ENGINES, 2 EA. CATERPILLAR 3512 @ 1028 hp	28800
202	LOCAL MACH. CONTROL & MONITORING STATIONS	1200
203	BRIDGE MACH. CONTROL & MONITORING STATION	800
204	MAIN REDUCTION GEARS, 2 EA. MODEL 7271	16040
205	AUX. ENGINES, 3 EA. CATERPILLAR 3412 @ 435 kw	15900
206	WET ENGINE PRIMARY COOLANT	1868
207	WET ENGINE LUBE OIL	2268
208	TAILSHAFTS, 2 EA. 6 IN x 30 FT, AQUAMET 19	5822
209	PACKING GLANDS, 2 EA., FOR 6 INCH SHAFT	360
210	MACHINERY COOLING WATER PUMPS, 3 EA. @ 400 GPM	1350
211	FUEL DAY TANK, 2 EA. @250 GALLONS	550
212	REDUCTION GEAR LUBE OIL	360
213	FORCED AIR INTAKE SYSTEMS, BLOWERS & DUCTING	1000
214	ENGINE ROOM HALON SYSTEMS	2400
215	SHAFT BEARINGS	540
216	MAIN ENGINE RAFTS	9000
217	AUX. ENGINE RAFTS	6600
218	PROPULSION SHAFT COUPLINGS	680
219	BULKHEAD SHAFT STUFFING BOX & GLAND	660
220	MAIN THRUST BEARINGS	6000
221	PROPELLERS, 90 INCH KAPLAN	9200
222	STEERABLE PROPELLER NOZZLES	6320
223	ENGINE EXHAUST WASTE HEAT BOILERS	1000
224	PROPELLER NOZZLE SHAFTING, 6'x12"	1180
225	PROPELLER NOZZLE SHAFT BEARINGS	1200
226	PROPELLER FAIRWATER	300
227	SHAFT SPEED SENSING SYSTEM	80
228	FUEL FILTERING & WATER SEPARATION	400
229	PROPULSION MACHINERY SPARES	1000
230	PROPULSION MACHINERY TOOLS	1000
231	NOISE ISOLATION MOUNTS	320
232	NOISE INSULATION COATINGS	4000
233	PROPELLER SHAFT BRAKES	700
234	ENGINE MUFFLERS	760
235	ENGINE EXHAUST PIPING	600
	SUBTOTAL	130258
236	OTHER MISCELANEOUS	13026
	GROUP 200 TOTAL	143284

MACHINERY ALTERNATIVES

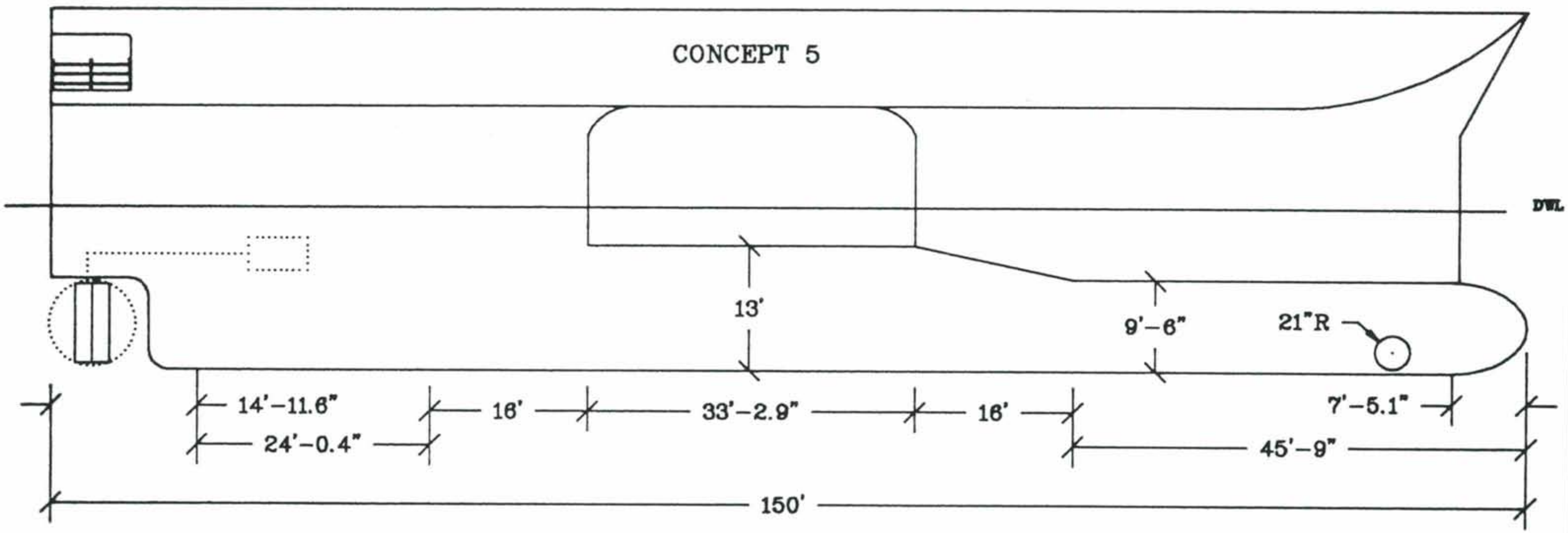
	1	2	3
ENGINE RM LOC.	L.H. MIDSHIP	U.H. FWD.	U.H. FWD.
DRIVELINE	MECHANICAL	D.C. ELECTRIC	D.C. ELECTRIC
MAIN PROPULSOR	FPP/STEERABLE NOZZLE	FPP/STEERABLE NOZZLE	AZIMUTHING THRUSTER
PROPULSOR SPEED	250	300	250
REDUCTION GEAR	4.8:1	NONE	4.6:1
PROPULSIVE COEF.	BEST	GOOD	GOOD
BOW THRUSTERS	2 x 400 HP	2 x 400 HP	2 x 400 HP
STERN THRUSTERS	2 x 300HP	2 x 300HP	NONE
TOTAL HORSEPOWER	3,700	2,600	2,800
NOISE	WORST	BEST	GOOD
MACHINERY WEIGHT	BEST	WORST	MODERATE
STATIONKEEPING	GOOD	GOOD	BEST
DRIVING FACTORS	WEIGHT	NOISE	NOISE WEIGHT STATIONKEEPING

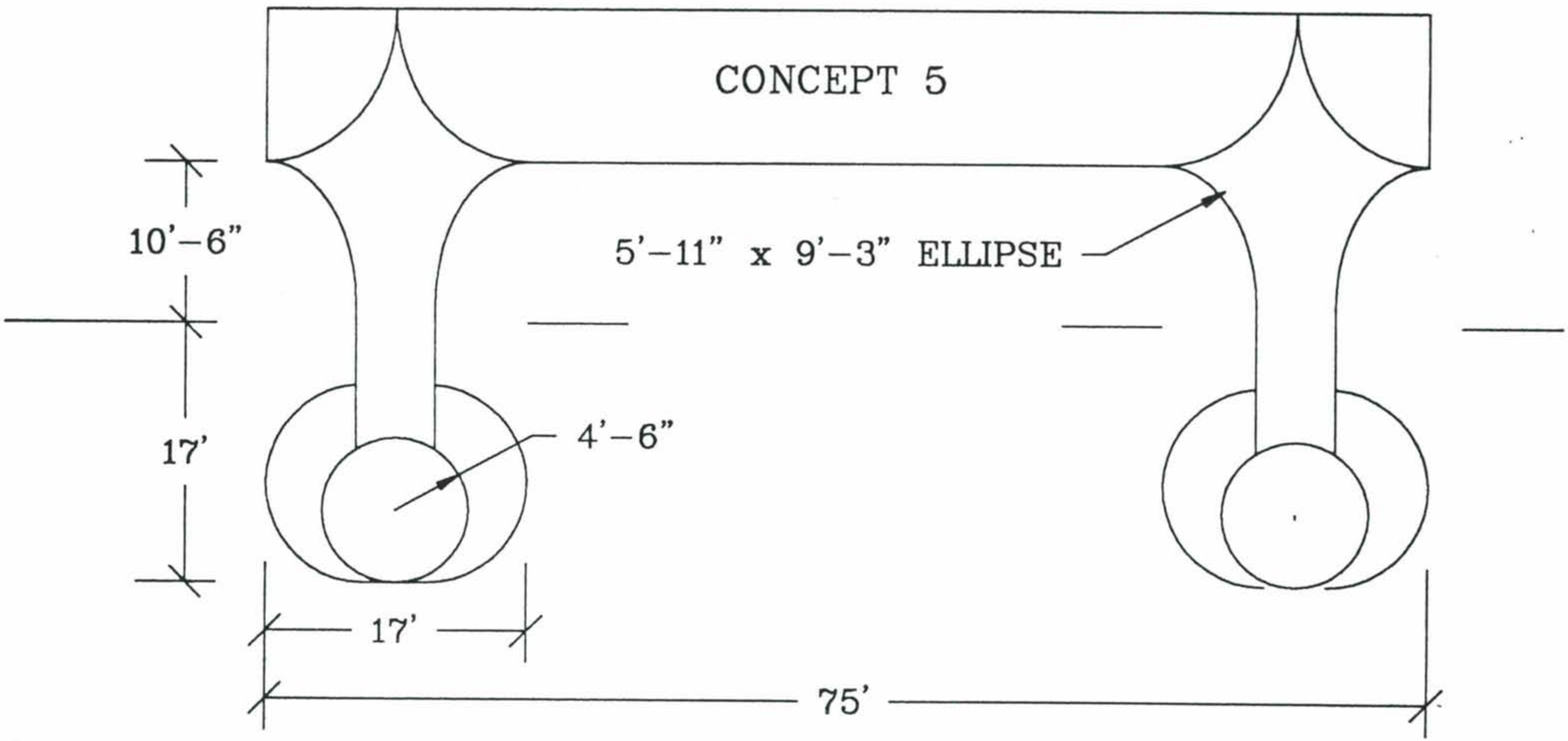
0 UNOLS 150 FOOT SWATH - ELECTRIC POWER CONSUMPTION - FAVORABLE ENVIRONMENTAL CONDITIONS

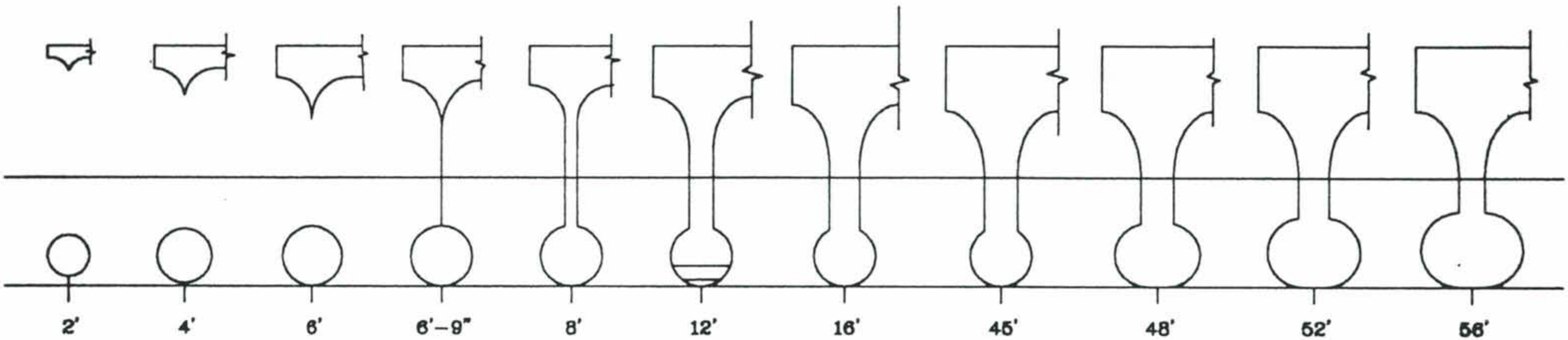
LINE NUMBER	LOAD DESCRIPTION	QTY.	RATED HP	EFFICIENCY	USE FACTOR CRUISE CONDITION	POWER USED CRUISE CONDITION	USE FACTOR STATIONKEEP. CONDITION	POWER USED STATIONKEEP. CONDITION	USE FACTOR TOWING CONDITION	POWER USED TOWING CONDITION	USE FACTOR ANCHORED CONDITION	POWER USED ANCHORED CONDITION
	PORT PROPULSION MOTOR	1	1100	0.95	0.8	926.3	0.1	115.8	0.3	347.4	0	0.0
	STARBOARD PROPULSION MOTOR	1	1100	0.95	0.8	926.3	0.1	115.8	0.3	347.4	0	0.0
	PORT/FWD THRUSTER MOTOR	1	400	0.92	0	0.0	0.2	87.0	0.1	43.5	0	0.0
	STBD/FWD THRUSTER MOTOR	1	400	0.92	0	0.0	0.2	87.0	0.1	43.5	0	0.0
	PORT/AFT THRUSTER MOTOR	1	200	0.92	0	0.0	0.2	43.5	0.1	21.7	0	0.0
	STBD/AFT THRUSTER MOTOR	1	200	0.92	0	0.0	0.2	43.5	0.1	21.7	0	0.0
	S.W. COOLING PUMPS	3	20	0.85	0.67	15.8	0.67	15.8	0.33	7.8	0.33	7.8
	F.W. CIRC. PUMP	2	10	0.85	0.5	5.9	0.5	5.9	0.5	5.9	0.5	5.9
	F.O. DAYTANK PUMP	2	5	0.7	0.2	1.4	0.2	1.4	0.2	1.4	0.1	0.7
	F.O. TRANSFER PUMPS	4	25	0.85	0.25	7.4	0.25	7.4	0.2	5.9	0.1	2.9
	FIRE PUMPS	2	50	0.88	0.05	2.8	0.05	2.8	0.05	2.8	0	0.0
	BATTERY CHARGING	2	2	1	0.5	1.0	0.5	1.0	0.5	1.0	0.8	1.6
	GENERAL LIGHTING	1	18	1	0.8	14.4	0.8	14.4	0.8	14.4	0.8	14.4
	MOTOR-GENERATOR	1	75	0.8	0.2	18.8	1	93.8	1	93.8	0.5	46.9
	EMERGENCY LIGHTING	1	4	1	0	0.0	0	0.0	0	0.0	0	0.0
	DECK LIGHTING	5	1	1	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	POWER TO VANS	2	40	1	0.5	20.0	0.8	32.0	0.8	32.0	0.5	20.0
	GENERAL OUTLETS	80	1	1	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.4
	GENERAL COMM & NAV INSTRUMENTS	15	0.5	1	1	0.5	1	0.5	1	0.5	0.2	0.1
	BILGE & BALLAST PUMPS	4	12	0.8	0.25	3.8	0.25	3.8	0.25	3.8	0	0.0
	DESALINATOR FEED PUMP	1	2	0.7	1	2.9	1	2.9	1	2.9	1	2.9
	HOT WATER PUMP	2	4	0.7	0.7	4.0	0.7	4.0	0.7	4.0	0.7	4.0
	BALLAST AIR COMP. @ 20 PSI	6	20	0.85	0.05	1.2	0.05	1.2	0.05	1.2	0.02	0.5
	SHIP SERVICE AIR COMP. @ 100 PSI	3	15	0.8	0.2	3.8	0.5	9.4	0.5	9.4	0.1	1.9
	DECK MACH. HYD. PUMPS	2	100	0.85	0.1	11.8	0.6	70.6	0.9	105.9	0.1	11.8
	SHIP CONTROL HYD. PUMPS	2	30	0.85	0.8	28.2	0.6	21.2	0.8	28.2	0	0.0
	DECK DAVITS	4	2	0.7	0	0.0	0	0.0	0	0.0	0.1	0.3
	TANK LEVEL INDICATORS	24	0.1	1	1	0.1	1	0.1	1	0.1	1	0.1
	ENGINE RM VENT. FANS	4	15	0.7	0.75	16.1	0.75	16.1	0.75	16.1	0.2	4.3
	OTHER VENT. FANS	6	5	0.7	0.8	5.7	0.8	5.7	0.8	5.7	0.2	1.4
	AIR CONDITIONERS	5	25	0.8	0	0.0	0	0.0	0	0.0	0	0.0
	HEAT CIRC PUMPS	4	6	0.8	0	0.0	0	0.0	0	0.0	0	0.0
	LOCAL ELEC. HEAT	12	3	1	0	0.0	0	0.0	0	0.0	0	0.0
	KITCHEN EQUIPMENT	1	50	1	0.4	20.0	0.4	20.0	0.4	20.0	0.3	15.0
	SHOP EQUIPMENT	1	25	1	0.1	2.5	0.2	5.0	0.2	5.0	0.3	7.5
	TOTALS	207	3965.6			2041.3		828.2		1193.8		150.8



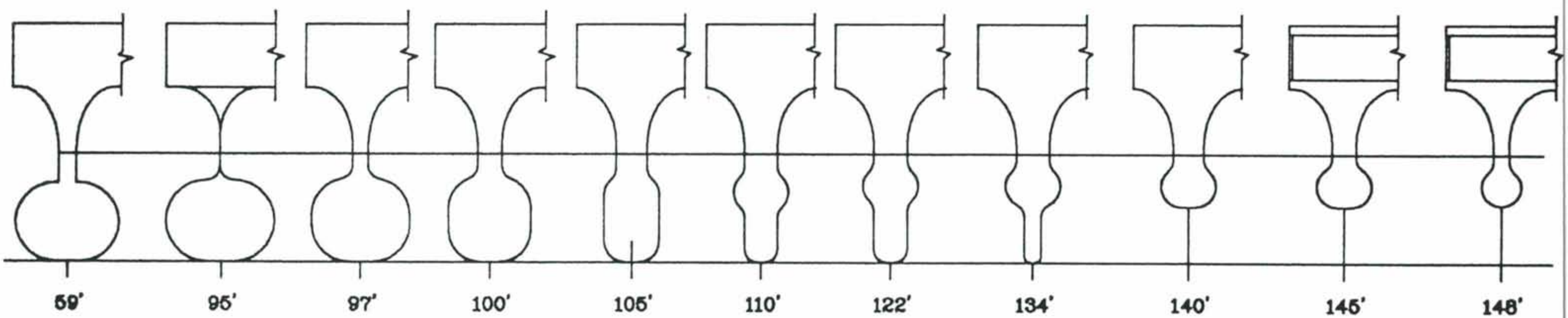
BUOY TENDER 1000 TONS
202, 1325 TONS
203, 1103 TONS
204. 1032 TONS
207, 1046 TONS
SHP (PC = .665)
2500
2000
1500
1000
500
0
0
4
8
12
16
SPEED, KNOTS

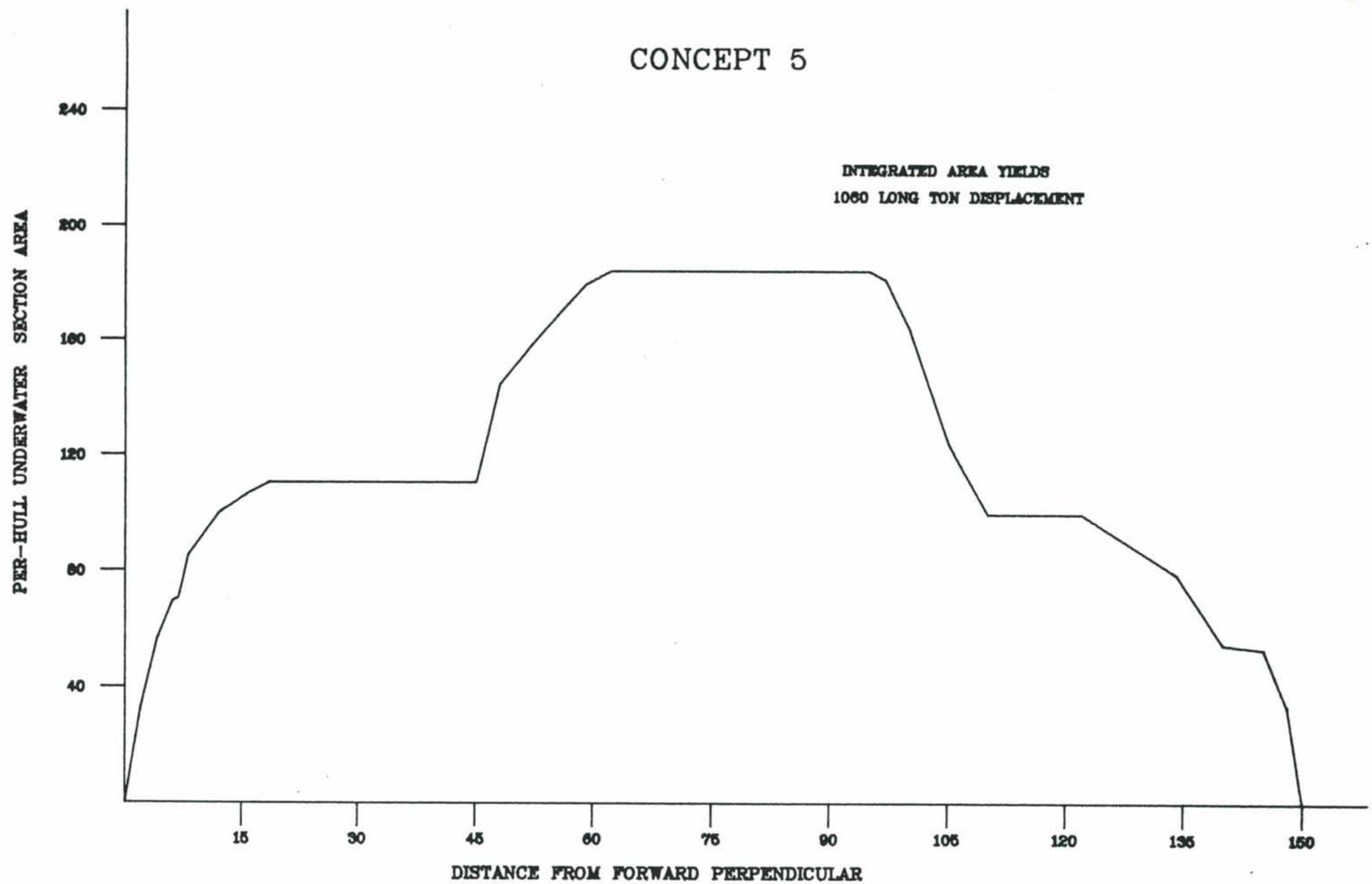

CONCEPT 5
DWL
13'
9'-6"
21"R
14'-11.6"
16'
33'-2.9"
16'
7'-5.1"
24'-0.4"
45'-9"
150'


CONCEPT 5
5'–11" x 9'–3" ELLIPSE
10'–6"
17'
4'–6"
17'
75'

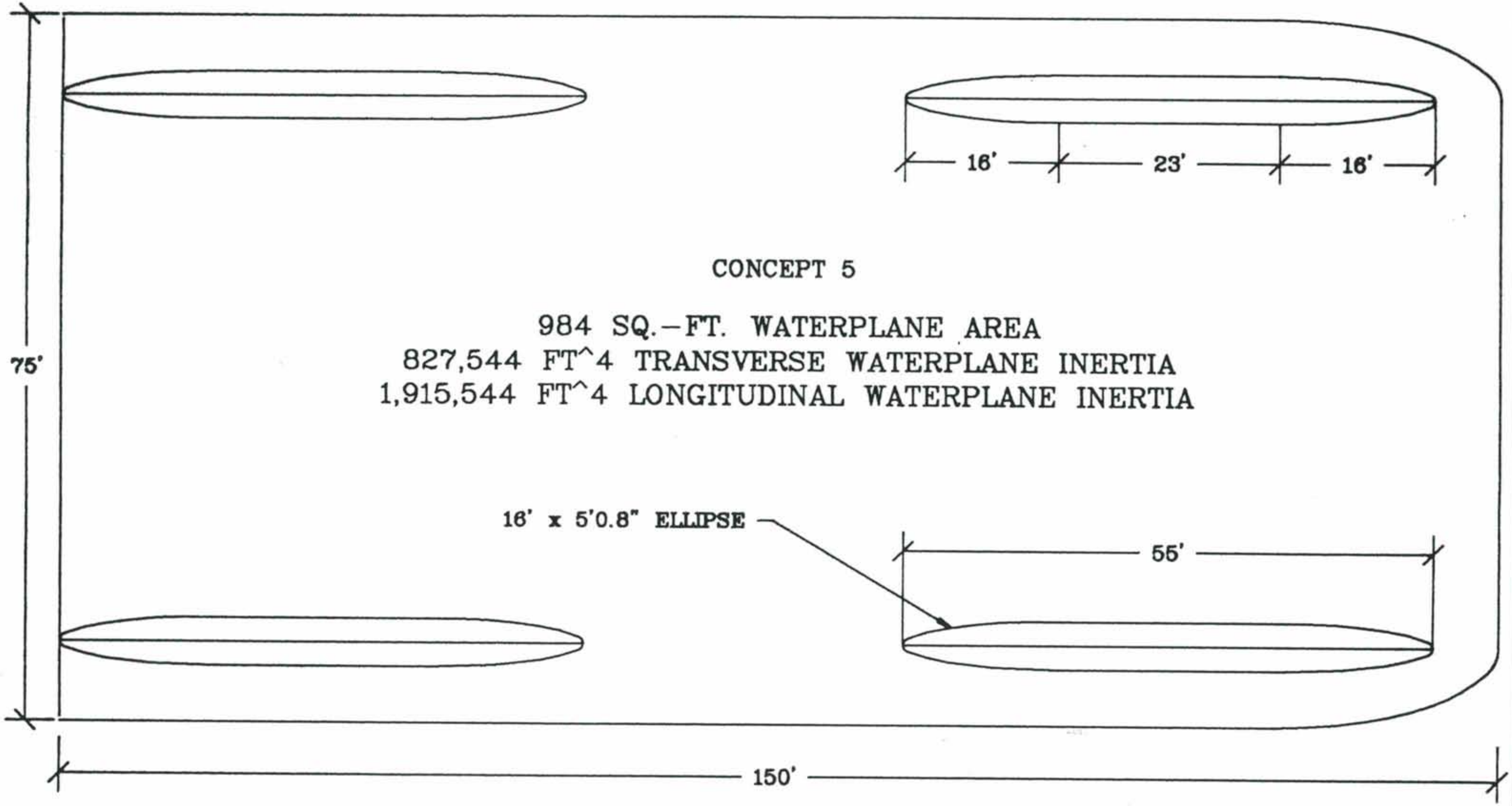


CONCEPT 5 – FEET FROM THE F.P.





CONCEPT 5
INTEGRATED AREA YIELDS
1060 LONG TON DISPLACEMENT
PER-HULL UNDERWATER SECTION AREA
240
200
160
120
80
40
15
30
45
60
75
90
105
120
135
150
DISTANCE FROM FORWARD PERPENDICULAR



CONCEPT 5
984 SQ.-FT. WATERPLANE AREA
827,544 FT^4 TRANSVERSE WATERPLANE INERTIA
1,915,544 FT^4 LONGITUDINAL WATERPLANE INERTIA
16' x 5'0.8" ELLIPSE
16'
23'
16'
55'
75'
150'

0

CALCULATION OF WIND AND CURRENT DRIFT FORCES
150 FOOT UNOLS SWATH AT REST IN BEAM WIND AND CURRENT

VESSEL DISPLACEMENT:	1080	LENGTH BETWEEN PERPS:	151 FEET
BEAM OVERALL:	75	DRAFT IN FEET:	17 FEET
WIND SPEED IN KNOTS:	20.0	RELATIVE WIND ANGLE:	90 DEGREES
CURRENT VELOCITY IN KNOTS:	1.5	RELATIVE CURRENT ANGLE:	90 DEGREES

MOMENTS TAKEN ON CENTERLINE AT FORWARD PERPENDICULAR

	AREA SQ. FEET	SECT/PROFILE CENTER OF PRESSURE	VERTICAL CENTER OF PRESSURE	DRAG COEFICIENT	VELOCITY KNOTS	DRAG POUNDS	SECT/PROFIL MOMENT FOOT-LBS.	VERTICAL MOMENT POUNDS
SECTION AREAS - IN AIR:								
ABOVE WATERLINE STRUT:	480	0.0	21.1	0.15	0.0	0	0	0
UPPER HULL BOX:	979	0.0	30.9	0.90	0.0	0	0	0
DECK HOUSE:	396	0.0	42.9	1.20	0.0	0	0	0
PILOT HOUSE:	325	0.0	50.8	1.20	0.0	0	0	0
DECK MACHINERY:	200	0.0	41.7	1.40	0.0	0	0	0
P.H. ROOF RIGGING:	50	0.0	60.5	1.80	0.0	0	0	0
BRIDGE DECK STANTIONS:	90	0.0	48.3	1.80	0.0	0	0	0
WEATHER DECK STANTIONS:	125	0.0	39.2	1.80	0.0	0	0	0
SECTION AREAS - UNDERWATER:								
BELOW WATERLINE STRUT:	168	0.0	14.1	0.12	0.0	0	0	0
LOWER HULLS:	304	0.0	5.8	0.15	0.0	0	0	0
PROPELLER SHROUDS:	32	0.0	5.0	0.35	0.0	0	0	0
CANARD:	5	0.0	5.0	0.10	0.0	0	0	0
STABILIZERS:	5	0.0	5.0	0.10	0.0	0	0	0
PROFILE AREAS - IN AIR:								
FWD WINDWARD STRUT:	376	45.1	21.1	1.50	20.0	767	34594	16185
AFT WINDWARD STRUT:	345	125.5	20.4	1.50	20.0	704	88327	14358
FWD LEEWARD STRUT:	376	45.1	21.1	1.50	14.0	376	16951	7930
AFT LEEWARD STRUT:	345	125.5	21.4	1.50	14.0	345	43280	7380
UPPER HULL BOX:	1871	73.0	30.9	0.90	20.0	2290	167178	70764
DECK HOUSE:	460	40.3	42.9	0.90	20.0	563	22691	24154
PILOT HOUSE:	90	60.9	50.7	0.90	20.0	110	6686	5566
DECK MACHINERY:	280	107.0	41.7	1.40	12.0	192	20536	8003
P.H. ROOF RIGGING:	50	62.5	60.5	1.80	20.0	122	7650	7405
BRIDGE DECK STANTIONS:	80	48.8	48.3	1.80	20.0	196	9557	9459
WEATHER DECK STANTIONS:	250	74.0	39.2	1.80	20.0	612	45288	23990
PROFILE AREAS - UNDERWATER:								
FWD WINDWARD STRUT	324	28.2	14.1	1.50	1.5	3084	86970	43485
AFT WINDWARD STRUT:	326	125.3	14.6	1.50	1.5	3103	388815	45305
FWD LEEWARD STRUT:	324	28.2	14.1	1.50	1.1	1511	42615	21308
AFT LEEWARD STRUT:	326	125.3	14.6	1.50	1.1	1521	190520	22199
LOWER HULL WINDWARD BOW:	45	4.1	5.0	0.90	1.5	255	1044	1274
LOWER HULL LEEWARD BOW:	45	4.1	5.0	0.90	1.1	125	512	624
LOW HULL UNDER W/FWD STRUT	505	33.4	5.4	0.90	1.5	2884	96330	15574
LOW HULL UNDER L/FWD STRUT	505	33.4	5.4	0.90	1.1	1551	51804	8376
LOWER HULL WIND. MIDBODY:	571	76.5	6.2	0.60	1.5	2174	166315	13479
LOWER HULL LEE. MIDBODY:	571	76.5	6.2	0.60	1.1	1169	89441	7249
LOW HULL UNDER W/AFT STRUT	427	116.3	5.9	1.20	1.5	3252	378157	19184
LOW HULL UNDER L/AFT STRUT	427	116.3	5.9	1.20	1.1	1749	203364	10317
WINDWARD PROP. SHROUD	29	147.8	5.0	2.10	1.5	386	57118	1932
LEEWARD PROP. SHROUD:	29	147.8	5.0	2.10	1.1	208	30717	1039
CANARD:	0	0.0	0.0	0.30	1.5	0	0	0
STABILIZERS:	0	0.0	0.0	0.30	1.5	0	0	0
TOTAL IN-AIR DRAG & MOMENT:						6277	462737	195196

TOTAL UNDERWATER DRAG:						22971	1783724	211345
TOTAL DRAG:						29248	2246460	406540
FORWARD LEEWARD THRUSTER:	13	2.1				-7491	-98132	
FORWARD WINDWARD THRUSTER:	13	2.1				-5993	-78506	
AFT LEEWARD THRUSTER:	131	1.7				-8758	-1149925	
AFT WINDWARD THRUSTER:	131	1.7				-7006	-919940	
RESULTANT DRAG AND MOMENT:						0	-43	

0 CALCULATION OF WIND AND CURRENT DRIFT FORCES

150 FOOT UNOLS SWATH AT REST IN BEAM WIND AND CURRENT

VESSEL DISPLACEMENT:	1080	LENGTH BETWEEN PERPS:	151 FEET
BEAM OVERALL:	75	DRAFT IN FEET:	17 FEET
WIND SPEED IN KNOTS:	35.0	RELATIVE WIND ANGLE:	90 DEGREES
CURRENT VELOCITY IN KNOTS:	2.0	RELATIVE CURRENT ANGLE:	90 DEGREES

MOMENTS TAKEN ON CENTERLINE AT FORWARD PERPENDICULAR

	AREA SQ. FEET	SECT/PROFILE CENTER OF PRESSURE	VERTICAL CENTER OF PRESSURE	DRAG COEFICIENT	VELOCITY KNOTS	DRAG POUNDS	SECT/PROFIL MOMENT FOOT-LBS.	VERTICAL MOMENT POUNDS
SECTION AREAS - IN AIR:								
ABOVE WATERLINE STRUT:	480	0.0	21.1	0.15	0.0	0	0	0
UPPER HULL BOX:	979	0.0	30.9	0.90	0.0	0	0	0
DECK HOUSE:	396	0.0	42.9	1.20	0.0	0	0	0
PILOT HOUSE:	325	0.0	50.8	1.20	0.0	0	0	0
DECK MACHINERY:	200	0.0	41.7	1.40	0.0	0	0	0
P.H. ROOF RIGGING:	50	0.0	60.5	1.80	0.0	0	0	0
BRIDGE DECK STANTIONS:	90	0.0	48.3	1.80	0.0	0	0	0
WEATHER DECK STANTIONS:	125	0.0	39.2	1.80	0.0	0	0	0
SECTION AREAS - UNDERWATER:								
BELOW WATERLINE STRUT:	168	0.0	14.1	0.12	0.0	0	0	0
LOWER HULLS:	304	0.0	5.8	0.15	0.0	0	0	0
PROPELLER SHROUDS:	32	0.0	5.0	0.35	0.0	0	0	0
CANARD:	5	0.0	5.0	0.10	0.0	0	0	0
STABILIZERS:	5	0.0	5.0	0.10	0.0	0	0	0
PROFILE AREAS - IN AIR:								
FWD WINDWARD STRUT:	376	45.1	21.1	1.50	35.0	2349	105943	49565
AFT WINDWARD STRUT:	345	125.5	20.4	1.50	35.0	2155	270501	43970
FWD LEEWARD STRUT:	376	45.1	21.1	1.50	24.5	1151	51912	24287
AFT LEEWARD STRUT:	345	125.5	21.4	1.50	24.5	1056	132546	22601
UPPER HULL BOX:	1871	73.0	30.9	0.90	35.0	7013	511981	216715
DECK HOUSE:	460	40.3	42.9	0.90	35.0	1724	69490	73973
PILOT HOUSE:	90	60.9	50.7	0.90	35.0	336	20477	17047
DECK MACHINERY:	280	107.0	41.7	1.40	21.0	588	62891	24510
P.H. ROOF RIGGING:	50	62.5	60.5	1.80	35.0	375	23428	22678
BRIDGE DECK STANTIONS:	80	48.8	48.3	1.80	35.0	600	29268	28968
WEATHER DECK STANTIONS:	250	74.0	39.2	1.80	35.0	1874	138695	73471
PROFILE AREAS - UNDERWATER:								
FWD WINDWARD STRUT	324	28.2	14.1	1.50	2.0	5483	154613	77307

AFT WINDWARD STRUT:	326	125.3	14.6	1.50	2.0	5517	691227	80542
FWD LEEWARD STRUT:	324	28.2	14.1	1.50	1.4	2687	75760	37880
AFT LEEWARD STRUT:	326	125.3	14.6	1.50	1.4	2703	338701	39466
LOWER HULL WINDWARD BOW:	45	4.1	5.0	0.90	2.0	453	1857	2264
LOWER HULL LEEWARD BOW:	45	4.1	5.0	0.90	1.4	222	910	1109
LOW HULL UNDER W/FWD STRUT	505	33.4	5.4	0.90	2.0	5127	171254	27688
LOW HULL UNDER L/FWD STRUT	505	33.4	5.4	0.90	1.4	2512	83915	13567
LOWER HULL WIND. MIDBODY:	571	76.5	6.2	0.60	2.0	3865	295672	23963
LOWER HULL LEE. MIDBODY:	571	76.5	6.2	0.60	1.4	1894	144879	11742
LOW HULL UNDER W/AFT STRUT	427	116.3	5.9	1.20	2.0	5781	672279	34105
LOW HULL UNDER L/AFT STRUT	427	116.3	5.9	1.20	1.4	2832	329417	16712
WINDWARD PROP. SHROUD	29	147.8	5.0	2.10	2.0	687	101544	3435
LEEWARD PROP. SHROUD:	29	147.8	5.0	2.10	1.4	337	49756	1683
CANARD:	0	0.0	0.0	0.30	2.0	0	0	0
STABILIZERS:	0	0.0	0.0	0.30	2.0	0	0	0
TOTAL IN-AIR DRAG & MOMENT:						19222	1417131	597786
TOTAL UNDERWATER DRAG:						40099	3111784	371463
TOTAL DRAG:						59321	4528915	969249
FORWARD LEEWARD THRUSTER:	13	2.1				-15322	-200718	
FORWARD WINDWARD THRUSTER:	13	2.1				-12258	-160575	
AFT LEEWARD THRUSTER:	131	1.7				-17634	-2315344	
AFT WINDWARD THRUSTER:	131	1.7				-14107	-1852275	
RESULTANT DRAG AND MOMENT:						0	3	

0

CALCULATION OF WIND AND CURRENT DRIFT FORCES

150 FOOT UNOLS SWATH AT REST IN HEAD WIND AND CURRENT

VESSEL DISPLACEMENT:	1080	LENGTH BETWEEN PERPS:	151 FEET
BEAM OVERALL:	75	DRAFT IN FEET:	17 FEET
RELATIVE WIND SPEED KNOTS:	47.0	RELATIVE WIND ANGLE:	0 DEGREES
VESSEL FORWARD VELOCITY:	12.0	RELATIVE CURRENT ANGLE:	0 DEGREES

MOMENTS TAKEN ON CENTERLINE AT FORWARD PERPENDICULAR

	AREA SQ. FEET	SECT/PROFILE CENTER OF PRESSURE	VERTICAL CENTER OF PRESSURE	DRAG COEFICIENT	VELOCITY KNOTS	DRAG POUNDS	SECT/PROFIL MOMENT FOOT-LBS.	VERTICAL MOMENT POUNDS
SECTION AREAS - IN AIR:								
ABOVE WATERLINE STRUT:	480	0.0	21.1	0.15	47.0	540	0	11401
UPPER HULL BOX:	979	0.0	30.9	0.90	47.0	6620	0	204567
DECK HOUSE:	396	0.0	42.9	1.20	47.0	3569	0	153112
PILOT HOUSE:	325	0.0	50.8	1.20	47.0	2929	0	148800
DECK MACHINERY:	200	0.0	41.7	1.40	28.2	757	0	31570
P.H. ROOF RIGGING:	50	0.0	60.5	1.80	47.0	676	0	40895
BRIDGE DECK STANTIONS:	90	0.0	48.3	1.80	47.0	1217	0	58767
WEATHER DECK STANTIONS:	125	0.0	39.2	1.80	47.0	1690	0	66243
SECTION AREAS - UNDERWATER:								
BELOW WATERLINE STRUT:	168	0.0	14.1	0.12	12.0	8188	0	115444
LOWER HULLS:	304	0.0	5.8	0.15	12.0	18519	0	107413
PROPELLER SHROUDS:	32	0.0	5.0	0.35	12.0	4549	0	22743

CANARD:	5	0.0	5.0	0.10	12.0	203	0	1015
STABILIZERS:	5	0.0	5.0	0.10	12.0	203	0	1015
PROFILE AREAS - IN AIR:								
FWD WINDWARD STRUT:	376	45.1	21.1	1.50	0.0	0	0	0
AFT WINDWARD STRUT:	345	125.5	20.4	1.50	0.0	0	0	0
FWD LEEWARD STRUT:	376	45.1	21.1	1.50	0.0	0	0	0
AFT LEEWARD STRUT:	345	125.5	21.4	1.50	0.0	0	0	0
UPPER HULL BOX:	1871	73.0	30.9	0.90	0.0	0	0	0
DECK HOUSE:	460	40.3	42.9	0.90	0.0	0	0	0
PILOT HOUSE:	90	60.9	50.7	0.90	0.0	0	0	0
DECK MACHINERY:	280	107.0	41.7	1.40	0.0	0	0	0
P.H. ROOF RIGGING:	50	62.5	60.5	1.80	0.0	0	0	0
BRIDGE DECK STANTIONS:	80	48.8	48.3	1.80	0.0	0	0	0
WEATHER DECK STANTIONS:	250	74.0	39.2	1.80	0.0	0	0	0
PROFILE AREAS - UNDERWATER:								
FWD WINDWARD STRUT	324	28.2	14.1	1.50	0.0	0	0	0
AFT WINDWARD STRUT:	326	125.3	14.6	1.50	0.0	0	0	0
FWD LEEWARD STRUT:	324	28.2	14.1	1.50	0.0	0	0	0
AFT LEEWARD STRUT:	326	125.3	14.6	1.50	0.0	0	0	0
LOWER HULL WINDWARD BOW:	45	4.1	5.0	0.90	0.0	0	0	0
LOWER HULL LEEWARD BOW:	45	4.1	5.0	0.90	0.0	0	0	0
LOW HULL UNDER W/FWD STRUT	505	33.4	5.4	0.90	0.0	0	0	0
LOW HULL UNDER L/FWD STRUT	505	33.4	5.4	0.90	0	0	0	0
LOWER HULL WIND. MIDBODY:	571	76.5	6.2	0.60	0.0	0	0	0
LOWER HULL LEE. MIDBODY:	571	76.5	6.2	0.60	0	0	0	0
LOW HULL UNDER W/AFT STRUT	427	116.3	5.9	1.20	0.0	0	0	0
LOW HULL UNDER L/AFT STRUT	427	116.3	5.9	1.20	0	0	0	0
WINDWARD PROP. SHROUD	29	147.8	5.0	2.10	0.0	0	0	0
LEEWARD PROP. SHROUD:	29	147.8	5.0	2.10	0.0	0	0	0
CANARD:	0	0.0	0.0	0.30	0.0	0	0	0
STABILIZERS:	0	0.0	0.0	0.30	0.0	0	0	0
TOTAL IN-AIR DRAG & MOMENT:						17998	0	715355
TOTAL UNDERWATER DRAG:						31662	0	247631
ADDED DRAG DUE TO SEAS:						3166		
TOTAL DRAG:						52826	0	962986
PORT PROPELLER:	145	5.0				26413		
STARBOARD PROPELLER:	145	5.0				26413		
TOTAL SHP FOR P.C. = 0.7						2783		

0

CALCULATION OF WIND AND CURRENT DRIFT FORCES
150 FOOT UNOLS SWATH AT REST IN HEAD WIND AND CURRENT

VESSEL DISPLACEMENT:	1080	LENGTH BETWEEN PERPS:	151 FEET
BEAM OVERALL:	75	DRAFT IN FEET:	17 FEET
WIND SPEED IN KNOTS:	35.0	RELATIVE WIND ANGLE:	0 DEGREES
CURRENT VELOCITY IN KNOTS:	2.0	RELATIVE CURRENT ANGLE:	0 DEGREES

MOMENTS TAKEN ON CENTERLINE AT FORWARD PERPENDICULAR

	AREA SQ. FEET	SECT/PROFILE CENTER OF PRESSURE	VERTICAL CENTER OF PRESSURE	DRAG COEFICIENT	VELOCITY KNOTS	DRAG POUNDS	SECT/PROFIL MOMENT FOOT-LBS.	VERTICAL MOMENT POUNDS
SECTION AREAS - IN AIR:								
ABOVE WATERLINE STRUT:	480	0.0	21.1	0.15	35.0	300	0	6322
UPPER HULL BOX:	979	0.0	30.9	0.90	35.0	3671	0	113443
DECK HOUSE:	396	0.0	42.9	1.20	35.0	1979	0	84908
PILOT HOUSE:	325	0.0	50.8	1.20	35.0	1624	0	82517
DECK MACHINERY:	200	0.0	41.7	1.40	21.0	420	0	17507
P.H. ROOF RIGGING:	50	0.0	60.5	1.80	35.0	375	0	22678
BRIDGE DECK STANTIONS:	90	0.0	48.3	1.80	35.0	675	0	32589
WEATHER DECK STANTIONS:	125	0.0	39.2	1.80	35.0	937	0	36735
SECTION AREAS - UNDERWATER:								
BELOW WATERLINE STRUT:	168	0.0	14.1	0.12	2.0	227	0	3207
LOWER HULLS:	304	0.0	5.8	0.15	2.0	514	0	2984
PROPELLER SHROUDS:	32	0.0	5.0	0.35	2.0	126	0	632
CANARD:	5	0.0	5.0	0.10	2.0	6	0	28
STABILIZERS:	5	0.0	5.0	0.10	2.0	6	0	28
PROFILE AREAS - IN AIR:								
FWD WINDWARD STRUT:	376	45.1	21.1	1.50	0.0	0	0	0
AFT WINDWARD STRUT:	345	125.5	20.4	1.50	0.0	0	0	0
FWD LEEWARD STRUT:	376	45.1	21.1	1.50	0.0	0	0	0
AFT LEEWARD STRUT:	345	125.5	21.4	1.50	0.0	0	0	0
UPPER HULL BOX:	1871	73.0	30.9	0.90	0.0	0	0	0
DECK HOUSE:	460	40.3	42.9	0.90	0.0	0	0	0
PILOT HOUSE:	90	60.9	50.7	0.90	0.0	0	0	0
DECK MACHINERY:	280	107.0	41.7	1.40	0.0	0	0	0
P.H. ROOF RIGGING:	50	62.5	60.5	1.80	0.0	0	0	0
BRIDGE DECK STANTIONS:	80	48.8	48.3	1.80	0.0	0	0	0
WEATHER DECK STANTIONS:	250	74.0	39.2	1.80	0.0	0	0	0
PROFILE AREAS - UNDERWATER:								
FWD WINDWARD STRUT	324	28.2	14.1	1.50	0.0	0	0	0
AFT WINDWARD STRUT:	326	125.3	14.6	1.50	0.0	0	0	0
FWD LEEWARD STRUT:	324	28.2	14.1	1.50	0.0	0	0	0
AFT LEEWARD STRUT:	326	125.3	14.6	1.50	0.0	0	0	0
LOWER HULL WINDWARD BOW:	45	4.1	5.0	0.90	0.0	0	0	0
LOWER HULL LEEWARD BOW:	45	4.1	5.0	0.90	0.0	0	0	0
LOW HULL UNDER W/FWD STRUT	505	33.4	5.4	0.90	0.0	0	0	0
LOW HULL UNDER L/FWD STRUT	505	33.4	5.4	0.90	0	0	0	0
LOWER HULL WIND. MIDBODY:	571	76.5	6.2	0.60	0.0	0	0	0
LOWER HULL LEE. MIDBODY:	571	76.5	6.2	0.60	0	0	0	0
LOW HULL UNDER W/AFT STRUT	427	116.3	5.9	1.20	0.0	0	0	0
LOW HULL UNDER L/AFT STRUT	427	116.3	5.9	1.20	0	0	0	0
WINDWARD PROP. SHROUD	29	147.8	5.0	2.10	0.0	0	0	0
LEEWARD PROP. SHROUD:	29	147.8	5.0	2.10	0.0	0	0	0
CANARD:	0	0.0	0.0	0.30	0.0	0	0	0
STABILIZERS:	0	0.0	0.0	0.30	0.0	0	0	0
TOTAL IN-AIR DRAG & MOMENT:						9981	0	396700
TOTAL UNDERWATER DRAG:						879	0	6879
ADDED DRAG DUE TO SEAS:						88		
TOTAL DRAG:						10948		
PORT PROPELLER:	145	5.0				5474		
STARBOARD PROPELLER:	145	5.0				5474		
TOTAL SHP FOR P.C. = 0.7						96		

0

CALCULATION OF WIND AND CURRENT DRIFT FORCES

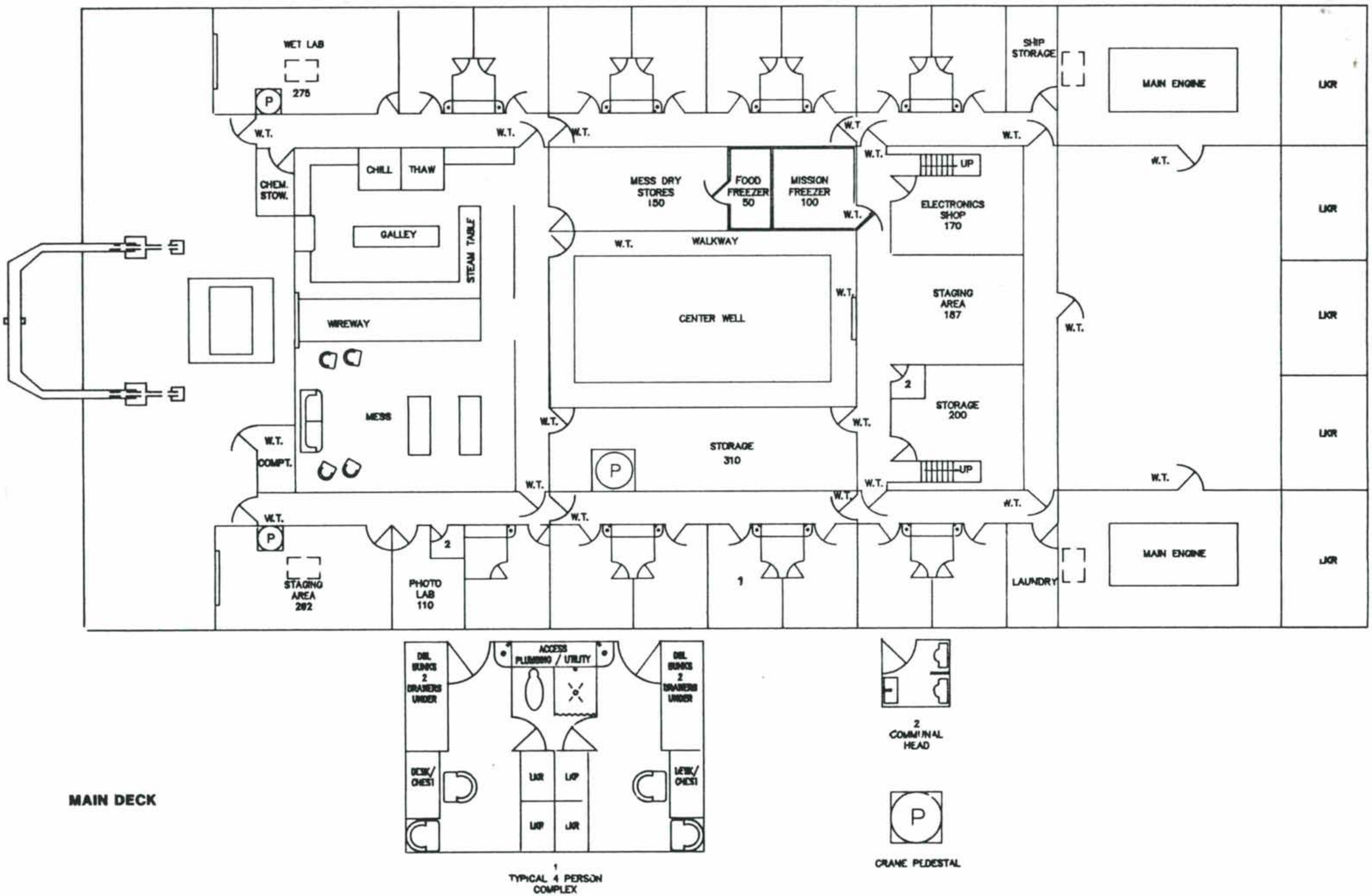
150 FOOT UNOLS SWATH AT REST IN HEAD WIND AND CURRENT

VESSEL DISPLACEMENT:	1080	LENGTH BETWEEN PERPS:	151 FEET
BEAM OVERALL:	75	DRAFT IN FEET:	17 FEET
WIND SPEED IN KNOTS:	20.0	RELATIVE WIND ANGLE:	0 DEGREES
CURRENT VELOCITY IN KNOTS:	1.5	RELATIVE CURRENT ANGLE:	0 DEGREES

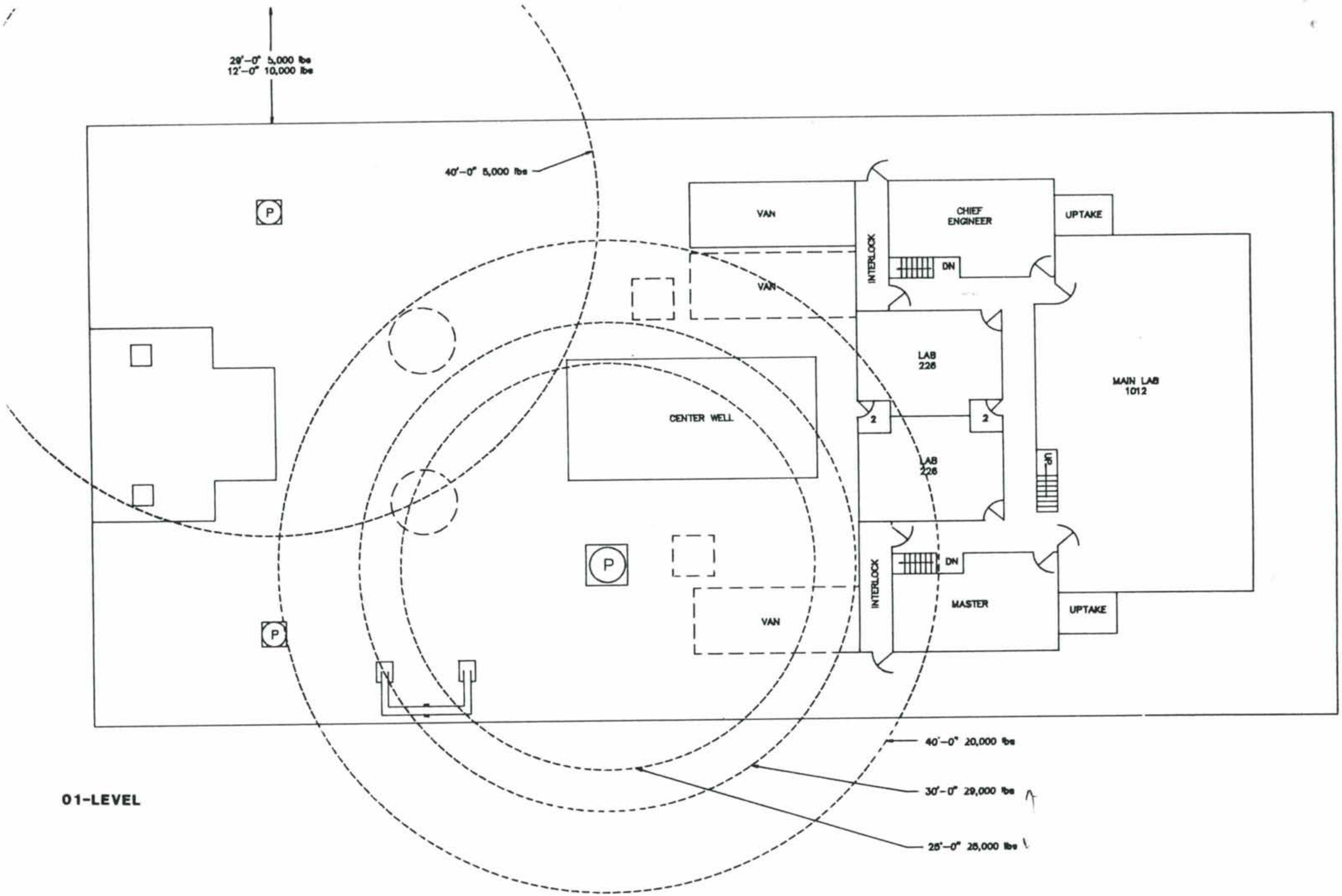
MOMENTS TAKEN ON CENTERLINE AT FORWARD PERPENDICULAR

	AREA SQ. FEET	SECT/PROFILE CENTER OF PRESSURE	VERTICAL CENTER OF PRESSURE	DRAG COEFICIENT	VELOCITY KNOTS	DRAG POUNDS	SECT/PROFIL MOMENT FOOT-LBS.	VERTICAL MOMENT POUNDS
SECTION AREAS - IN AIR:								
ABOVE WATERLINE STRUT:	480	0.0	21.1	0.10	20.0	65	0	1376
UPPER HULL BOX:	979	0.0	30.9	0.60	20.0	799	0	24695
DECK HOUSE:	396	0.0	42.9	0.80	20.0	431	0	18483
PILOT HOUSE:	325	0.0	50.8	1.00	20.0	442	0	22454
DECK MACHINERY:	200	0.0	41.7	1.40	12.0	137	0	5717
P.H. ROOF RIGGING:	50	0.0	60.5	1.20	20.0	82	0	4937
BRIDGE DECK STANTIONS:	90	0.0	48.3	1.20	20.0	147	0	7094
WEATHER DECK STANTIONS:	125	0.0	39.2	1.20	20.0	204	0	7997
SECTION AREAS - UNDERWATER:								
BELOW WATERLINE STRUT:	168	0.0	14.1	0.08	1.5	85	0	1203
LOWER HULLS:	304	0.0	5.8	0.12	1.5	231	0	1343
PROPELLER SHROUDS:	32	0.0	5.0	0.35	1.5	71	0	355
CANARD:	5	0.0	5.0	0.10	1.5	3	0	16
STABILIZERS:	5	0.0	5.0	0.10	1.5	3	0	16
PROFILE AREAS - IN AIR:								
FWD WINDWARD STRUT:	376	45.1	21.1	0.90	0.0	0	0	0
AFT WINDWARD STRUT:	345	125.5	20.4	0.90	0.0	0	0	0
FWD LEEWARD STRUT:	376	45.1	21.1	0.90	0.0	0	0	0
AFT LEEWARD STRUT:	345	125.5	21.4	0.90	0.0	0	0	0
UPPER HULL BOX:	1871	73.0	30.9	0.80	0.0	0	0	0
DECK HOUSE:	460	40.3	42.9	0.80	0.0	0	0	0
PILOT HOUSE:	90	60.9	50.7	0.80	0.0	0	0	0
DECK MACHINERY:	280	107.0	41.7	1.20	0.0	0	0	0
P.H. ROOF RIGGING:	50	62.5	60.5	1.00	0.0	0	0	0
BRIDGE DECK STANTIONS:	80	48.8	48.3	1.00	0.0	0	0	0
WEATHER DECK STANTIONS:	250	74.0	39.2	1.00	0.0	0	0	0
PROFILE AREAS - UNDERWATER:								
FWD WINDWARD STRUT	324	28.2	14.1	0.90	0.0	0	0	0
AFT WINDWARD STRUT:	326	125.3	14.6	0.90	0.0	0	0	0
FWD LEEWARD STRUT:	324	28.2	14.1	0.90	0.0	0	0	0
AFT LEEWARD STRUT:	326	125.3	14.6	0.90	0.0	0	0	0
LOWER HULL WINDWARD BOW:	45	4.1	5.0	0.75	0.0	0	0	0
LOWER HULL LEEWARD BOW:	45	4.1	5.0	0.75	0.0	0	0	0
LOW HULL UNDER W/FWD STRUT	505	33.4	5.4	0.60	0.0	0	0	0
LOW HULL UNDER L/FWD STRUT	505	33.4	5.4	0.60	0	0	0	0
LOWER HULL WIND. MIDBODY:	571	76.5	6.2	0.40	0.0	0	0	0
LOWER HULL LEE. MIDBODY:	571	76.5	6.2	0.40	0	0	0	0
LOW HULL UNDER W/AFT STRUT	427	116.3	5.9	0.60	0.0	0	0	0
LOW HULL UNDER L/AFT STRUT	427	116.3	5.9	0.60	0	0	0	0
WINDWARD PROP. SHROUD	29	147.8	5.0	1.40	0.0	0	0	0
LEEWARD PROP. SHROUD:	29	147.8	5.0	1.40	0.0	0	0	0
CANARD:	0	0.0	0.0	0.30	0.0	0	0	0
STABILIZERS:	0	0.0	0.0	0.30	0.0	0	0	0
TOTAL IN-AIR DRAG & MOMENT:						2307	0	92753

TOTAL UNDERWATER DRAG:			394	0	2932
ADDED DRAG DUE TO SEAS:			39		
TOTAL DRAG:			2740		
PORT PROPELLER:	145	5.0	1370		
STARBOARD PROPELLER:	145	5.0	1370		
TOTAL SHP FOR P.C. = 0.7			18		


WET LAB
275
SHIP STORAGE
MAIN ENGINE
LKR
W.T.
CHILL
THAW
CHEM. STOW.
GALLEY
STEAM TABLE
MESS DRY STORES 150
FOOD FREEZER 50
MISSION FREEZER 100
UP
ELECTRONICS SHOP 170
WALKWAY
CENTER WELL
STAGING AREA 187
WIREWAY
MESS
STORAGE 200
COMPT.
STORAGE 310
P
STAGING AREA 282
PHOTO LAB 110
LAUNDRY
1
2
ACCESS PLUMBING / UTILITY
DBL BUNKS 2 DRAWERS UNDER
DESK/ CHEST
LKR
1 TYPICAL 4 PERSON COMPLEX
2 COMMUNAL HEAD
CRANE PLDESTAL

MAIN DECK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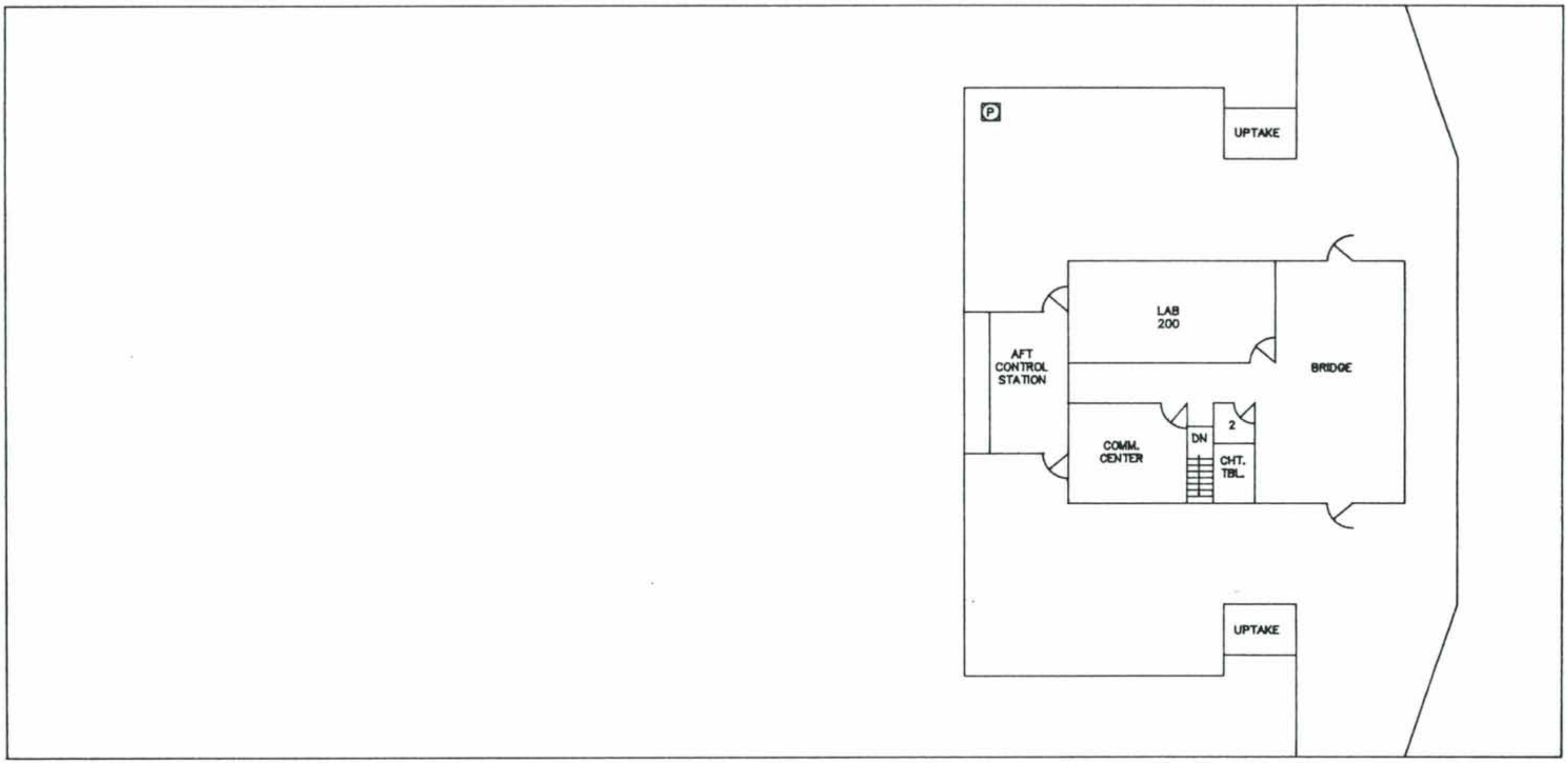
12'-0" 10,000 lbs
40'-0" 5,000 lbs
P
VAN
INTERLOCK
CHIEF ENGINEER
UPTAKE
DN
VAN
LAB 226
MAIN LAB 1012
2
2
CENTER WELL
LAB 226
UP
DN
P
INTERLOCK
MASTER
UPTAKE
VAN
P
40'-0" 20,000 lbs
30'-0" 29,000 lbs
25'-0" 25,000 lbs

01-LEVEL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UPTAKE
LAB
200
AFT
CONTROL
STATION
BRIDGE
2
DN
COMM.
CENTER
CHT.
TBL.
UPTAKE

02-LEVEL

UNOLS SWATH OCEANOGRAPHIC SHIP
OPERATIONAL REQUIREMENTS

LENGTH OVER ALL	150	150
BEAM	OPEN	75
DRAFT (HARBOR, FULL LOAD)	16-18	17
DISPLACEMENT	600-800	1070
SPEED (CRUISING)	12 kts/SS4	12 kts
SPEED (MAXIMUM FOR 2 HOURS)	14 kts	14 kts
ENDURANCE:		
TRANSIT	15 DAYS	15 DAYS
ON STATION	15 DAYS	15 DAYS
RANGE	~~15 DAYS~~ 6K	~~15 DAYS~~
STATIONKEEPING +/- 150'		
WIND	35 kts	35 kts
CURRENT	2 kts	2 kts
SEA STATE	5	5
PAYLOAD	50 TONS + MISSION EQ	YES

UNOLS SWATH OCEANOGRAPHIC SHIP

ACCOMODATIONS:		
SCIENTIFIC	20/2 PERSON ROOMS	YES
	4 IN VANS	YES
SHIPS CREW	2/1 PERSON ROOMS	YES
	10/2 PERSON ROOMS	YES
WORKING AREAS:		
STERN	2500 SQUARE FT	YES +
STARBOARD SIDE	18 X 80 FT	YES - BUT
DECK LOAD	1200 LBS/SQUARE FT	YES
CENTERWELL	15' X 30'	YES
CRANES:		
100% COVERAGE ABOVE AREAS	YES	YES
20,000 LBS STARBOARD SIDE OR STERN	YES	YES
OVERSIDE REACH	30'/5,000 LBS	YES

UNOLS SWATH OCEANOGRAPHI SHIP

WINCHES:		
TWO HYDRO TYPE (CW STARBOARD & STERN)	30,000 FT CABLE	YES
HEAVY DUTY (CW & STERN)	40,000 FT	TBD
OVERSIDE HANDLING:		
STERN A-FRAME	YES 15 - FT HORIZONTAL	YES
STARBOARD A-FRAME	YES - 15 FT HORIZONTAL	YES
TRANSOM PORCH	YES	YES
DIVER PLATFORM	OPTIONAL	PENDING
LABORATORIES:		
MAIN LAB	1,000 SQUARE FT	YES - BUT
HYDRO LAB	200 SQUARE FT	YES
FREEZER	100 SQUARE FT	YES
VANS, 8 X 8 X 20	2	YES - BUT

Lamont-Doherty Geological Observatory of Columbia University | *Palisades, N.Y. 10964*

Cable: LAMONTGEO
Palisades New York State
TWX-710-576-2653

Telephone: Code 914, 359-2900

February 29, 1988

Dr. M. Grant Gross, Director
Division of Ocean Sciences
National Science Foundation
Washington, D. C., 20550

Dear Grant:

I want to follow-up my informal conversations with you and your staff on the subject of a replacement vessel for the R/V ROBERT D. CONRAD. In particular, we want to stimulate an early, informal response from NSF, ONR, and UNOLS regarding a specific plan to acquire an existing research vessel. The particular vessel we have in mind is the M/V BERNIER, a Canadian-flag geophysical exploration ship. This ship can 1) help solve the general long-term fleet replacement problem and 2) simultaneously address the problem of the inadequate marine geological and geophysical capabilities that would follow any near-term demise of the R/V CONRAD. I request, therefore, that this matter be considered by you and brought by NSF before the UNOLS Advisory Council Committee at their meeting of 3-4 March.

By way of background, we have examined the M/V BERNIER (using various professionals from ABS, ex-USCG, and from our own ranks) and we are persuaded that the likely availability of this vessel represents a unique opportunity. The relatively modest cost of this approach is equally important.

Tc assess the likely response of the UNOLS community, we have compared the characteristics (existing or easily acquired) of the M/V BERNIER to the generic characteristics of the medium-endurance and high-endurance vessels as defined in the UNOLS Fleet Replacement Committee Report of April, 1986. The M/V BERNIER can satisfy all of the scientific mission requirements of the medium-endurance "class" and most of the mission requirements of the high-endurance "class." The basic specifications of the M/V BERNIER are given in Table 1 and Tables 2A-C.

We believe this particular ship could be acquired and modified for enhanced MG&G capability, general purpose use, reflagging and classification requirements for a cost in the range of $10M. Although the idea of replacing the fleet in part by acquiring existing hulls for conversion is not new, the suitability of existing ships varies widely regarding availability, cost, capability, and conversion requirements. Furthermore, the volatility of this used-ship market is well known and it is currently a buyer's market. We are convinced that the near-term availability of the M/V BERNIER presents an unusually attractive opportunity---but one that is likely to be lost if we don't collectively act expediently and boldly.

We are currently prepared to pledge up to $1M in institutional funds to help secure this vessel and to put it into operation. Additionally, we are actively soliciting major gifts/support from the private sector and elsewhere that would increase "our" financial commitment and decrease the proposed NSF role commensurately.

In order to move ahead we need to lay a specific offer on the table soon. I would like an informal reaction to the following scenario that would underpin a bid of ~$10M to acquire the ship and to affect the needed modifications, equipment, installations, etc.

FY 89	NSF	$6M	($3M new, $3M reprogrammed from operations)
	LDGO	$1M	(institutional)
FY90	NSF	$3M	(new)

(all NSF new monies requirements would be reduced accordingly to reflect private gifts and other agency support)

We would plan for CY89 to be primarily a low-to-no operations year (for both R/V CONRAD and M/V BERNIER). The funds typically provided for R/V CONRAD operations (~$3M) could be reprogrammed to partially meet the estimated $6M, NSF component needed in FY89. The R/V CONRAD would be retired and the M/V BERNIER brought into service; in late 89-early 90 we would expect to resume full operations and would compete for NSF CY90 operational funds in the normal manner.

In summary, we are looking for: ~ $6M in FY89 of which $3M could be reprogrammed because of curtailed operations and $+3M would have to be new. In FY90, an additional $3M of new money would be required, plus operations monies commensurate with the level of NSF-supported science projects to be implemented on this vessel. Naturally, we are prepared to consider any plausible plan of creative financing and look to NSF to help identify ways in which the needed funds could be committed.

We would want the BERNIER to be considered a bonafide component of the UNOLS fleet and in particular a part of the NECOR mini-fleet. It would be operated by Columbia University/L-DGO, assuming the same level of cooperation from the other NECOR institutions that has supported the R/V CONRAD operations for the last several years. Because the ship is less than five years old, and in excellent condition, it would provide an important component of the UNOLS large ship needs (including enhanced MG&G) for the next 25+ years.

We are convinced that the opportunity to acquire the BERNIER will evaporate if we do not take some positive action with the next 2-3 months. This strawman proposal simply illustrates our thinking and alerts NSF to the elements of an intended proposal; we urge NSF to be prepared to evaluate and respond quickly. It is my intention to submit a formal specific proposal shortly, within the next few weeks.

I trust this letter of intent will stimulate some discussion among NSF, UNOLS, ONR, and other interested parties and will demonstrate that we are prepared to make institutional commitments. The community cannot allow itself to get paralyzed by the enormous scope and complexity of the long-term capitalization problems facing the ocean and earth sciences. I trust you will discuss at NSF a position that could accomodate a quick response to solutions of component parts of this problem as opportunities are identified.

We would appreciate some guidance from both NSF and UNOLS regarding how to proceed. Naturally, we recognize the importance of a general endorsement from UNOLS and the broader scientific community as well as from NSF and ONR. Our proposal to acquire the M/V BERNIER is well in line with actions proposed in recent studies regarding the fleet replacement problems. Therefore, we presume that broadly based enthusiasm for our plan will be forthcoming once the appropriate groups have had an opportunity to review and confirm the suitability of the M/V BERNIER as a component of the future UNOLS fleet.

Sincerely,

DEH.

Dennis E. Hayes

Associate Director

cc: R. Corell, NSF
D. Heinrichs, NSF
J. Martin, UNOLS
G. Keller, UNOLS ✓
K. Kaulum, ONR
C. B. Raleigh, L-DGO

Table 1

GEOPHYSICAL SURVEY VESSEL M/V BERNIER

DIMENSIONS AND RIGGING

Length OA	72.75 m	(239')
Length BP	66.30 m	(218')
Beam Mld. Amidships at C Deck	14.00 m	(46')
Draught Mld. Design	7.00 m	(23')
Displacement Light	1748.78 t	
Displacement Loaded @ 5.3 m	2665.90 t	
Fuel Capacity	702.90 cu m	
Cruising Range	12000.00 n mi @ 14 kts	
Total Ballast	265.92 t	
Feed & Fresh Water Tanks	50.36 t	
Shaft Horsepower	2350.00 kW	
Official Number	370452	
Port of Registry	Sorel, Canada	
Gross Tonnage	1965.73 t	
Net Tonnage	582.64 t	
Number of Berth	40	(Presently 16 Officers/Crew)

MAIN ENGINE

Main Ship Power	4 Diesel generator sets, each rated at 1000 kW at 600 V, 3 phase, 60 hz.
Main Generating Engines	4 Burmeister and Wain Holeby Diesel generating sets, type 6S28LH-4.
Propulsion Motor	4 CGE type 1571AT DC motors rated at 600 kW each.
Gear Box	Lohmann Stolterforth 4 input, single output ratio = 6.06:1 Model GVA 1120.B/SO.
Bow Thruster	CGE DC motor, 750 V, 540 A, horsepower:378 kW.

PRCPELLCR CHARACTERISTICS

L.R.S. Ice Class: 1
Material: NI AL Bronze
Number of Blades: 5
Diameter: 3.000 m
Mean Pitch: 3.480 m

CLASSIFICATION

Lloyds Register of Shipping: Class +100-A-1, with descriptive notation hull ice class Baltic 1A.

BRIDGE ELECTRONICS

Radar Sets	Furuno FR-126RS and RMS 1630C. 230 mm display units, 1.2 and 1.8 m scanners. Maximum range 48 n mi with optimum conditions, 30 n mi with seas of Beaufort force 5.
VHF Radios (Air Band)	2 Genave Alpha/720 40 channel transceivers. 4 watt RF carrier, frequency range 118.000 to 135.975 MHz in 25 KHz increments.
VHF Radios (Marine Band)	2 Sailor Channelized transceiver 25 watt frequency range 156.000 to 157.775 MHz.

HF-SSB Radio	Harris RF-2330 Channelized ARQ System. SSB channelized transceiver. 125 watt PEP transmitter. 0.5 uV sensitivity receiver with 4 watt output to internal speaker; 32 through 96 field programmable channels. Operable in all standard modes including continuous duty RTTY.
Weather Facsimilie	Alden Marinefax III. Digital leverwheel switches to 1 KHz resolution, frequency coverage from 100 KHz to 29.999 MHz continuous.
Echo Sounder	Honeywell Elac Echograph LAZ51. 6 measuring ranges, provides coverage to a maximum of 0 to 1500 m. Frequency 50 KHz.
Auto Pilot	Wagner Mark VI Steering Control System. Maximum hard over to hard over range: 90 degrees. Dual switchable hydraulic pumps, failure alarm, off course alarm, gyro compass repeater, rudder angle and order meters, compass selector (magnetic or gyro).
Loran C	Decca 1024 Receiver/Plotter. Two time delay displays, notch filters, plotter with Lat/Long LED display.
Radar Responder Beacon	Displays the Morse letter P (pappa) on all operational radar sets within appropriate range. Used to identify M/V Bernier from other vessels.
Aircraft Homing Beacon	267 KHz SG 3 1020 Hz Modulation.
Marisat	Magnavox 211 Satellite Communications Terminal. Enables 24 hour worldwide telex and voice communications. Telex # 1560322 PCNA X.
Water Distillation	2 evaporator type and 1 reverse osmosis water makers. Can make up to 18 tons of potable fresh water daily.
Helideck	For sizes up to Bell 212.

Table 2A

Reference between the `Scientific Mission Requirements for New Oceanographic Ships´ published by the UNOLS Fleet Replacement Committee dated June 86, comparing the modified M/V Bernier to the requirements for both the class 1 & 2 vessels as per the above mentioned document.

SUMMARY COMPARISON OF SCIENCE REQUIREMENTS FOR LARGE SHIPS

	M/V Bernier	Medium Endurance	High Endurance
Size	240 ft.	200-250	250-300
Endurance	60 days 12000 nm @ 14 knots	50 days 12000 nm @ 14 knots	60 days 15000 nm @ 15 knots
Cruise Speed	14 knots	14 knots	15 knots
Seakeeping	No Data (They tow a 3 Km. streamer @ 5 kts. in B6 seas)	14 knots B4 12 " B5 8 " B6	15 knots B4 13 " B5 8 " B6
Station Keeping	No Data available, 750 kw bow thruster		
Trackline	No Data available.		
Towing	18000 lbs. normal ops at 5 knots.		
Science Accomm.	30 cabins *?? vans	20-25 cabins 30 w/ vans	30-35 cabins 40 w/ vans
Deck work area	3500 sq.ft. 15 x 100 waist dk. disposable load ??	2000 sq.ft. 12 x 40 waist dk. 90 tons disp. load	3000 sq.ft. 12 x 50 waist dk. 100 tons disp. load
Lab area	4500 sq. ft. **2 vans to inside 4 deck load	3000 sq.ft. 2 vans	4000 sq. ft. 4 vans
Science storage	approx. 19000 cu.ft. 15000 climate ctrl.	15000 cu.ft.	20000 cu.ft.
Ice rating	Ice sheathed to Canadian Class B	ABS Class 1C	ABS 1B / 1AA
Acoustical systems	Sea Beam, 3.5 Khz., 12 Khz., current profiling.	---------Sea Beam, 3.5 Khz 12 Khz., current profiling.	--------
MCS	3000 scfm 2500 psi. 8000 + cu. in. 240 ch. digital streamer	3000 scfm 2000 psi. large array none spec.	4000 scfm 2500 psi. large array none spec.

Table 2A cont.

* Upper limit would have to be set by Coast Guard and the additional safety equipment would have to be acquired, life rafts etc.. This would also adversely effect the endurance based on food storage requirements.

**This would be predicated on the removal of the Solas status, by removing the two 52 man life boats(see *), this would not be directly into main lab but into the main ladder well accessing the main lab areas.

Table 2B

The following is a comparison of the available space and equipment aboard the R/V Conrad and the M/V Bernier as she would be reconfigured to suit the community needs:

Description	Conrad	Bernier w/mod
Instrument Lab	610 sq.ft.	1282 sq.ft.
Wet Lab	270 sq.ft.	2660 sq.ft.
Hydro Lab	0	to
Bio/Chem. Lab	88 sq.ft.	be
Dark Room	0	assigned
Working deck @ 6 ft.	1235 sq.ft.	1720 sq.ft.
Open deck @ 14+ ft.	450 sq.ft.	1790 sq.ft.
Winch Area	730 sq.ft.	1640 sq.ft.
Sci. storage aft.	3000 cu.ft.	8700 cu.ft.
Tape/Sci. storage	2500 cu.ft.	3200 cu.ft.
Air gun shop	96 sq.ft.	250 sq.ft.
MCS/SCS storage	0	800 cu.ft.
	Scientific Equipment	
MCS/SCS Logging	DSS240 240ch.	DSS240 240ch.
Gravity	BGM-3	BGM-3 KSS-30
Magnetics	Varion V75	2 Varion V75
Nav. Logging	Masscomp	?
Q.C./reduction	Masscomp	Masscomp
Sound sources		
Airguns	5835 c.i./10	8300 c.i./16
Waterguns	160 c.i./2	160 c.i./2
Compressors	1030 csfm/5	3000 csfm/3
Bathymetry		
3.5 Khz.	EDO	EDO/ORE
12 Khz.	EDO	EDO
Bottom mapping	Sea Beam	Sea Beam
Speed log	Furuno	Furuno
Core/Trawl winch	Lebus	Lebus
CTD winch	Lebus	Lebus
Hydro winch	Lebus	Lebus
	Accommodations	
W/ Head and shower	10	12
W/ Heads	0	18
W/O Heads	16	0
Total Bunks (+ 2 medical)	44	50
Sci. Bunks	21	34
Crew Bunks	23	16

Table 2C

The following is a list of the items currently in operation aboard the M/V Bernier, which could be part of the package:

3 ea. LMF 1000 csfm D.C. drive compressors

40 ea. Bolt 1500C airguns

46 ea. Geco 100 m x 12.5 m group sections

2 ea. Armored lead-in sections

1 ea. Bodenzeeworks KSS-30 gravity meter

1 ea. Varion V-75 maggie

1 ea. Magnavox 3-D integrated nav. system

1 ea. Texas Instruments DFS-V 6250 bpi sys.

1 ea. I.O. Inst. Gun controller

1 ea. Seismic Eng. DSS5 Streamer system

4 ea. Gun array handlers

This list only covers the larger items, which doesn't include the current spares inventory.