UNIVERSITY - NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

ADVISORY COUNCIL MEETING
National Science Foundation
1730 K Street NW
Washington, D.C.

Minutes of Meeting, October 24, 1983

Advisory Council Members and representatives from the National Science Foundation, the Office of Naval Research, the National Oceanic and Atmospheric Administration and the U.S. Geological Survey convened in Suite 300 of NSF offices at 1730 K Street NW. The meeting was called to order at 9:00 a.m. by Chairman Charles Miller.

Attendees

Advisory Council
Charles B. Miller, *Chairman*
Harris B. Stewart, Jr., *Vice Chairman*
Robert W. Corell
Robertson P. Dinsmore
Donn S. Gorsline
Roger Larson
Bruce Robison
John C. Van Leer
Joseph Curray, *ex-officio*
Ferris Webster, *ex-officio*

Observers
Richard Alderman, NOAA
Larry Clarke, NSF/OFS
Tom Cooley, NSF/OFS
Grant Gross, NSF/OCE
Mark Holmes, USGS
Keith Kaulum, ONR
Don Keach,* USC
Ronald La Count, NSF/OFS
John McMillan, NSF/OFS
John Morrison, NSF/OFRS
Robert Wall, NSF/OSRS
Richard West, NSF/OFS

UNOLS Office
William D. Barbee
Mitchell Stebens

*Don Keach made a presentation on the University of Southern California's draft report on replacing the VELERO IV.

The minutes of the Advisory Council meeting of July 28, 29, 1983, held in Durham, New Hampshire were accepted.

Status reports were made on *Council Member's Standing Roles.*

UNOLS Cruise Assessment Forms and Summaries are the core of the Advisory Council's role on *Fleet Efficiency and Effectiveness* under Joe Curray. Summaries of Assessment Reports for March 1 through June 30, 1983 were distributed and provided to sponsoring agencies. The Council, after examining the Summaries directed that they be distributed to UNOLS operators.

The Executive Secretary informed the Council of several requests that he had received from principal investigators of any equipment deficiencies noted in Cruise Assessment Reports. The Advisory Council noted that the Assessment forms were designed to serve the funding agencies and operators, and a broader distribution of the contents of returns could compromise their value. Further, the Council felt that direct communication between prospective investigator and operator is the only effective means of providing alerts to equipment needs, notification of changes in equipment capabilities, capacities, etc. *The Advisory Council directed that distribution of summaries of Cruise Assessment Reports remain limited to the Advisory Council, Federal funding agencies and UNOLS operating institutions.*

Ronald La Count noted that NSF's Oceanographic Facilities Support Section had requested that UNOLS establish a method of cruise assessment in part to evaluate assertions made "...that significant losses of science occur on almost 40% of cruises...." He then submitted an excerpt from the 1983 report from the Oceanographic Facilities Support Section Oversight Committee, a subcommittee of the Executive Committee of the Advisory Committee to the Division of Ocean Sciences:

These forms have provided a positive feedback to both the operators and to the funding agencies, and the information has been beneficial to both. The operators have responded immediately and positively to remedy problems with the ships, crew, and equipment; and both OFS and ONR have responded positively by emphasizing funding for maintenance and upgrading. The result has been a dramatic improvement in efficiency and cost-effectiveness of operation. A quick perusal of Cruise Assessment forms for the past year suggests that less than 5% of cruise legs suffered any loss of science time due to operator, ship, crew, scientific support equipment or operator-supplied instrumentation.

In his report on *Communications*, Donn Gorsline noted that the first issue of UNOLS News would be out early in November. It will be mailed to more than 600 addressees (multiple copies to several agencies and institutions). As in the first issue, UNOLS News will limit its coverage to UNOLS matters (e.g., UNOLS activities, schedules, ship utilization, funding projections). The next issue will be in the first quarter, 1984.

Other communications from the UNOLS Office to the community of ocean investigators include information on the ALVIN program in The Oceanography Report to be published in EOS in November, and a letter to approximately 600 potential investigators describing UNOLS' ALVIN and expeditionary planning processes and announcing planning workshops to be held in December, 1983 and January, 1984.

Robert Corell reported that his subcommittee on *Access for Ocean Research* had not been active since his last report July 28, 29, 1983. The Council was informed that Lee Stevens has left the Department of State and is in graduate school at the University of Washington. Carl Price is presently handling clearance matters under William Erb at the Office of Marine Science and Technology Affairs.

Roger Larson reported the results of his informal survey of east coast institutions concerning *Specialized Instrumentation Facilities for Ocean Research*. With help from several colleagues he has gathered expressions of at least preliminary interest in centers for

physical ocean profiling,
high pressure facility,
sediment core curating facility.
deep sea sampling
ocean remote sensing, and

Perhaps more noteworthy, the Bigelow Laboratory for Ocean Sciences now operates two multi-use facilities: a culture collection and a cytometer sorting facility which together support a cell biology center. The success and utility of this facility is a powerful endorsement to the concept of shared facilities in ocean research.

Bob Ballard, WHOI endorses a family of unmanned vehicles extending JASON-ARGO developments and leading to a Deep Submergence Engineering facility.

NECOR institutions have effectively established a multi-use facility for swath-sounding (i.e., SEABEAM). The Navy has recently indicated that they will fund a second echo processor, for installation on ATLANTIS II and thus both AII and CONRAD will have complete systems.

Robertson Dinsmore reported that as chairman of the *UNOLS Committee on Fleet Replacement* a committee has been formed. Committee membership is:

Robertson Dinsmore, WHOI, Chairman
George Keller, OSU
John Martin, MLML
David Menzel, Skidaway
Worth Nowlin, TAMU
Fred Spiess, Scripps
Derek Spencer, WHOI

A committee meeting is being organized to set direction for the committee and to define the study. A two-stage approach is contemplated. In the first stage the committee would identify and verify fleet requirements (emphasizing the replacement crisis emerging during the 1990's), determine needs, examine and evaluate various hull/platform capabilities and configurations, and sponsor a number of conceptual designs. A community-wide workshop would be held to gain broad-based information and to establish the basis of support for preliminary concepts. In the second stage the committee would develop coordinated plans from preliminary results for vessel replacement and construction, and sponsor preliminary design or designs for identified priority needs. It will be important to work closely with Federal funding agencies who have undertaken a parallel effort, particularly through the Federal Oceanographic Fleet Coordinating Committee (FOFCC).

The Committee has also been alerted to the need to examine current plans for vessel replacement which might affect composition of the UNOLS fleet. A

Fleet Replacement Committee report will be made at the UNOLS semiannual meeting.

John Van Leer delivered a report on *Platform Design Ideas* (Appendix 1). In the report it is recognized that a substantial program must soon be undertaken in fleet replacement. Near term needs to replace individual vessels are opportunities to explore innovative approaches. Two advanced platform design ideas are advanced: semisubmersibles and catamaran hulls with modest water plane areas.

The Advisory Council directed that the report on Platform Design Ideas, with supporting documentation be transmitted to the UNOLS Fleet Replacement Committee.

The availability of commercial vessels for research charter to UNOLS institutions was discussed. Discussion centered on means to identify what vessels (and their capabilities) are available, and appropriate mechanisms for chartering. It was noted that the Marine Technology Society's Ship Committee is preparing a directory of available research vessels.

Bruce Robison noted that the Advisory Council review of their report on Composition, Distribution and Management of the UNOLS Fleet is due by Spring, 1984.

Ron La Count, reading again from the report by the Oceanographic Facilities Support Oversight Committee, emphasized the importance of Advisory Council and UNOLS review of UNOLS fleet management:

"Comments on Ship Assignment and Fleet Distribution and Composition

The capabilities, composition, distribution, and management of the Academic Fleet is of fundamental importance to the health and vitality of U.S. Oceanography. Considerable attention has been given to various aspects of these issues by the National Academy of Science, UNOLS, the NSF and other government agencies, and by academic institutions. We commend OFS for seeking the assistance of UNOLS Advisory Council during the spring of 1982 by asking for a thorough review of the composition, distribution, and management of the Academic Fleet. This request was a direct consequence of projected budgetary limitation which forecasted fleet reductions. The use of an organized and representative body like UNOLS, combined with NSF and other governmental policies and procedures provides the basis for a widely accepted context for the difficult responsibility of determining the composition, distribution and management of the Academic Fleet. While the UNOLS study contributed significantly towards addressing the budgetary issues raised in 1982, the overall policies for increasing, decreasing, or altering the size, composition, and distribution of oceanographic vessels remains unclear. The subcommittee observes that a recent vessel acquisition and assignment, while proper in governmental procedural context, caused considerable concern within the ocean sciences community. The review of the grant jacket by the subcommittee gives some credence to those concerns as the guidelines were not clear. We feel that a review of present procedures and the ultimate establishment of new policy and guidelines concerning ship assignment or deassignment should be conducted by NSF/OFS with substantial input from the ocean science community, through the UNOLS Advisory Council. We urge OFS to place highest priority on this matter.

Further, the subcommittee suggests that formal review of proposed additions, replacements or other augmentations of the fleet by UNOLS would provide a consistent external review mechanism for all changes contemplated for the academic fleet. We are of the opinion that proposals by individual institutions to change, in some way, vessels assigned to them should not be considered in isolation, but must be thoroughly reviewed in the fullest context of scientific needs for vessel support by an institution, by the oceanic region to be served by the vessel, and by the ocean science community at large.

We recommend that all major actions involving the composition of the academic fleet be sent to the UNOLS Advisory Council for their recommendations."

Robertson Dinsmore reported that the Federal Oceanographic Fleet Coordinating Committee (FOFCC) is producing information of interest to the Advisory Council and to UNOLS. Their report on Federal Fleet Study, 1983 is in draft, and will be made available to UNOLS in its final form.

Robert Corell reported that *ALVIN/ATLANTIS II* will be operational early in 1984. Modifications, especially installation and testing of ALVIN lift capability on the ATLANTIS II has taken longer than anticipated. New ALVIN/ATLANTIS II schedules have been drafted, with an anticipated January 4, 1984 start date.

New equipment and support mode will lead to new operating protocals for the ALVIN program.

The Chairman discussed the *UNOLS Charter Revision* material that had been distributed to UNOLS members and to the Advisory Council. Member responses, in some instances endorsed the recommended revisions, but in others had taken exception. Objections were generally either to the method of designating UNOLS ships (i.e., by UNOLS vote) or to the strong Advisory Council role in formulating UNOLS policy. The Council agreed that the ship designation issue should be settled by UNOLS vote, but the question of the Advisory Council role in UNOLS policy was beyond the scope of charter recommendations considered or advanced by the Council. The Chairman noted that one mistake included in the recommended revisions, concerning voting procedures on UNOLS membership. The Council recommended that the minor change necessary to correct this mistake be made in the revision introduced at the UNOLS meeting.

Ferris Webster, UNOLS Chairman, outlined the procedures to be used in introducing Charter Revisions at the UNOLS meeting.

Ron La Count introduced the issue of *VELERO IV replacement* by noting that NSF/OFS had sponsored a report to be prepared by the University of Southern California. VELERO IV replacement is an issue because of the vessels age, its limited capability to support science in the weather conditions encountered in its region of operation, perceived research vessel requirements and because of other factors cited in the Advisory Council's fleet management studies. He again cited the NSF/OFS Oversight Committee's report recommending "...major actions involving the composition of the academic fleet be sent to the Advisory Council for their recommendations." (See above excerpts from the report). Mr. La Count delivered the following charge to the Advisory Council:

Review the USC report in the fullest context of scientific needs for vessel support by the institution, by the oceanic region to be served by the vessel, and, in your opinion, by the ocean science community at large, and provide the National Science Foundation with your recommendation on whether the (replacement) vessel should be included in the UNOLS fleet.

Don Keach, University of Southern California was asked by Mr. La Count and by the Chairman, Advisory Council to make a presentation on the vessel replacement study. He distributed to Council Members copies of draft report *University of Southern California Research Vessel Replacement*. The report reviewed USC's history as a research vessel operator, discussed VELERO IV capabilities and limitations, projected scientific requirements for a research vessel in areas north and south of Pt. Conception (off Central California), cited requirements from the Naval Postgraduate School and from USGS, derived characteristics of a replacement vessel and assessed the availability of appropriate replacement vessels. *The draft report concluded that an existing modern purse seiner would be most suitable and selected the OSPREY, 220 ft. vessel owned by Van Camp, for further study.* The report includes estimated costs and schedule for overhaul, conversion and outfitting the OSPREY to oceanographic research service.

In his presentation, Mr. Keach emphasized that the converted OSPREY would be comparable to the largest ships in the UNOLS fleet, and would have numerous virtues in seakindliness, general capabilities and economy of operation. He also asserted that overall acquisition and operation costs would be bargain-low. He noted that requirements for certification, manning and documentation could not yet be completely defined.

In discussion with Don Keach, the Advisory Council raised questions on the need for a vessel as large as the OSPREY, on estimated conversion and outfitting costs, on estimated operating costs, on the suitability of such a vessel to traditional California Borderland use (e.g., as is being filled by VELERO IV), and on potential new operation funding sources (e.g., NPG School, USGS).

The Advisory Council agreed to accept the charge from NSF/OFS to review the USC report (see text of charge above), and directed that the Chairman inform UNOLS of that acceptance.

In discussing the USC report the Council drew heavily on a *Report of Inspection, M/V OSPREY, October 18, 19, 1983* by Captain Robertson Dinsmore, Advisory Council Member and Chairman, UNOLS Committee on Fleet Replacement.

After the Council had gathered information, Don Keach was excused from the meeting. Donn Gorsline, Advisory Council member and USC faculty member also withdrew from the meeting (in accordance with Council rules) prior to consideration of the issues of vessel replacement at USC.

After additional discussion, the Advisory Council adopted the following recommendation:

The UNOLS Advisory Council, at the request of OFS, reviewed the report from USC to replace Velero IV with a 220 ft. tuna seiner (M/V Osprey) to be purchased from Ralston Purina Co.

An on-site review of the ship and conversion plan by one of our members has resulted in a considered report upon which we base much of the opinion which follows:

1) We commend USC for responding to the Advisory Council recommendation of March 1983 that Velero IV be replaced in the relatively near term.

2) Conversion costs projected by USC appear to be unrealistic by a factor of 1.8 to 2.0 Therefore, OFS should not promise to underwrite conversion costs on the basis of present USC estimates.

3) Choice of M/V Osprey would provide UNOLS West Coast users with much more A + B Class ship capacity than appears to be justified by the present demand. The M/V Osprey would not simply replace Velereo IV with comparable capability. It is a much larger vessel than the Advisory Council has suggested would be needed to fill regional rquirements. As a Class A vessel M/V Osprey would certainly have operating costs well above those projected by USC. Fuel consumption and crew costs will surely exceed USC's estimates.

For both of these reasons we cannot recommend that OFS support further development of the Osprey plan.

4) We recommend that UNOLS, USC, and OFS pursue Velero IV replacement along other lines. In particular they should seek a ship that will provide better sea-keeping and longer range than Velero IV, and that will fit the definition of a UNOLS Class C vessel. Velero IV replacement plans should be developed in consultation wth the UNOLS Fleet Replacement Committee.

The recommendation was delivered to NSF/OFS on October 25, 1983.

The Council reviewed *applications for Associate Membership in UNOLS from the Naval Postgraduate School, Monterey, California and from the Louisiana Universities Marine Consortium (LUMCON), Chauvin, Louisiana.*

The Advisory Council recommended that the Naval Postgraduate School and the Louisiana Universities Marine Consortium be admitted to UNOLS as Associate Members and directed that their recommendations be presented to the UNOLS membership for action.

Review of the UNOLS Semiannual Meeting agenda was essentially completed in the course of other Advisory Council business.

Mr. Ronald La Count gave a brief report on activities of interest to UNOLS in NSF/OFS.

The Advisory Council's July, 1983 endorsement of the NSF, NOAA, ONR Memorandum of Agreement on ALVIN was included in presenting that package to the National Science Board.

The Council's July recommendation that ship inspection programs be extended to include institution-owned ships has been implemented.

Funds from all agencies supporting the UNOLS grant have been received and transferred. The grant is funded by NSF, ONR, NOAA, DOE, MMS and USGS. (Note that MMS funds the share heretofore covered by BLM.)

Mark Holmes, USGS, Menlo Park described work that USGS has scheduled for the Defense Mapping Agency. He also reported that the R/V LEE, now operated for USGS by the University of Hawaii is leaving for the South Pacific where the vessel is scheduled at least until October, 1984.

Keith Kaulum, ONR and Richard Alderman, NOAA had nothing new to report.

Under *other business*, Ferris Webster reported that he had attended the October, 1983 meeting of the Federal Oceanographic Fleet Coordinating Committee and urged continuing close liaison. He noted that FOFCC will study need for a polar research vessel, and advised that recent UNOLS studies must be made available to the FOFCC study group.

Mr. La Count introduced a letter to Dr. F. James Rutherford, Chief Education Officer, American Association for the Advancement of Science. The letter (Appendix 2) transmits copies of the recent UNOLS publication The Research Fleet for use in science kits for junior high schools in Ohio, Colorado and North Carolina.

The meeting was adjourned at 5:30 p.m.

POSITION PAPER ON DESIGN IDEAS FOR OCEANOGRAPHIC RESEARCH PLATFORMS

presented at the UNOLS/AC Fall '83 Meeting

by

John C. Van Leer

Abstract

Our fleet of research vessels is mostly middle-aged now and will be retired together during a relatively brief period between 1990 and 2005. Substantial progress has been made in the last decade in advanced computer modeled platform designs for the navy, and the offshore industries which offer significant improvement in station keeping, comfort, economy and safety compared to the present. In the search for platforms to take the place of VELERO and IDA GREEN we have unique opportunities to explore the alternatives. We should avoid the short term temptation to convert surplus ships from distressed industries but rather seek to advance the state of the art in research platform performance. If we fail to seize this opportunity now we will have insufficient experience with the next generations of platforms such as semi-submersible ships and sailing catamaran ships. We then might be tempted to merely replace the present vessels with more of the same rather than exciting new vessels which can work efficiently world-wide in higher sea states with much greater payloads, comfort and safety.

The following position paper outlines two possibilities for advanced platforms. We must not permit the recent hard economic times for scientific ship operations lock us into accepting more mediocre platforms with which we will have to live for decades. With over one hundred research vessels nationwide, ocean scientists and engineers have ample justification for the construction of a fleet of ships tailored to their needs.

Introduction

We in the UNOLS have just experienced a painful period with staggering increases in fuel and labor cost coincident with declining usage of our major research vessels. This has lead to several early ship retirements and to much belt tightening. For the time being the funding/inflation squeeze seems to be moderating much to the relief of the ship operating community. We also find ourselves with a fleet of mostly middle aged vessels whose capabilities as research platforms have not expanded significantly during the last 20 years. Our platforms still have the same operational limitations and high operating costs having been designed for the type of science which was invisioned during the post war research boom and favorable economic conditions. We have been "making do" with what we have and trying to survive. This is hardly a climate which encourages expansive planning. We have been downsizing our research vessels with the addition of Coastal Zone and the Oceanus class vessels. While both classes of new ships have performed many jobs well, they can hardly be termed more capable than their full sized predecessors. They are only noteworthy because they are cheaper to operate. Instead of pushing the state of the art in research platforms forward with fresh concepts, we are talking about "replacing" our aging research vessels with more of the same. When one talks of computers or satellites one speaks of getting the next generation vector processor or the advanced TOPEX systems. When the discussion centers on ships the term "replacement" comes to mind which implies that we must be content with the limitations of existing platform performance. Such a mind set dooms our next generation of

oceanographers to working with the small pay load limitations, poor sea keeping, and slow speed of our present platforms on the presumptions that little room for improvement exists.

Special Platforms

The last new types of platforms introduced were the GLOMAR CHALLENGER operated by the Deep Sea Drilling Project and the research submersible ALVIN. The exciting discoveries made by both platforms particularly in geology and biology are well known (Submersible Science Study, February 1982). Achievement of significant scientific advances often follows the creation of new technology which makes a new part of the parameter space available for inspection and inquiry. While we can point to a number of examples of special platform successes, our general purpose research vessels are not keeping pace in terms of enhanced capabilities to conduct advanced oceanic research. It is 20 years or more since the groundwork for these special platforms was laid so it is high time we got busy to design viable platforms for the turn of the century. If the aviation industry had the same attitude about aircraft that oceanographers have about ship development, we would still be flying in propellor driven planes and the space shuttle would be viewed as an improbable development for the distant future. I will give two examples of the effects of our regressive thinking - one in the recent past and the other in the near future.

ALVIN/ATLANTIS II

The submersible ALVIN'S tender, R/V LULU, was clearly a limitation on ALVIN operations with extremely cramped accommodations, limited endurance and slow speed of advance. Also because of LULU'S small

reserve buoyancy another ship was often sent along on remote operations for safety reasons and additional accommodations or towing capability. However the LULU was a $1M/yr operation which is being replaced by R/V ATLANTIS II which is a $3.3M/yr platform. Even though AII or KNORR can barely meet the stability needs to operate with the existing ALVIN, the decision was made for converting AII as an ALVIN tender.

The cost of the support ship required for distant ALVIN/LULU operations for an average of 132 days per year was about $1M/yr. In the WHOI cost projections only the actual 206 days per year AII time on station with ALVIN was counted against the Alvin project assuming that the transit time and the remaining days of the year would be paid from other sources. The first full projected year of operation and those in the foreseeable future however show full AII use on the ALVIN project at an extra cost of at least $1M/yr. The possibility of a completely new ALVIN mother ship which would not require a support vessel was not seriously considered in the AII conversion proposal largely because of a tight time table. It can be argued that if a tender for ALVIN had been designed from the ground up, using a different hull form, that significantly improved stability, sea keeping, range, speed and comfort could have been attained compared to the expected ATLANTIS II performance at close to half the operating cost. Instead over $1.5M was spent on the conversion and $2.0M on ATLANTIS II's midlife refit. Use of ATLANTIS II for an ALVIN support ship solves a pressing short term problem in a brute force way for a greatly increased operating cost and compromised ALVIN'S ultimate rough water operating ability. We are also locked into launching the only deep diving submersible now available

world wide to science from a single very expensive platform for the next 10 to 15 years with little hope for relief. This will restrict deep diving to a very select few scientists.

VELERO IV Replacement

The example in the near future involves the replacement of the aging R/V VELERO IV. The excellent background material prepared by USC projects the formation of a central California consortium with a greatly expanded area of operation, particularly the central coast of California north of Pt. Conception. There rough conditions exist during most of the year so that few research cruises have been carried out. USC has proposed to solve the replacement and sea keeping problems by converting a 220' surplus tuna clipper into a research vessel.

The experience of the OPUS program in working north of Pt. Conception is instructive in looking at the "replacement" alternatives. In the summer of 1982, OPUS used VELERO IV for the survey of persistent upwelling centers north of Pt. Conception. Not surprisingly, the strong winds and heavy seas for which the area is famous prevented the program from working in the area during the very times when upwelling signals were strongest. Only after the events were over could the OPUS scientists hope to get measurements over a significant part of the area. During the summer of 1983 OPUS asked for the R/V MELVILLE hoping to be able to conduct measurements during all phases of the upwelling events. Owing to the modest level at which the project was funded, the 170' R/V NEW HORIZON was assigned to OPUS together with VELERO IV for work in the study area. However even the 170' NEW HORIZON got "blown out" of the area repeatedly proving to be little improvement over VELERO IV. The

170' mudboat-type hull was unable to handle the rough conditions.

Clearly the scientists at USC and other UNOLS institutions participating in OPUS or other programs need a more capable platform for working in the central California coastal region covered by the proposed consortium. The first response by USC was to propose the use of a much larger ship than VELERO IV. The proposed conversion of a 220' tuna clipper is an honest attempt to gain sea keeping by brute force use of a large platform which could be acquired at a bargain price from the distressed tuna industry. Tuna boats operated in a light load condition are notoriously rough riding vessels. If ballast is added in a large enough dose to calm the rough ride to a significant degree and immerse the bulbous bow, fuel consumption will be increased by a substantial amount. It is also doubtful if even a heavily ballasted tuna boat can operate successfully in the OPUS region north of Pt. Conception under strong upwelling conditions. In addition, return to over 300 GRT ships reopens the whole "inspected vessel" pandora's box with its attending very high operating costs.

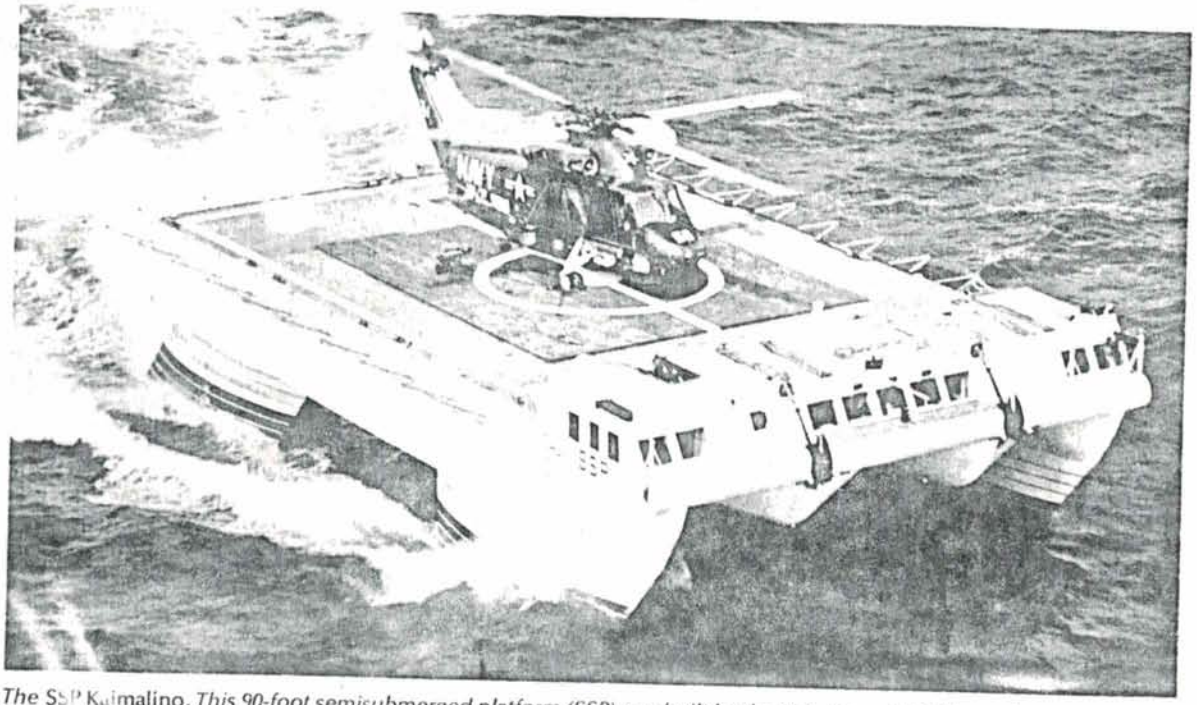
Before we jump to accept cast off ships which are uneconomical in the industries for which they were designed, we should seriously look at the alternatives. Once a ship such as this is put in service, UNOLS users will be locked into it for 20 or 30 years. Replacement of VELERO IV is perhaps the only chance to advance research vessel design before the bulk of our aging fleet must be retired in the late 1980's and 1990's. The exact year for VELERO'S replacement matters far less than

whether the platform which USC chooses can operate effectively and economically in the rough seas routinely encountered in its primary operating area.

New Platform Ideas

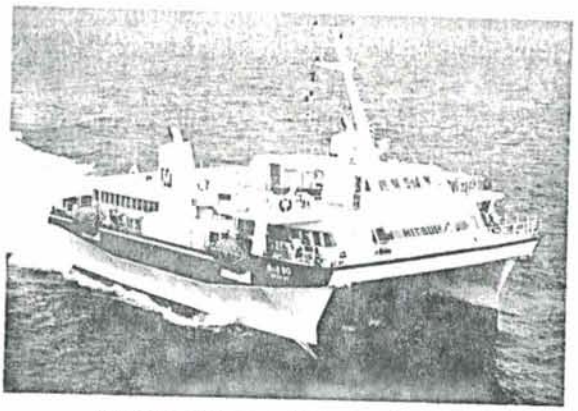
Since sea keeping can be accurately modeled on a computer by naval architects such as Prof. Chryssostomos Chryssoslomidis at MIT, the response of all prospective replacement platforms should be compared with existing ships whose performance is well known. Comparisons of stability for handling gear, economy of operation, simplicity of maintenance, safety of personnel in heavy weather, speed between stations and maneuverability while on station should be predicted. We must be sure that future ships built with NSF funding provide NSF and other scientists with oceanographic platforms which are able to do more useful work at sea per ship day invested than at present for the given sea state expected in the proposed region of operation.

We must include semisubmersible (Figure 1 and 2)(Vine 1982) and other catamaran hull forms (Figures 3, 4, and 5)(Van Leer 1982) with modest water plane areas in these trade- off studies. They are presently being used successfully in the oil industry and premium passenger and yacht charter trades to give the best combination of comfort and gear handling safety. Although several examples of catamaran hull forms with large water plane area (and thus rough ride) have been used in oceanography, this should not discourage our modeling of the successful catamaran hull forms used in the industries mentioned above.



The SSP Kaimalino. *This 90-foot semisubmerged platform (SSP) was built by the U.S. Navy. (U.S. Navy photo)*

Fig. 1



Mesa 80, *a Japanese high-speed semisubmerged catamaran (SSC) passenger ferry.*

Fig. 2

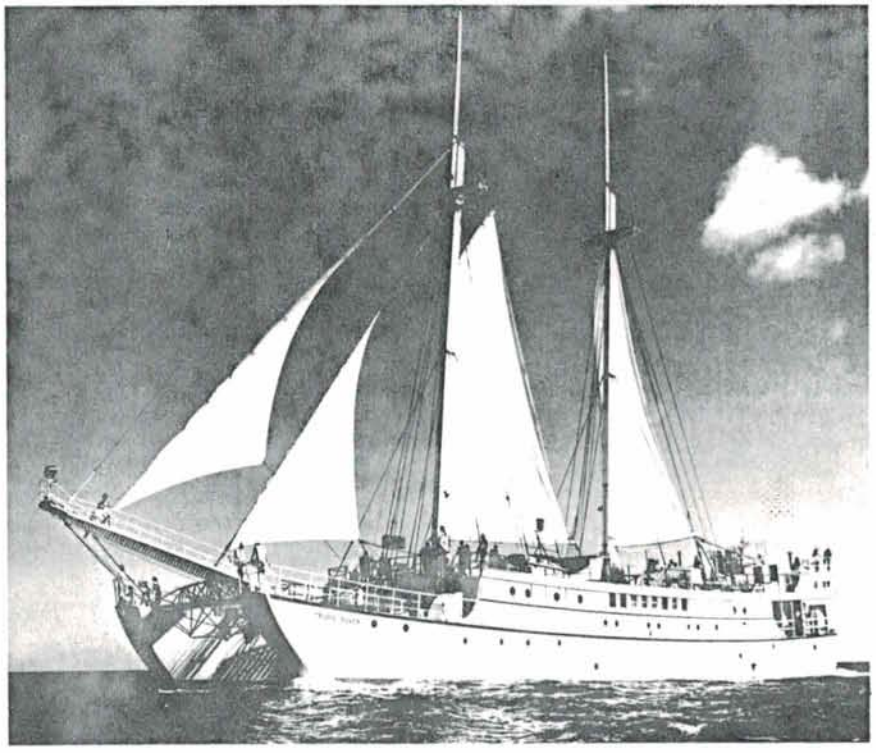


Fig. 3 Tropic Rover — *150 ft. LOA + 20 ft. bowsprit, 125 ft. LWL, 40 ft. beam, 8½ ft. draft, and 275 LT displacement loaded. (Fifty-six passengers and 18 crew, including 3 officers, 1 engineer, 2 cooks, 3 seamen, and 9 stewards.)*

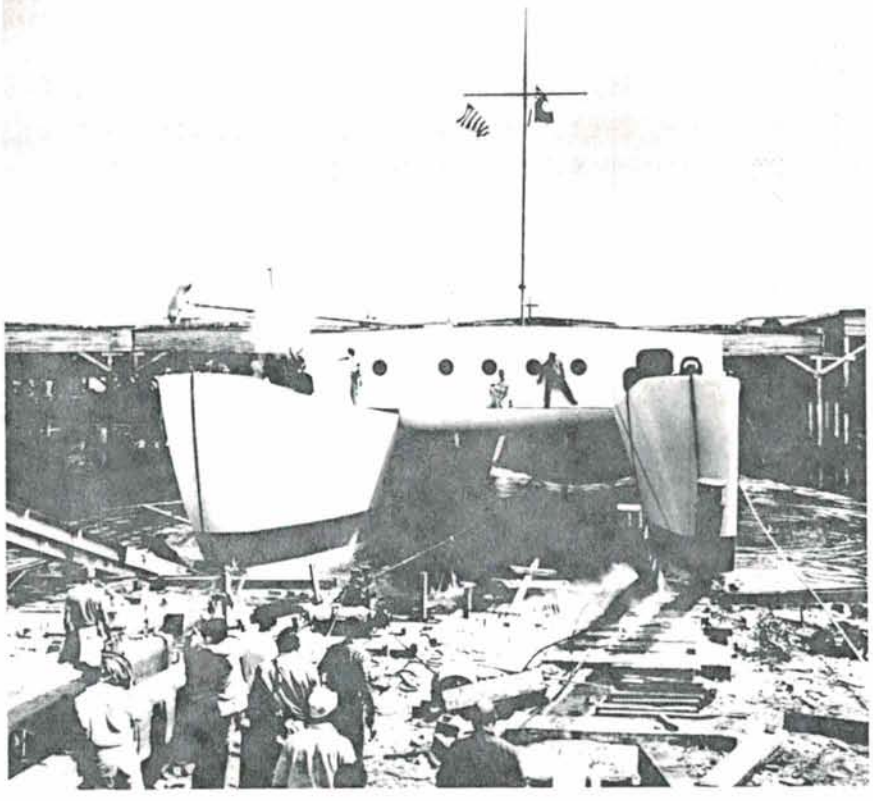


Fig. 4 Tropic Rover *on the day of her launching. Note the wide separation between the hulls, the long, buoyant bows, and the substantial clearance between the waterline and the large box-beam connecting structure.*

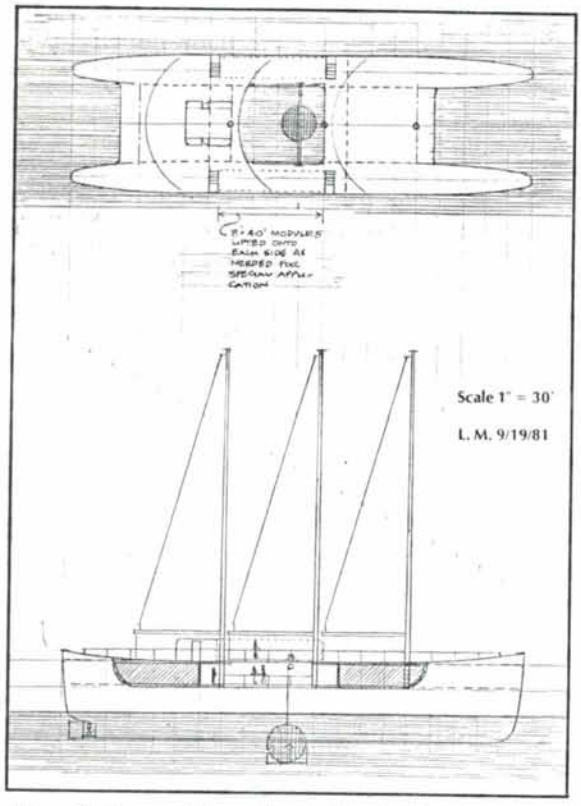


Fig.5 *Proposed layout for a sail-assisted catamaran research vessel. LOA, 170 ft.; LWL, 160 ft.; hull beam at waterline, 10 ft.; hull beam at middle level, 12 ft.; extreme beam, 54 ft.; draft full load, 9 ft.; full load displacement, 475 LT; light load displacement, 375 LT; wing clearance, 10 ft.; distance between hulls, 30 ft.; mast height, 140 ft.*

Modern Use of Commercial Sails

The use of sails for practical commerical applications are increasing so that sails should also be considered seriously for oceanography. They can be used for steadying ship motion and for auxilliary power to extend range and to increase speed particularly in heavy weather.

The Japanese have installed a unique rig on two ships, the SHIN AITUKO MARU and the AITUKO MURU. This rig uses rigid sails and is furled using a folding rather than a roller reef type system (Figure 6).

WIND SHIP in Norwell, Mass., has installed a 3000 square foot (300 square meter) roller reefed cat rig on a small Greek flag tanker called MINI LACE. Fuel savings on this low speed coastal vessel have been on the order of 25% (Figure 7). Another European sail-assisted tanker the OILMAN goes into service in the North Sea late this year.

WIND SHIP has also built a 300 square foot (30 square meter) airfoil test rig which is currently undergoing limited testing (Figure 8). It is anticipated that the Government will underwrite extensive wind tunnel testing of this rig in the near future.

In both examples the ships were operated at constant speed with engine power reduced when the course and wind speed made auxilliary sail power effective. Fuel savings were the prime motive for sail power. In both cases savings in fuel costs of 20 to 40% were realized. However, the shipping companies found to their surprise that the sail assisted ships kept a more reliable schedule than their sister ships (which were purely motor propelled) on the same routes and weather conditions. This surprising result was due to the steadying effect of the sailing rig and

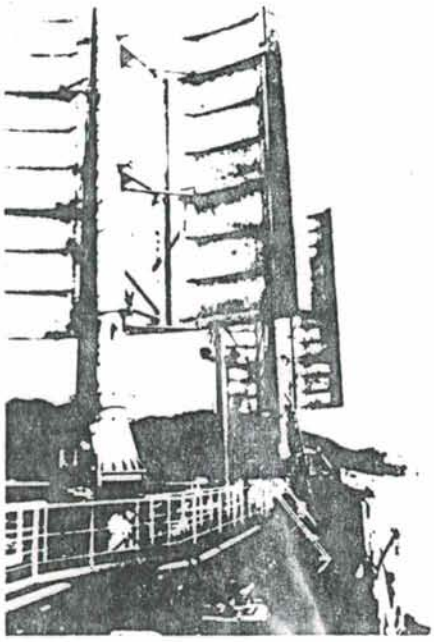


Figure 6 : SHIN AITOKU MARU'S folding sails.(7)

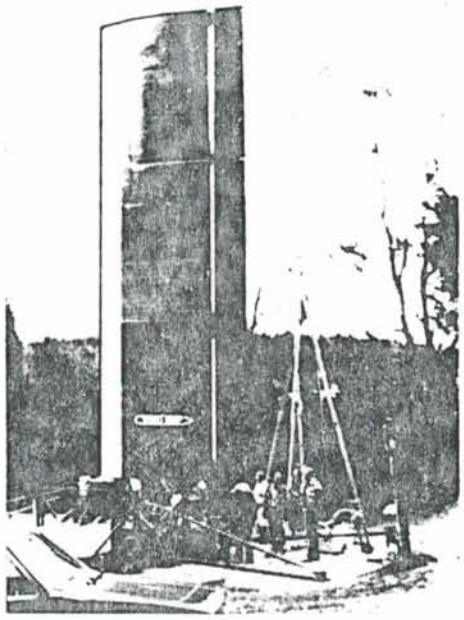


Figure 8 : Wind Ship's 300 square foot (30 square meter) airfoil model.

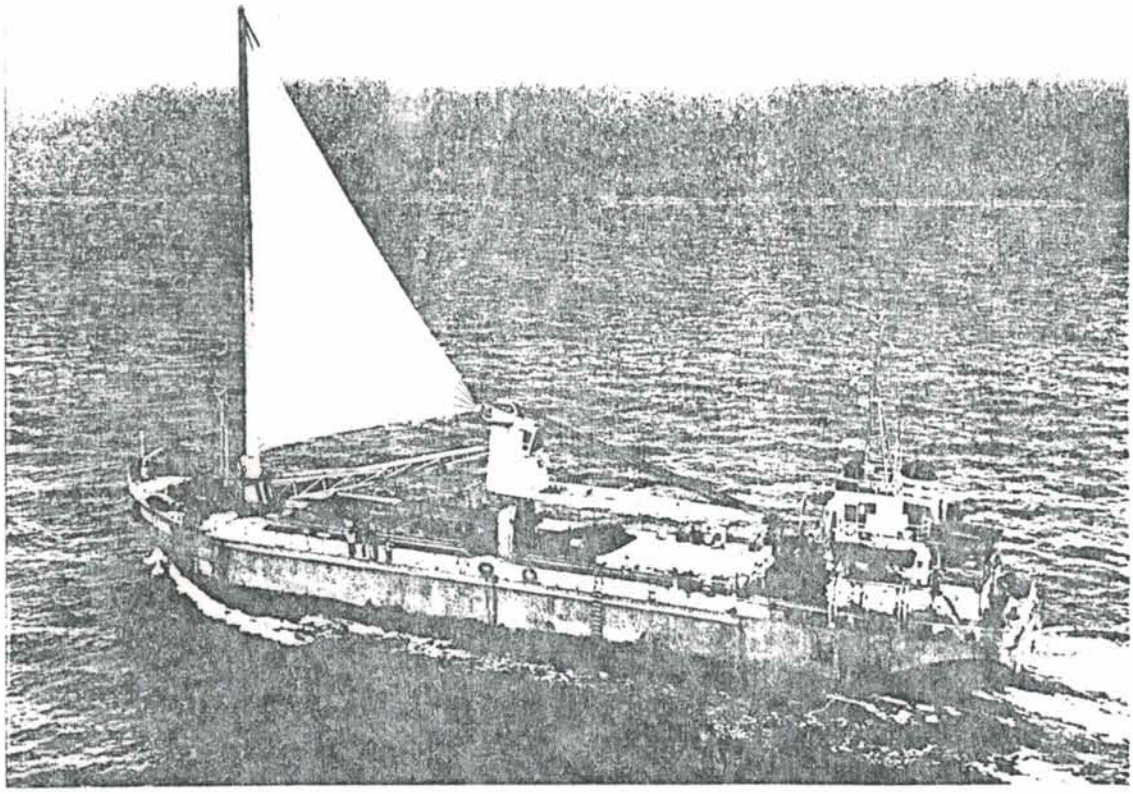


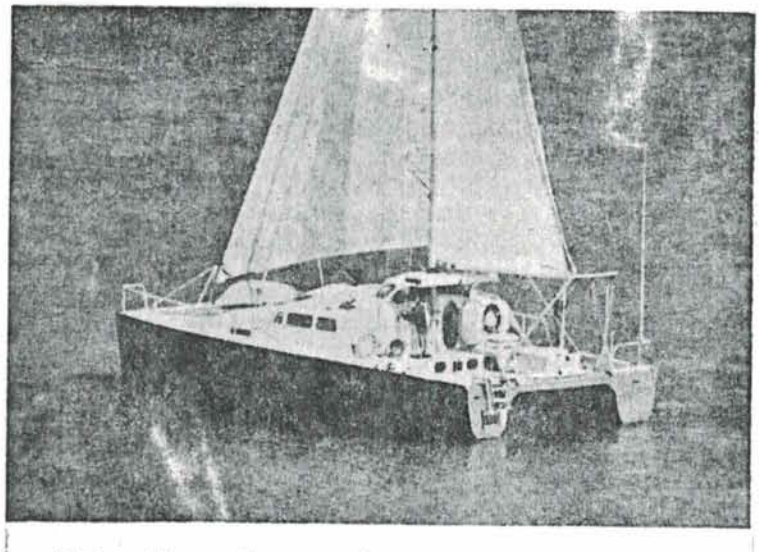
Figure 7 : MINI LACE - Small coastal tanker under Greek Flag with U.S. design roller furled cat rig.(6)

the extra power generated by the sails which permitted these ships to make much faster progress into a head sea. The use of sail has also reduced insurance premiums for a number of fishing vessels since they would seldom need towing.

Sailing Catamarans

Since our last report, the first working example of a new type of research platform has been put into operation by the Lizard Island Research Station and operated by the Australian Museum. This vessel called the R/V SUNBIRD was designed to support and operate out of a remote research station near the Great Barrier Reef and the Western Coral Sea (see below). This area of operation is devoid of significant shore support facilities and fuel is scarce and expensive. The R/V SUNBIRD is a 46' sailing catamaran research vessel which was designed by Lock Crowther who is a naval architect with 25 years of catamaran design experience for the high wind and rough sea conditions found off Australia's east coast. It is a small scale prototype of one kind of new vessel which holds considerable promise for improved platform performance compared to conventional research vessels in operation today (see Figures 3, 4 and 5).

The four areas in which such a vessel excels are, 1) sea keeping; 2) safety of gear handling; 3) fuel economy at reasonable cruising speeds and; 4) maneuverability on station in strong winds. To illustrate these points I will contrast the characteristics of R/V SUNBIRD with R/V CALANUS which has the same scientific complement, crew size and shallow tropical reef strewn area of operation. The following comparison could be made with any other small ship such as CAYUSE.



R.V. SUNBIRD

a unique vessel to support research on the Great Barrier Reef

Designed by world renowned naval architect Lock Crowther and built by SBF Engineering in Fremantle, West Australia, the R.V. Sunbird is an all aluminium motor-sailor catamaran research vessel with accommodation for 6 researchers, a small laboratory below decks and an exceptionally large, unobstructed and stable after-deck with hydraulic trawling winches and A-frame.

The R.V. Sunbird is an extension of the research facilities of the Lizard Island Research Station and places the entire northern region of the Great Barrier Reef, and western Coral Sea, within easy reach of scientists working from Lizard Island, in all but the worst of weather conditions.

The R.V. Sunbird was sailed from Perth, via Darwin, to Lizard Island in January 1983 and is now available for use by any scientist or research organization wishing to carry out studies into the biology, ecology, geology or oceanography of the Great Barrier Reef.

Usage of the R.V. Sunbird will be on a share-cost basis and researchers will be expected to provide and prepare their own meals.

For full details as to usage, costing, availability and any special requirements, enquires are welcome and should be directed to:

The Director
Lizard Island Research Station
P.M.B. 37
Cairns Queensland 4870
Australia

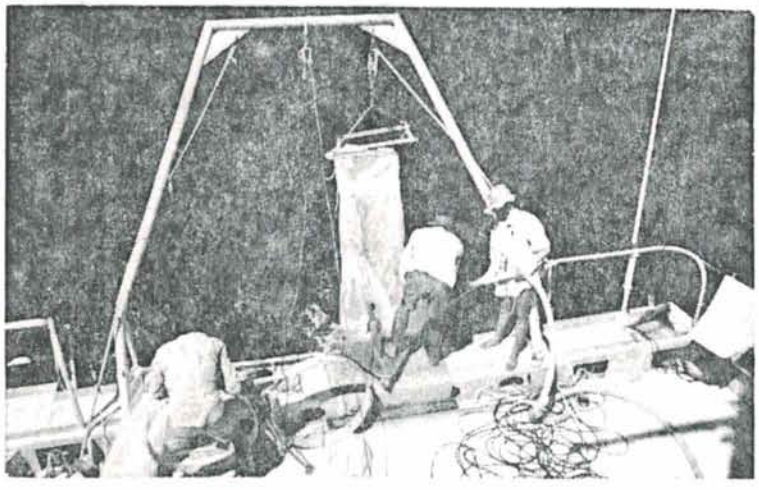
Telephone: (070) 534500
Cables: VN4LZ OPR CAIRNS

operated by the
LIZARD ISLAND RESEARCH STATION
a facility of
THE AUSTRALIAN MUSEUM

G.K. Bolton Printers, Cairns. F 6872

R.V. SUNBIRD — SPECIFICATIONS

length	14.1 meters
beam	7 meters
draft	1.3 meters
displacement	12,000-16,000 kgm ie. 4,000 kgm cargo and bulk fuel capacity
motors	two LISTER HRW3 marine diesels
horse power	64 kw (90 BHP) total
gearboxes	two HURTH mechanical with 3:1 reduction
propellors	Hundested VP3 controllable pitch (fully feathering for sailing)
bollard pull	800 kgm
steering	two station, Wagner hand-hydraulic
sails: mainsail	35 sq m genoa 74 sq m
jib	50 sq m storm jib 24 sq m
speed	8 knots under power 7-9 knots under sail but up to 12 knots in good conditions
fuel capacity	420 litres in 'day tanks' 4,000 litres in bulk
fuel consumption	1.5 litres/nautical mile average (2 l/nm with both engines) (0.5 l/nm under sail)
fresh water	800 litres
hydraulics	two independant 15 kw hydraulic pumps, one on each diesel
trawl winch	hydraulic, stainless steel drum with 1,000 m 8 mm wire rope capacity c. 1,000 kgm mid-drum pull and mid-drum retrieval rate c. 1 m/sec
A-frame	transom mounted with hydraulic rams 1,000 kgm load capacity
Laboratory	below decks in starboard hull with 1.8 m dry bench and 2.4 m wet bench, fresh & salt water and power.
Aft Deck/ work area	7 m wide by 4 m provides an exceptional area for working, sorting specimens and dive groups etc.

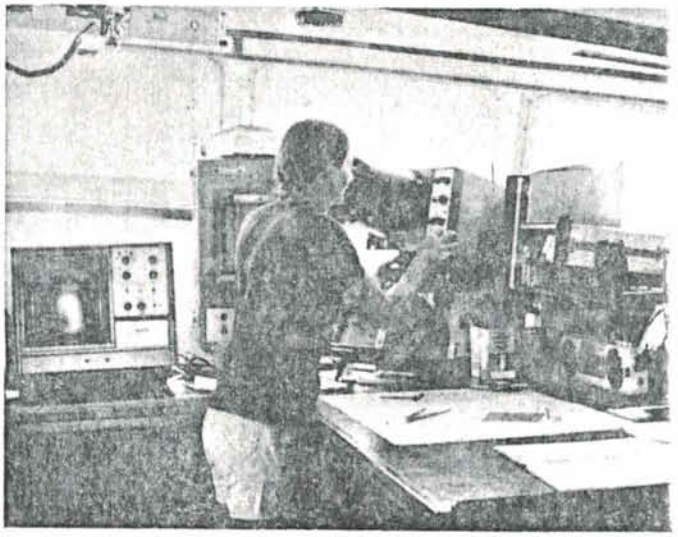


NAVIGATION EQUIPMENT:

Timco electro-hydraulic autopilot
Furuno radar, range to 48 nm
Furuno FE 400 depth sounder. 200 kHz to 100 m
Furuno FE D814 depth sounder. 50 kHz to 1,500 m
Furuno FCV colour video display unit interfaced with both depth sounders
Furuno FSN 80 satellite navigation receiver
Furuno FAX 108 weather facsimile receiver

SAILING INSTRUMENTS:

Danavigate 7000, comprising wind speed, wind directi chronometer, boat speed, distance log and flux-gate compass, under microprocessor control; with computed functions such true wind speed and direction, velocity made good etc.



ACCOMMODATION: master's cabin plus two 3-berth cabi for visiting researchers.

BRIDGE DECK: The large saloon and well appointed gall contains a 4 burner gas stove, large pantry, small 80 litre elect fridge and 150 litre deep freeze.

POWER: ships services operate on 12 V.D.C. however 240 50 Hz A.C. is available for electrical appliances in the galley a laboratory (5 KVA).

DIVING: a 6 cfm 3,000 psi SCUBA compressor and tanks a available on board for use by certified divers.

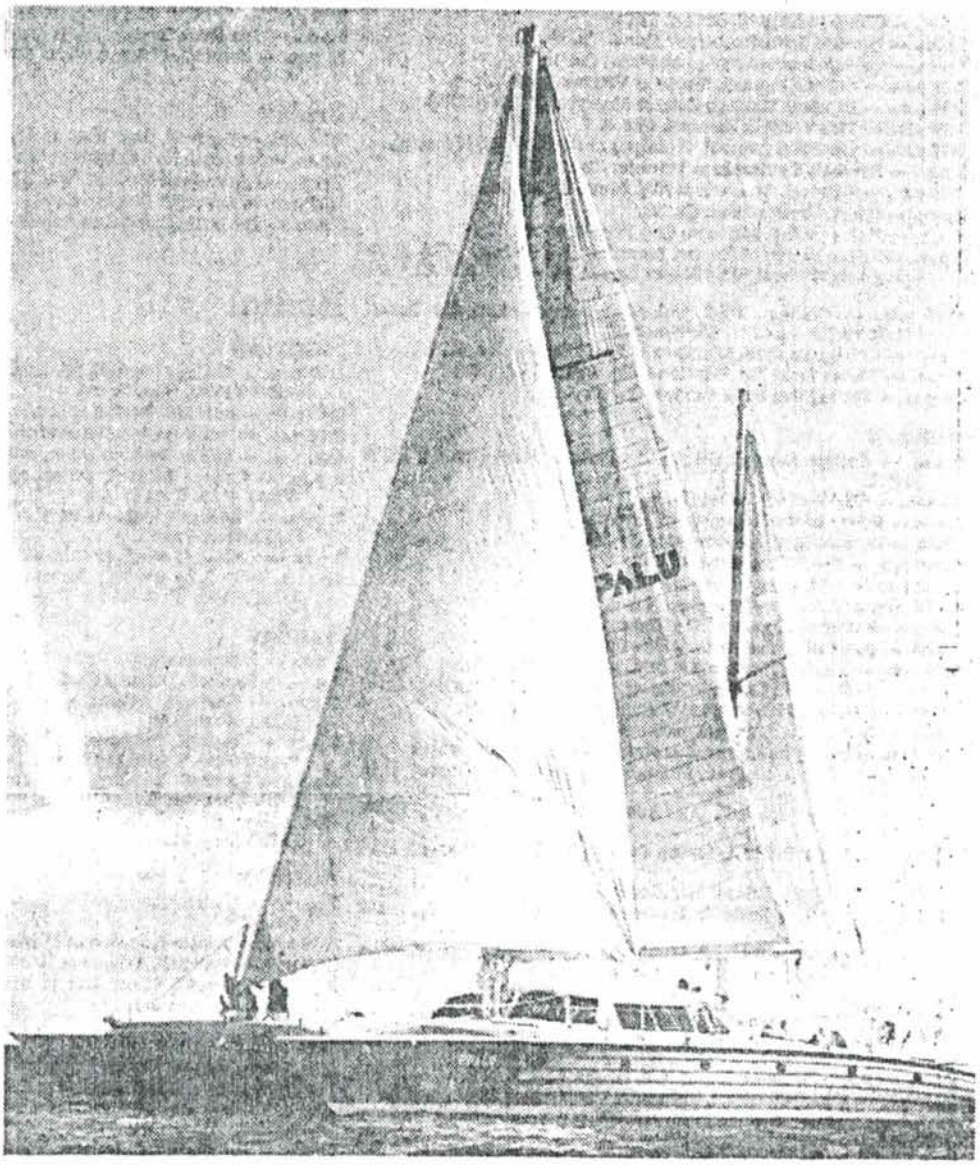
Similar contrasts in performance will pertain between larger catamaran sailing ships (see Figure 3, 4 and 5) and their single hulled counterparts. The emphasis below is on sailing catamaran ships because they have the correct hull form for extremely comfortable sea keeping while maintaining operational simplicity. However, the use of the sails in research is really an economic decision which will be a strong function of fuel price and the cost evaluation for days presently lost to foul weather and is not necessary to the concept of a catamaran research vessel.

Comparison of SUNBIRD to CALANUS - Sea Keeping

Successful sailing catamarans have long slender hulls with a minimum water plane area approaching that of a semisubmersible vessel. They provide in effect a spatial filter over one or more wave lengths in rough conditions. CALANUS by contrast is a short flat bottomed shrimp boat with a large topside load which routinely rolls to large amplitude with a well defined natural period. Sea sickness on the R/V SUNBIRD is rare while on R/V CALANUS is common. Since very few oceanographers have ever sailed on a large catamaran, I have included a quotation from a Miami Herald published on September 17, 1982 describing the feeling of sailing on the 75 foot sailing catamaran PPLAU (Figures 9 and 10).

"PPALU, is a Peter Spronk design, 75 feet long on deck (68 on the waterline) with a 27-foot beam. She is ketch rigged with twin centerboards, one in each hull, and draws 2-1/2 feet with the boards up, six feet with them down."

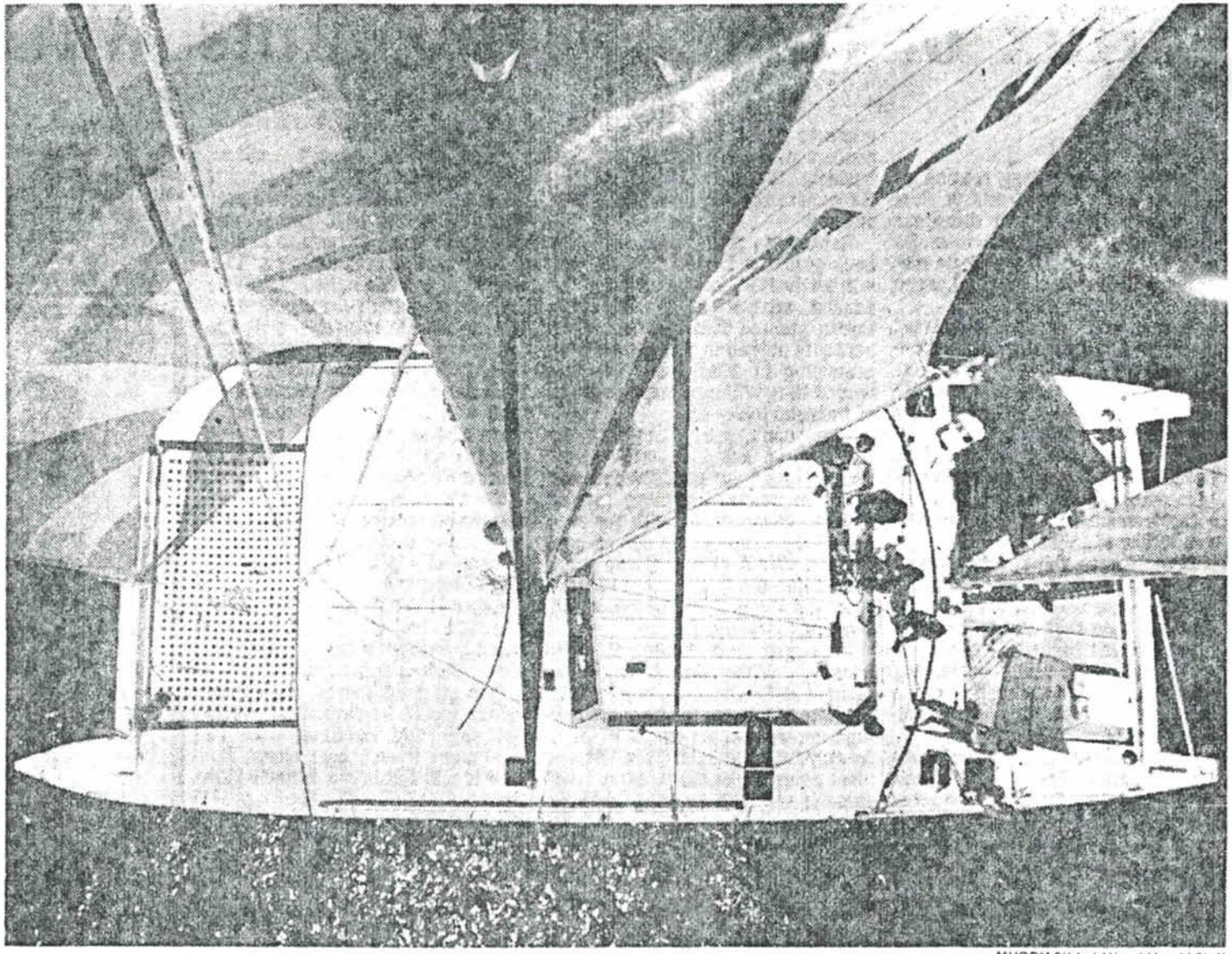
" Dough Heath, PPALU'S professional skipper, says few sailors realize that sailing this monster is an experience that monohulls, and



MURRY SILL / Miami Herald Staff

Ppalu can reach a speed of 25 knots in 20 knots of wind.

Fig. 9



MURRY SILL / Miami Herald Staff

An overhead view shows the spacious deck area on the 75-foot Ppalu.

Fig. 10

even smaller catamarans, can't prepare you for."

"This boat doesn't heel, but it had a funny little pitch and roll. And the strangest thing was the lack of sensory input. Coming from monohulls, I was used to the boat's angle of heel being one of the inputs that told me where I was on the wind. You may not realize it, but you're unconsciously depending on all sorts of information like heeling angle, bow wave and the sound of water on the hull to guide you when you sail a boat."

"On PPALU, you don't get those sensations. She doesn't heel more than a couple of inches, there is no bow wave, and you don't even have any sensation of speed until you get up above 15 knots. I had to train myself to believe what the gauges were telling me, even when my body said they were wrong."

"Charles Chiodi, publisher of Multihulls Magazine and one of the world's experts on big cats and tris, said there are perhaps two dozen catamarans 60 feet or longer in the world, and none like PPALU. There's a 60-footer in Australia that was built for racing that might be as fast, but it doesn't have PPALU'S accommodations."

"Chiodi said that even after years of trying, he still finds it impossible to explain the experience of sailing a huge cat to someone who hasn't done so. "How do you explain sex?" he said."

"Non-sailing wives like this boat." Heath says. "A lot of them won't go on monohull charters with their husbands because they hate living at a 45-degree angle. But in PPALU, the husband can be at the wheel sailing a boat faster than he has ever gone before, and the wife can stretch out with a book on the cabin setee and hardly even be aware

that they're movi ."

"Heath, a monohull sailor since childhood, has been skippering PPALU for a year. I always looked at multihulls with respect for their speed but not for their other abilities. I believed the myths that they wouldn't point well, the feeling that they weren't seaworthy. Now I wouldn't want to go back. PPALU handles big seas as well as any boat I've ever sailed."

Gear Handling

Safety of gear handling and maneuverability tie together. On a small rough riding research vessel like CALANUS you are forced to handle gear at the extremities of the platform where wave induced accelerations are maximum and boarding seas are an ever present danger. Swinging loads are difficult to control even in moderate seas with possible damage to gear and injury to people. With winds above 20 knots there is considerable difficulty keeping head up into the wind and load handling problems are greatly magnified if you get into the trough. R/V SUNBIRD can be kept head up relatively easily with twin variable pitch propellors separated by nearly 20 feet working routinely up to 30 knots. Her motion is much less violent than that of CALANUS. While SUNBIRD presently handles her gear over the stern, her design could easily be modified according to Crowther to permit gear to be lowered through her center of motion (as seen in Figure 5) where it could be restrained from all sides.

Speed and Economy

From the point of view of economy, SUNBIRD shines again. She is propelled at 8 to 9 knots by 90 hp without using her sails. To make 6.5

to 7.75 knots CALANUS must use about 440 hp. SUNBIRDS average fuel consumption is 1.5 liters per nautical mile (under engines along 2.0 l/nmile and under sail .5 l/nmile). On a beam reach with sails set she can average up to 12 knots sustained speed in comfort compared to 7 knots on CALANUS whose rolling is undamped by sails. CALANUS consumes about 40 liters per hour with both engines and a generator. Because SUNBIRD is light in weight she was also inexpensive to build. Fully equipped she cost $230K in 1982 Australian or under $200K U.S. I doubt CALANUS could have been constructed and outfitted for much less than three times this price. Dr. Barry Goldman who operates R/V SUNBIRD writes, "In closing I must say I am thrilled and more than satified with R/V SUNBIRDS performance, abilities, comfort and speed."

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

September 12, 1982

Dr. F. James Rutherford
Chief Education Officer
American Association for the
Advancement of Science
1776 Massachusetts Avenue, NW.
Washington, DC 20550

Dear Jim:

This is in reply to your letter proposing that the Foundation make available copies of The Research Fleet as a contribution to your project "Science Resources for Schools." We will be pleased to provide 3,000 copies of the publication and related 35mm slide sets for use by junior high school science teachers in Ohio, Colorado, and North Carolina.

It is our understanding that AAAS will develop and distribute a package for teachers consisting of the publication, the slides, and a series of related student activities. Joe Danek, of my staff, and Ron LaCount, Head of NSF's Oceanographic Facilities Support Section, are ready to work with you in selecting and developing material for the packages. As you know, careful consideration must be given to the selection of photographs for slide development to avoid copyright infringement, and clearance must be sought in some cases.

We are delighted that the opportunity arose to cooperate with AAAS in this promising and worthwhile project.

Sincerely,

M. Kent Wilson
Director, Office of Planning
and Resources Management

cc:
J. Danek, OPRM/PRS
R. LaCount, OCE