UNIVERSITY - NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

UNOLS
FLEET IMPROVEMENT COMMITTEE
MEETING

Summary Report

December 12-13, 1996

Shannon Court Hotel
Franciscan Room
550 Geary Street
San Francisco, CA

Meeting Summary Report

FLEET IMPROVEMENT COMMITTEE
Shannon Court Hotel
Franciscan Room
550 Geary Street
San Francisco, CA
12-13 December, 1996

Appendices

I. Meeting Agenda
II. Participant List
III. NSF Agency Report
IV. NOAA Agency Report
V. Projected Year of Retirement
VI. Fred Saalfeld letter dated
VII. Status of New Research Vessel
VIII. Senate Language Regarding SWATH
IX. SWATH Vessels (KAIYO, PIONEER, IGSS, SLICE)
X. MOANA WAVE Historical Statistics
XI. UH Revised SMRs
XII. MOANA WAVE vs UH Mid-Pacific SWATH
XIII. FIC Mid-Pacific SMRs
XIV. Estimated Useful Life of UNOLS Vessels

Introduction and Welcome - The Fleet Improvement Committee (FIC) held a meeting on 12-13 December, 1996 at the Shannon Court Hotel, Franciscan Room in San Francisco, CA. Chris Mooers called the Fleet Improvement Committee Meeting to order at 8:30 a.m. and introduced new committee members, Tom Crowley from Texas A&M and Bill Smethie from Lamont Doherty Earth Observatory. Scientists from West Coast universities and laboratories with seagoing experience in the Pacific were invited to the meeting to help FIC develop Science Mission Requirements (SMRs) for the Central Pacific region. Chris welcomed the invited guests and provided them with a background of the FIC's responsibilities for developing ship improvements and replacements. He explained that this meeting would address the science needs of the community. The SMRs developed at this meeting will be forwarded to the UNOLS Council for review at their winter meeting in mid-January.

These minutes reflect the order in which the meeting agenda items were addressed. The agenda and meeting participant list is included as ***Appendix I*** and ***Appendix II***, respectfully.

UNOLS Report - Ken Johnson, UNOLS Chair, reported on UNOLS activities. This year two vessels were added to the fleet, URRACA which is operated by Smithsonian Tropical Research Institute and ROGER REVELLE which is operated by Scripps Oceanographic Institution. COLUMBUS ISELIN was sold to Mexico in November. ATLANTIS II was retired from the fleet in July. ATLANTIS is scheduled to be delivered on 25 February 1997. When ATLANTIS comes on-line, there will be 28 ships in the UNOLS fleet.

UNOLS has been active in building new partnerships this year. The report. *Shortfall Projections in the UNOLS Fleet,* estimated a $10M shortfall by the year 2000. As a result, efforts were made to build support from agencies other than the traditional funding agencies of the National Science Foundation and the Office of Naval Research. Currently, a Memorandum of Agreement (MOA) is being developed between UNOLS and NOAA. The MOA would bring NOAA's new AGOR (RON BROWN) into UNOLS ship scheduling. NOAA would also provide approximately $5M for the ship operations support. Additionally, NOAA would provide approximately $2.6 M dollars for use of UNOLS vessels each year. Ken has been the co-chair with Alan Thomas, acting director of OAR, on developing the MOA. They are addressing NOAA's oceanographic needs. NOAA's fisheries needs are a bit more complicated. At the present time, there are no UNOLS vessels outfitted to support NOAA's fishery needs for deep trawling work. Also, fisheries stock assessment vessels require very quiet platforms. Considerations would need to be made as to whether a UNOLS vessel should be modified to accommodate NOAA's fishery needs.

Another partnership which has grown over the year has been between UNOLS, the National Science Foundation, and the U.S. Coast Guard. A UNOLS Standing committee, the Arctic Icebreaker Coordinating Committee (AICC) was formed to assist the Coast Guard in scheduling science parties for Arctic research. Additionally, the AICC is actively communicating with the Coast Guard on science outfitting of their icebreaker currently under construction, MICHAEL HEALY. HEALY will be delivered in 1998 and will begin science operations in 1999.

The third partnership is with the Naval Oceanographic Office (NAVO) and UNOLS. NAVO representatives have attended UNOLS Council and Fleet Improvement Committee meetings in the past year. As a result of the National Ocean Partnership Act (NOPA), $7.5M was earmarked for NAVO's use of UNOLS vessels. Ten NAVO cruises have been scheduled on the UNOLS vessels. Admiral Paul Gaffney, CNR and CNMOC, greatly supports sea going science.

Ken continued by reporting that the ship scheduling process received many criticisms over the past year. The scheduling process went through many iterations and a number of factors contributed to its complications. Many requests had time constraints such as mooring recoveries. ROV shipping schedules were a factor. Two large foreign programs required scheduling. Operations in general are becoming more complex. Programs were spread out across the globe. New UNOLS partnerships introduced first-time users to the UNOLS fleet. As a result, an ad-hoc working group has been formed to review the scheduling process. Rick Jahnke has agreed to chair the group which includes two oceanographers, two schedulers, and three program managers. In addition to Rick, group members include Bob Detrick, Robert Hinton, Rose Dufour, Sujata Millick, Dolly Dieter, and Dave Epp. It has been noted that the community needs educating on the scheduling process.

Ken reported that the Navy's program which provides the science community with an opportunity for research under the ice on a nuclear submarine is completing its second year. The experience has worked out well. Installation of a multibeam system is planned for the next sub cruise. A five-year memorandum of agreement was developed to support these operations. ONR is the major coordinator for the program.

Ken reported that plans to continue the ship inspection program are underway. There have been no inspections in a year. The UNOLS Office is in the process of preparing a request for proposals. The contract would be let from UNOLS, but administered, as in the past, by NSF.

Agency Reports - Agency representatives provided Ken Johnson with summary reports prior to the meeting. Ken provided an overview of these reports.

National Science Foundation (NSF) - Don Heinrichs provided Ken with a set of viewgraphs, see ***Appendix III***. NSF predicts that if fleet support returns to the traditional sponsors only, a reduction of the fleet size would probably be necessary. Support from traditional sponsors has declined in recent years. New ships have been added, increasing costs by approximately $4.8M in 1997. Outside support in 1997 from NAVO and the UK may not be available in future years. All of these factors make the large ships vulnerable. Ken has asked the FIC to look at the various scenarios facing the UNOLS Fleet and to make recommendations for preserving a capable fleet.

Ken reviewed the ship operations support trends from 1993 to 1997. NSF continues to be the major contributor. The biggest increase in ship support in 1997 came from "other" (non-traditional) support. NAVO was the major sponsor in the "other" category.

The NSF Ship Operations budget is approximately level for 1997. Although Ocean Sciences Research overall had an increase of 4%, funding was needed to support a new initiative, Major Research Instrumentation. Also, NSF is seeing increased demand for computer work and less for field work.

Ken summarized NSF's report by making three observations:

1) Big ships are vulnerable,
2) Funding levels are level at best,
3) Partnership with NAVO is not set in concrete and is vulnerable.

As a result of these observations, Ken recommended that the meeting participants consider economics in the discussion on Science Mission Requirements.

National Oceanographic and Atmospheric Administration (NOAA) - Steve Piotrowizc provided Ken with an e-mail message prior to the FIC meeting. The e-mail reported on NOAA's ship time projections for 1998 and 1999. Depending on budgets, NOAA should be able to maintain the one-half of a ship year of Class I/II time on UNOLS vessels at a minimum. The message is included as ***Appendix IV***.

National Ocean Partnership Act - John Orcutt provided an update on the National Ocean Partnership Act (NOPA). The hearings leading up to the Act included heads of federal agencies. The Act was authorized and funds were appropriated. Unfortunately, because of the short lead time, no new funds were identified to support the Act. Congress decided that the funds to support the Act should come out of the Navy's operations budget.

Charge to FIC: Development of Science Mission Requirements (SMRs) for the Central Pacific - Ken Johnson presented a viewgraph of the projected years of retirement for the UNOLS vessels, see ***Appendix V***. By the year 2005, six ships in Classes I through IV are expected to retire. With the exception of MOANA WAVE and GYRE, all of the ships are small. In light of the Navy's plans to replace MOANA WAVE, Fred Saalfeld, Technical Director for ONR, has requested UNOLS and the University of Hawaii to develop SMRs for the Central Pacific, see ***Appendix VI***. The vessel under consideration should be in the Class II/III category. Normally, UNOLS/FIC would develop an SMR and then circulate it to the community for comment. The Navy, however, has requested that UNOLS and Hawaii provide a response by 27 January. Due to the short time frame, it was decided to convene a group of scientists with seagoing experience in the Pacific to meet with FIC to develop a set of SMRs. The SMRs developed from the FIC meeting will be passed to the Council for their review at its January meeting.

Ken reviewed the tasks before us:

- Develop a set of SMRs that NAVSEA will use to develop a circular of requirements for a request for bids.
- Economic Concerns - Costs for building and operation need to be considered in the development of the SMRs.

Office of Naval Research: Status of New Research Vessel - Sujata Millick reviewed the current status of the Navy's new research vessel, see ***Appendix VII***. Language was included in the Defense Authorization and Appropriation Bills regarding replacement of MOANA WAVE. It directs the Navy to look at SWATH and SLICE design options. ONR plans to forward ship specifications to NAVSEA by February 7, 1997. ONR and the Oceanographer of the Navy have issued a tasking letter to NAVSEA allowing them to conduct a SWATH market survey, study ship acquisition options, and begin preparing a program of actions and milestones. Under the design considerations, NAVSEA cannot develop a design that substantially exceeds the $45M appropriation. NAVSEA will evaluate the SWATH, SLICE, and monohull designs in their considerations.

Sujata reviewed the construction schedule. The Navy plans call for release of an RFP by June 1997, selection of a ship builder in September 1997, ship delivery in September 1999, and operations by the year 2000. Sujata pointed out that the schedule is very optimistic and that slippage should be anticipated.

Sujata provided the status of the Navy's SLICE construction. The vessel has been constructed and sea trials are expected to be conducted in mid February. A series of tests are planned for the vessel throughout 1997.

University of Hawaii Report - Barry Raleigh began the University of Hawaii report by reviewing the Senate's language regarding construction of a replacement for MOANA WAVE, see ***Appendix VIII***. He pointed out that the language recommends $45,000,000 to construct a SWATH. Barry Raleigh and Brian Taylor reviewed various SWATH vessel designs and their respective costs, see ***Appendix IX***. JAMSTEC's research vessel, KAIYO, cost approximately $36M to build. It has a 3,500 ton displacement. PIONEER, a diving support vessel built by Aker Gulf Marine and Global Industries in Louisiana was delivered in November, 1996. It has a 2800 ton displacement and two struts per side. The vessel has a dual draft capability. In transit, the hulls are on the surface for less resistance and the draft is 12 feet. On station, the hulls are submerged for greater stability and the draft is 21.5 feet. The dual draft feature offers the vessel a lot of flexibility. The cost of PIONEER without mission outfitting was less than $20M. Another SWATH under construction is the IGSS. It is being built by International Hospitality, Inc. in Toronto and has a planned delivery date of December 1997. The vessel will also have a dual draft capability. The cost without mission outfitting is estimated at less than $20M. Barry pointed out that the SWATH technology is maturing and construction costs are coming down. Lastly, the SLICE design was reviewed. The engines on the vessel are forward. SLICE requires lower installed power at high speeds as compared to a SWATH.

Brian Taylor continued by reviewing MOANA WAVE's historical cruise tracks, see ***Appendix X***. He also provided a table which gave statistics from the National Geophysical Data Center on the quantity of shipboard data collected from various UNOLS Institutions. MOANA Wave's contributions have been significant.

Lastly, Brian reported on Hawaii's development of SMRs for a Central Pacific vessel. In October, Hawaii circulated preliminary SMRs to the community for review and comment. The general concern of the community was that another Class I vessel was not needed. Hawaii listened to the community and downscaled their SMRs, see ***Appendix XI***. Brian presented a table which compared MOANA WAVE's design features to their mid-Pacific SWATH design, see ***Appendix XII***. The SWATH vessel characteristics call for a displacement of approximately 3,000 tons, transit speed of 15 knots, and a range of 10,000 nm. The SWATH design is very attractive to Hawaii since stability and speed of transit are high priorities.

Central Pacific SMR Workshop - The remainder of the first day and the morning of the second day of the FIC meeting was devoted to the development of SMRs for the Central

Pacific. Ken Johnson lead the workshop using existing UNOLS SMRs for Class II/III monohulls and SWATHs as a guideline. A summary of the minimum and desirable requirements developed is detailed in a report included in ***Appendix XIII***. The report includes issues discussed during the development of the SMRs. The desirable requirements were prioritized by the meeting participants. The SMRs developed will be forwarded to the UNOLS Council for review at their winter meeting on 12-13 January.

Estimated Useful Life of UNOLS Vessels - FIC reviewed the of estimated useful life of UNOLS vessels, see ***Appendix XIV***. A number of observations were made. Through the year 2010, only one large ship will retire, MOANA WAVE. Many of the ships that will retire before the year 2015 operate in the Atlantic. Most of the intermediate class vessels will approach retirement during roughly the same time frame (prior to 2015). Now is the time to start planning for their replacement.

Concept Design of Intermediate Vessel - The estimated useful life chart, ***Appendix XIV***, shows that many of the intermediate vessels will be retired by the year 2015. Now is the time to begin preparing for their replacement. Ken Johnson recommended the development of a conceptual design for an intermediate research vessel. The design should also address the needs of coastal research. It will be proposed to the Council that the UNOLS Office submit a proposal for development of conceptual designs.

White Paper on Crew Requirements - Ken Johnson recommended that a white paper be developed to address USCG requirements for crewing and how these requirements will impact the design of future UNOLS vessels. This item will be included on the Council Meeting agenda.

Interim Fleet Improvement Plan (IFIP) - The IFIP was reviewed in detail by FIC and modifications were recommended. Chris Mooers will modify the document and submit it to the UNOLS Council.

1998 Fleet Improvement Plan (FIP98) - Prior to the FIC meeting, FIC members had been assigned sections of the 1995 Fleet Improvement Plan (FIP95) to review and update. FIC members provided copies of their updates at the meeting. Some sections, it was determined, did not require updating. It was decided that rather than rewrite the entire FIP95, an addendum to the report would be prepared to update as necessary. An outline of the addendum will be prepared and circulated via e-mail by Chris Mooers.

FIC Summer Meeting - It was decided to hold the summer FIC meeting at the University of Rhode Island/GSO. A date in the May to August time-frame would be scheduled.

The meeting was adjourned at 1800.

APPENDIX I

FLEET IMPROVEMENT COMMITTEE MEETING
Shannon Court Hotel, Franciscan Room
550 Geary Street
San Francisco, CA
December 12-13, 1996

12 December/THURSDAY

Morning Session:

- Ken Johnson, UNOLS Chair
  - ◊ UNOLS Report
  - ◊ Summary of agency (written) reports
  - ◊ Charge to FIC: Development of Science Mission Requirements (SMR) for the Mid-Pacific
- Office of Naval Research
  - ◊ Status of SWATH appropriation project
- SMR for mid-Pacific Research Vessel
  - ◊ Application of existing UNOLS SMRs for Class II/III R/V (K. Johnson)
  - ◊ Review University of Hawaii's draft SMR (UH Representative)
  - ◊ SMR Workshop

Afternoon Session:

- SMR for mid-Pacific Research Vessel
  - ◊ SMR Workshop - continued

13 December/FRIDAY

Morning Session:

- SMR for mid-Pacific Research Vessel: Wrap-Up
- Chris Mooers, FIC Chair
  - ◊ Review draft Interim Fleet Improvement Plan (IFIP96 - short)
- 1998 Fleet Improvement Plan (FIP98): Future West Coast fleet needs
  - ◊ For the year 2010
  - ◊ For the year 2020

Afternoon Session:

- FIP98
  - ◊ IFIP (long) as draft for FIP98
  - ◊ Presentation of homework reports
  - ◊ UNOLS Fleet as Real-Time Data Platforms (E. Firing)
  - ◊ Future plans and schedule

APPENDIX II

FIC Participants **Dec. 12-13, 1996**

NAME	INSTITUTION/ORGANIZATION	PHONE/FAX/E-MAIL
Larry Atkinson	ODU	757-683-4926/atkinson@ccpo.odu.edu
John Bash	UNOLS	401-874-6825/401-874-6486/unols@gso.uri.edu
Mark Brzezinski	UCSB	805-893-8605/brzezins@lifesci.ucsb.edu
Joe Coburn	WHOI	508-289-2624/508-540-8675/jcoburn@whoi.edu
Curt Collins	Naval Postgraduate School	408-656-3271/408-656-3686/collins@oc.nps.navy.mil
Tom Crowley	TAMU	409-845/0795/tcrowley@ocean.tamu.edu
Annette DeSilva	UNOLS	401-874-6825/401/874-6486/unols@gso.uri.edu
Eric Firing	U of Hawaii	808-956-7894/808-956-4104/efiring@soest.hawaii.edu
Doug Hammond	U of So CA	213-740-5837/213-740-8801/dhammond@usc.edu
Don Heinrichs	NSF	703-306-1576/703-306-0390
Bruce Howe	APL/U of WA	206-543-9141/206-543-6785/howe@apl.washington.odu
Ken Johnson	MLML	408-755-8657/408-753-2826/johnson@mlml.calstate.edu
Bob Knox	SIO	619-534-4729/619-535-1817/rknox@ucsd.edu
Russ McDuff	U of WA	206-543-3058/206-543-6073/ mcduff@ocean.washington.edu
Chris Measures	U of HI	808-956-5924/808-956-7112/chrism@soest.hawaii.edu
Hugh Milburn	NOAA/PMEL	206-526-6169/206-526-6744/milburn@pmel.noaa.gov
Sujata Millick	ONR	703-696-4530/703-696-2007/millics@onr.navy.mil
Chris Mooers	U of Miami	305-361-4825/cmooers@rsmas.miami.edu
John Orcutt	SIO	619-534-2887/619-534-2902/jorcutt@iqpp.ucsd.edu
Barry Raleigh	U of Hawaii	808-956-6182/808-956-9152/raleigh@mano.soest.hawaii.edu
Bill Smethie	LDEO	914-365-8566/914-365-8155/bsmeth@ldeo@columbia.edu
Suzanne Strom	Western Washington U	360-293-2188/360-293-1083/stroms@henson.cc.wwu.edu
Brian Taylor	U of Hawaii	808-956-6649/808-956-2538/taylor@soest.hawaii.edu
Robert Wall	U of Maine	207-581-1435/207-581-1426/robert_wall@voyager.umeres.maine.edu
Bess Ward	UCSC	408-459-3171/408-459-4882/bbw@cats.ucsc.edu
Tom Weingartner	U of Alaska	907-474-7993/907-474-7204/weingart@ims.alaska.edu

APPENDIX III

NSF Ocean Sciences Division

	FY 1994	FY 1995	FY 1996	FY 1997
Ocean Sciences Research	100.0M	102.6M	104.9M	109.3M
Oceanographic Centers & Facilities	50.3M	50.4M	48.9M	52.3M
Ocean Drilling Program	38.7M	39.8M	39.9M	40.2M
	$189.0M	$192.8M	$193.7M	$201.8M
OCEANOGRAPHIC FACILITIES DETAIL				
Operations				
Ship Operations*	32.2M	35.1M	31.1M	31.4M
ALVIN, Aircraft, etc.	2.2M	2.1M	2.4M	2.7M
Marine Techs.	4.2M	4.4M	3.8M	4.0M
	$38.6M	$41.6M	$37.3M	$38.1M
Infrasturcture				
Major Research Inst.	--	--	--	4.5M
Science Instruments	2.5M	1.9M	2.3M	2.1M
Shipboard Equipment	2.1M	1.1M	1.7M	1.5M
Ships, Upgrades	2.1M	0.2M	1.5M	1.0M
UNOLS, misc.	0.5M	0.5M	0.3M	0.5M
	$7.2M	$3.7M	$5.8M	$9.6M
Centers & Reserves				
AMS	1.2M	1.0M	1.4M	1.2M
IAI	1.3M	2.0M	1.9M	1.6M
Cross Directorate/Reserves	2.0M	2.1M	2.5M	1.8M
	$4.5M	$5.1M	$5.8M	$4.6M

*Plus $1.6M from ODP (1994), $1.8M (1995), $1.4M (1996), $2.0M (1997)

Nov 96

Ocean Sciences Division Budget (in $M)

	FY 1995	FY 1996	FY 1997*	% Change 96 to 97
	102.60	104.92	109.32	+4.2%
	50.45	48.91	52.26	+6.8%
	39.76	39.85	40.25	+1.0%
	$192.81	$193.68	$201.83†	+4.2%

† Includes $4.47M which is committed to the centrally managed Academic Research Infrastructure program. Excluding these funds the OCE total is $197.38M for 1997, a 1.9% increase over 1996.

*** unofficial estimate.**

1997 UNOLS Ship Classification (Heinrichs Model)

Large Ships
- THOMPSON
- KNORR
- MELVILLE
- EWING
- ATLANTIS
- REVELLE

Local
- PELICAN
- LONGHORN
- BLUE FIN
- SEA DIVER
- BARNES
- CALANUS
- LAURENTIAN
- URRACA

Intermediate Ships
- MOANA WAVE
- OCEANUS
- WECOMA
- ENDEAVOR
- GYRE
- NEW HORIZON
- S. JOHNSON
- E. LINK

Regional
- ALPHA HELIX
- POINT SUR
- CAPE HATTERAS
- SPROUL
- CAPE HENLOPEN
- WEATHER BIRD

UNOLS Operations Support Trends 1993-1997 ($K)

	ACTUAL 1993	ACTUAL 1994	ACTUAL 1995	PRELIM 1996	REQUEST* 1997
NSF	30,558	33,336	36,022	30,785	32,815
ONR/NRL	6,484	3,588	6,455	4,530	4,358
NOAA	1,981	1,956	2,209	1,143	3,509
OTHER	2,982	2,479	2,280	2,796	7,634
INST/STATE	3,074	2,591	1,563	3,112	2,536
	$45,079	$43,950	$48,529	$42,366	$50,852
	ENDEAVOR midlife	OCEANUS, WECOMA, and S. JOHNSON midlife	ISELIN retired	CAPE HATTERAS layup PT. SUR overhaul N. HORIZON midlife, ATLANTIS II retired	REVELLE and URRACA added ATLANTIS replaces ATLANTIS II

* 1997 Request In Ship Operations Proposals. Some Projects Still Pending. Expect Some Reduction In Actual Support.

Nov 96

"Other Support" -- UNOLS Operations Trends 1993-1997

	ACTUAL 1993	ACTUAL 1994	ACTUAL 1995	PRELIM 1996	REQUEST 1997
NAVOCEANO	---	---	---	---	4,655
INTERNATIONAL	815	191	687	494	1,849
INDUSTRY	467	119	614	652	551
DOE	401	641	36	950	---
NAVY POSTGRAD	322	338	202	86	294
"NAVY LABS"	521	281	8	136	---
ARPA	44	442	284	175	---
MMS	325	145	117	124	---
USGS	15	88	144	7	103
ALL OTHERS	72	234	188	172	183
	$2,982	$2,479	$2,280	$2,796	$7,635

Notes:
"NAVY LABS" -- NRAD, NOSC, ARL, NUSC, "NAVY", JHU/APL
ALL OTHER -- MBARI, JOI, EPA, NASA, ARMY, MUSEUMS

Nov 96

"Other Support" - UNOLS Ship Classes 1994-1997

SHIPS	ACTUAL 1994	ACTUAL 1995	PRELIM 1996	REQUEST 1997
Large	338	403	60	4,670
Intermediate	814	736	1,465	614
Regional	732	896	1,039	1,858
Local	595	245	232	493
	$2,479	$2,280	$2,796	$7,635

1997 DETAIL

	NAVOCEANO	U.K.	OTHER
Large	3,084	1,381	205
Intermediate	614	---	---
Regional	778	---	1,080
Local	179	---	314
	$4,655	$1,381	1,599

UNOLS Operations Support Trends Summary

Ships

- One Or More Intermediate/Regional Ship with Reduced Operations 1993-1996
- One Additional Large Ship 1997
- One Additional Local Ship 1997

Funds

- Traditional Sponsors Have Modest Decline In Total Support 1993-1996
- Additional Ships Increase Overall Fleet Cost By Approx. $4.8m In 1997
- New (One Time?) Funds From Navoceano and United Kingdom Of $6.0M In 1997
- NOAA Increase Of Approx. $2.4m In 1997

Future

- ??????
- Probable Reduction Of Academic Fleet If Support Returns To Traditional Sponsors Only
- Large Ships Vulnerable

"Oceanography in the Next Decade" Building New Partnerships

- The Board recommends that federal agencies with marine-related missions find mechanisms to guarantee the continued vitality of the underlying basic science on which they depend.
- NSF, and secondarily ONR, should retain primary responsibility for the vitality of the basic science....
- It is particularly important to encourage involvement of mission agencies in sampling and monitoring programs.
- At present, a disproportionate share of funds is provided by NSF.
- ...resources for individual investigator grants could be reduced if other agencies do not assume responsibility for some of the funding.

(Ocean Studies Board, NAS, 1992)

APPENDIX IV

From SPiotrowicz@rdc.noaa.gov Mon Dec 9 08:53:53 1996
Date: Sun, 08 Dec 1996 12:53:42 -0500 (EST)
From: Steve Piotrowicz <SPiotrowicz@rdc.noaa.gov>
Subject: re: FIC Agency REports
To: unols@gsosun1.gso.uri.edu
Cc: "M@H@C[johnson@mlml.calstate.edu]"@rdc.noaa.gov,
"Alan Thomas@AA@R" <ARThomas@rdc.noaa.gov>

Jack and Ken,

It looks like I will not be able to attend the FIC meeting this coming week. I will not be getting back into the office until late on Wednesday and then I have a meeting on Thursday so I thought I had best bring you up to date on how we see our fleet issues evolving.

We have our 1998 and 1999 shiptime requests and we certainly have the requirements to maintain at least one-half of a shipyear being outsourced on UNOLS vessels. Even without transits we have over 2 1/2 shipyears of requests for large and medium vessels. We also have some increased requirements for smaller vessels, primarily Florida Bay. There are still program funding issues that will not be resolved for quite some time.

Depending on budgets, we should be able to maintain the one-half of a shipyear of ClassI/II time we intend to obtain from UNOLS (at a minimum). Right now the present budget balancing guidelines indicate 5% across-the-board cuts in the Federal budget except for certain exempted areas like Presidential Priorities (of which Research is one). Whether the platform support that, in turn, goes to support research will be included in those "protected" areas will be publically known when the budget goes to Congress.

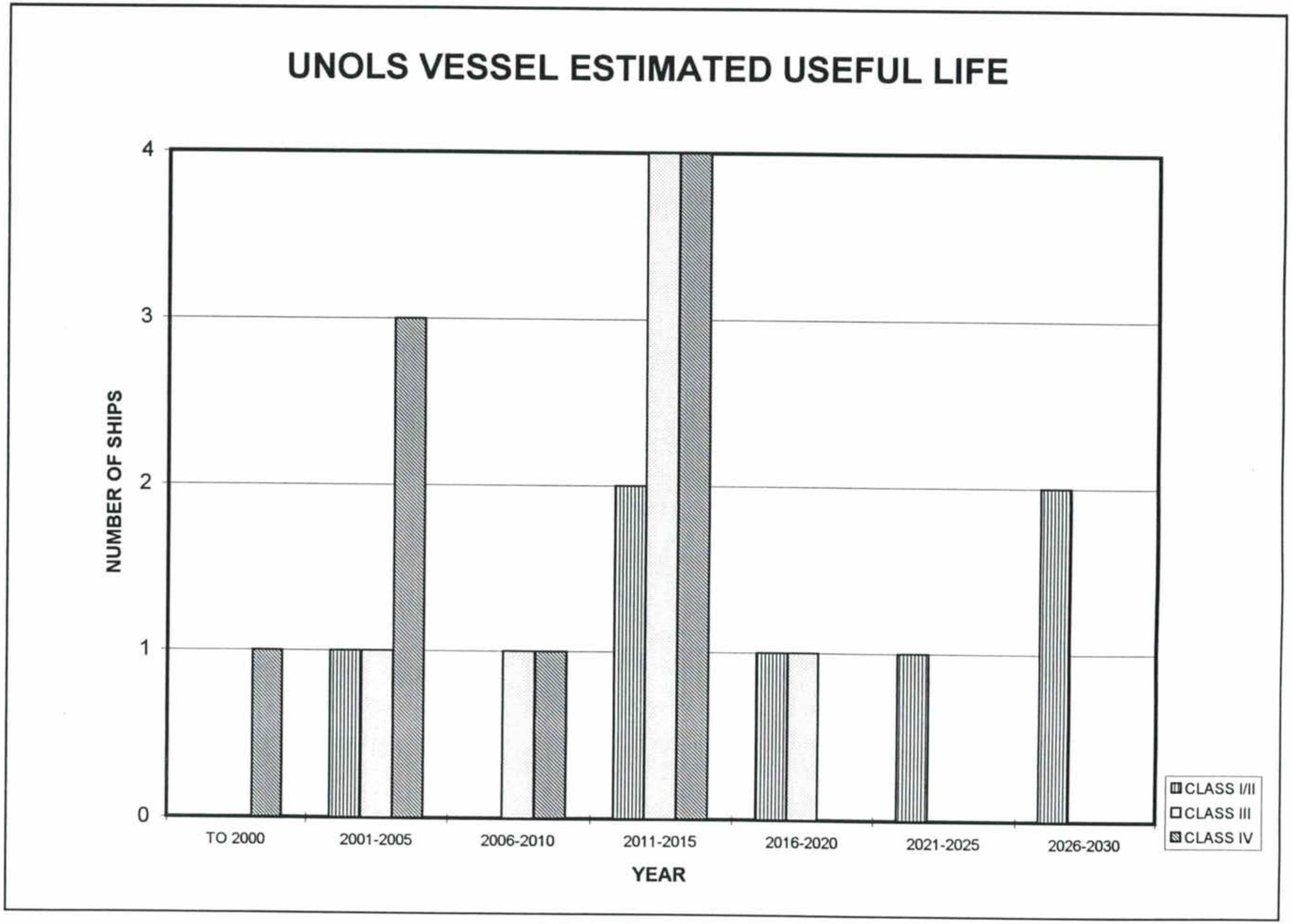
One rather dramatic shift we see in requests is a continuing decline in the areas of deep ocean research such as thermohaline circulation and the carbon cycle (including tracers) and an increase in the requests for support of atmospheric research programs. We have a total of four requests for the Doppler facility on BROWN in 1999. Friday we received the ECP costs for the Doppler on BROWN. Also, it looks like the vibration issue is not of concern. The costs area reasonable so we should be going ahead with the installation of the platform. We are also working several routes to obtain a permanent radar since the two TOGA-COARE radars are not available as a permanent installation on BROWN. BROWN will have a permanent upper-air capability. Given the 1998 and 1999 requests we are now looking to see if we should install a wind profiler permanently on BROWN. It has been a low priority mission equipment item up to now. (This is why I'll be in Boulder tomorrow.)

As regards to Fisheries requirements, you are probably as familiar with the issues as I can relate in writing. We do not expect new construction money in the 1998 budget (the necessity to balance the budget issue) from the White House. We expect to retain the funds to design a vessel in our Fleet Modernization account. As you are aware, the real watershed year for NMFS is 1999. If we do not obtain funds to start construction of a new vessel in 1998 or 1999, and given the time to construct a new vessel, the increasing age and maintenance requirements of the Fisheries vessels will probably result in vessels coming off line before they can be replaced.

I am sorry that we won't have anyone from D.C. at the FIC meeting but Hugh Milburn will be there.

Steve

APPENDIX V


UNOLS VESSEL ESTIMATED USEFUL LIFE
NUMBER OF SHIPS
0
1
2
3
4
TO 2000
2001-2005
2006-2010
2011-2015
2016-2020
2021-2025
2026-2030
YEAR
CLASS I/II
CLASS III
CLASS IV

APPENDIX VI

DEPARTMENT OF THE NAVY
OFFICE OF NAVAL RESEARCH
800 NORTH QUINCY STREET
ARLINGTON, VA 22217-5660

IN REPLY REFER TO

5000
Ser 321/96/164
7 Nov 96

Dr. Kenneth Johnson
Chair, UNOLS Council
UNOLS Office
P.O. Box 392
Saunderstown, RI 02874

Dr. Barry Raleigh
Dean, SOEST
University of Hawaii at Manoa
1000 Pope Road, MSB 205
Honolulu, HI 96822

Dear Drs. Johnson and Raleigh:

The Defense Appropriations Committee Conference Report contained the following language on the construction of a new oceanographic research ship:

> "The Committee strongly agrees with the Senate Armed Services statements regarding the inability of the current Navy fleet to meet oceanographic survey requirements. Furthermore, the Committee understands that there are many research efforts which could benefit from the availability of a small water plane area twin hull [SWATH] oceanographic research vessel. Therefore, the Committee has provided an increase of $45,000,000 to construct a small water plane, twin hull [SWATH] oceanographic research vessel.
>
> This will be one of the first SWATH vessels available to the research community. The Committee has endorsed this initiative to address the need to replace the retiring Moana Wave oceanographic research vessel.
>
> The Committee understands that a new SWATH concept developed by the Office of Naval Research may be tested in the near future. This design may produce a SWATH hull which is much faster than the TAGOS class. The Committee urges the Navy to fully evaluate this concept in defining the new SWATH oceanographic ship design."

The language directs the Navy to evaluate a SWATH design to replace the MOANA WAVE in the research fleet. The language also mentions the backlog of military surveys and the possibility that such a vessel could address the backlog. In discussions with the Oceanographer's staff, this design will be approached as an oceanographic research vessel, not an oceanographic survey vessel. However, the capability to do surveys will be maintained as in the AGOR class designs. The Office of Naval Research (ONR) will be the mission sponsor for this vessel, and the Oceanographer of the Navy (N096) will be the resource sponsor.

The process is envisioned to be as follows: ONR will develop the requirements for a Class II/III general purpose research vessel, with input from University-National Oceanographic Laboratory System (UNOLS) and the University of Hawaii. We request that UNOLS and the University of Hawaii convene a group to develop mission requirements for such a vessel, and forward the requirements to ONR by 27 January 1997. ONR will then assess the requirements and forward them to the Naval Sea Systems Command (NAVSEA) via N096. ONR will request that NAVSEA conduct feasibility studies based on the requirements, and perform trade-offs if the initial cost of the design exceeds the funds appropriated. It is expected that a monohull option will be considered during these studies. In addition, the language also directs the Navy to evaluate SLICE, an ONR SWATH concept, as one of the options for this vessel. This will be done concurrently by ONR and NAVSEA. SLICE will undergo sea-trials next January, after which full-scale data will be available for analysis.

Once the initial studies are completed, and NAVSEA begins work on the Request-for-Proposal for the construction of this vessel, ONR will begin operator selection. However, ONR will not make an operator decision until broad requirements for this vessel are developed and evaluated within an overall ONR fleet strategy.

My point of contact on this issue is Sujata Millick, and she can be reached at 703-696-4530.

Sincerely,

Fred Saalfeld

F. E. SAALFELD
Deputy Chief of Naval Research/
Technical Director

Copy to:
CNR
N096 (Capt. Schnoor)
NSF (D. Heinrichs)
NAVSEA (Capt. Williams)

APPENDIX VII

STATUS OF NEW RESEARCH VESSEL

Sujata Millick
Office of Naval Research

Current Status

- Language in Defense Authorization and Appropriation Bills regarding replacement of R/V Moana Wave.
- It directs the Navy to look at SWATH and SLICE design options.
- ONR has requested that UNOLS forward science mission requirements for a Class II/III ship by Jan 27 1997
- ONR forwards ship specifications to NAVSEA by Feb 7 1997

CURRENT ACTIONS

- ONR/N096 has issued a tasking letter to NAVSEA to allow them to begin the following tasks:
  - Conduct a SWATH Market Survey

    Review the spectrum of current designs, technology, and capabilities
  - Study Ship Acquisition Options
    - COR, will provide the shipbuilder greater flexibility
    - ACAT levels down-selection
    - Detail design
    - Integrated Process and Product Teams
    - Cost as an independent variable, CAIV
  - Program of Actions and Milestones, POA&M

Ship Design Considerations

- NAVSEA cannot develop a design that substantially exceeds the allocated ship construction funding.
- NAVSEA will evaluate SWATH, Monohull, and SLICE.
- NAVSEA currently does not have "design money" to do studies and cannot use SCN funds.

Ship Design Considerations

- "Best Value" Trade Offs, Feasibility Studies
- Prioritize Requirements/Mission Parameters With High-Low Ranges
  - Endurance/Accommodations
  - Speed/Seakeeping
  - Lab Space, etc..

Order of Events

Release RFP....................................June 1997
Select Ship Builder.................September 1997
Ship Delivery.........................September 1999
Fully Operational....................................2000

- Above Schedule is very optimistic, and everyone should anticipate slippage.

APPENDIX VIII

Senate

//Oceanographic ship\\.--The Committee strongly agrees with the Senate Armed Services statements regarding the inability of the current Navy fleet to meet oceanographic survey requirements. Furthermore, the Committee understands that there are many research efforts which could benefit from the availability of a small water plane area twin hull [SWATH] oceanographic research vessel. Therefore, the Committee has provided an increase of $45,000,000 to construct a small water plane, twin hull [SWATH] oceanographic research vessel.

This will be one of the first SWATH vessels available to the research community. The Committee has endorsed this initiative to address the need to replace the retiring Moana Wave oceanographic research vessel.

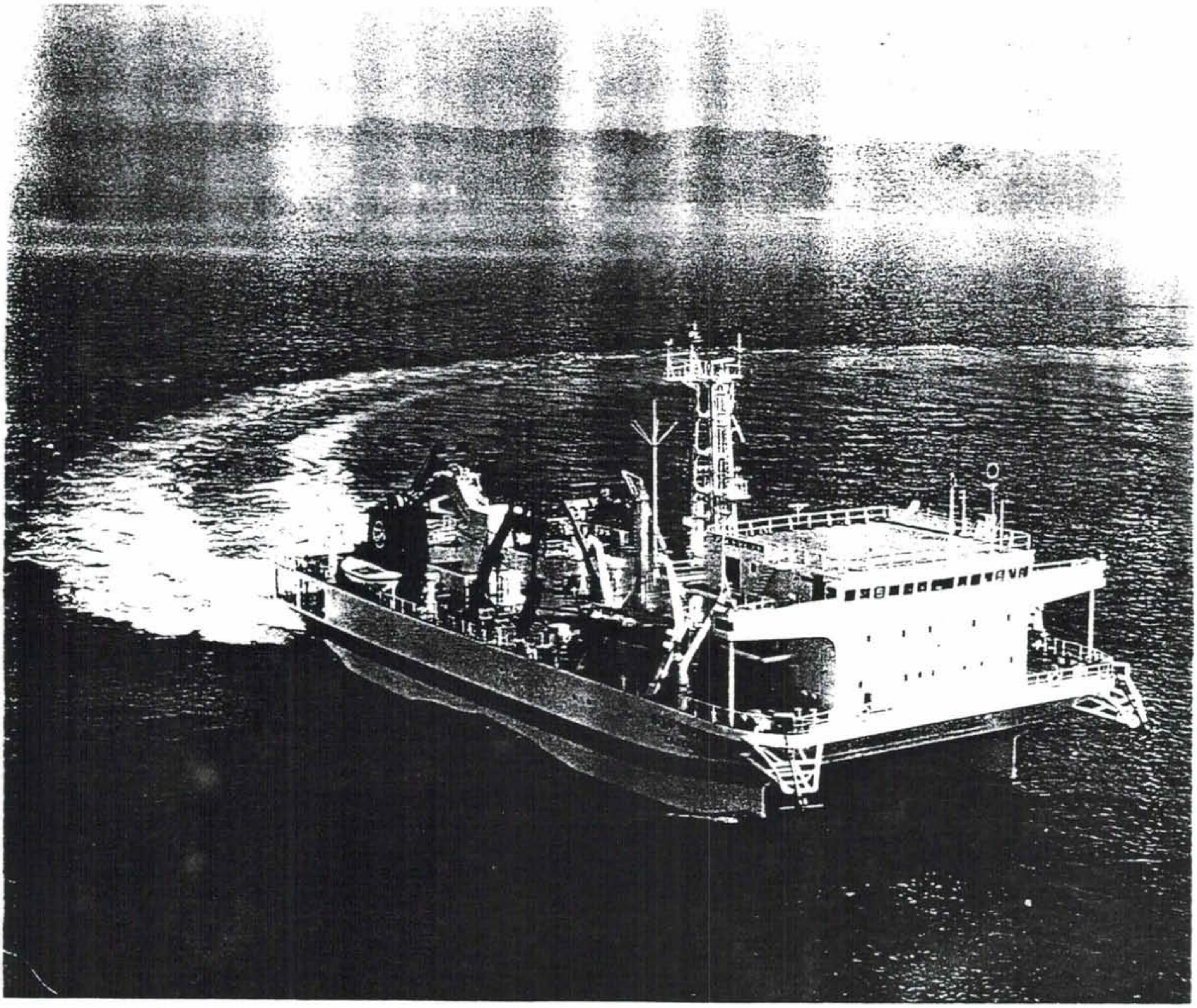
The Committee understands that a new SWATH concept developed by the Office of Naval Research may be tested in the near future. This design may produce a SWATH hull which is much faster than the TAGOS class. The Committee urges the Navy to fully evaluate this concept in defining the new SWATH oceanographic ship design.

"$45M ... SWATH ...
OCEANOGRAPHIC R/V ...
TO REPLACE MOANA WAVE"

APPENDIX IX

Research Vessel

KAIYO



JAMSTEC

	PIONEER	IGSS
Owner	Global Industries, Ltd. Lafayette, Louisiana	International Hospitality, Inc. Toronto, Ontario, Canada
Service	Offshore support	Gaming
Delivery	November 1996	December 1997
Builder	Aker Gulf Marine and Global Industries	Brown & Root, Inc.
Hull Material	Steel	Steel
Superstructure	Steel	Aluminum
Class. Society	ABS	ABS
Length:		
Overall	200 ft.	250 ft.
Box	200 ft.	230 ft.
Fwd. Struts	69	64
Aft Struts	54	54
Lower Hulls	200	225 ft.
Beam:		
Overall	87 ft.	93 ft.
Box	87 ft.	93 ft.
Struts (4 ea.)	9 ft.	9 ft.
Lower hulls	24 ft.	24 ft.
Draft:		
Transit (min.)	12 ft.	12 ft.
Ops. (max.)	21.5 ft.	21 ft.
Displacement:		
Transit	2,150 LT	2,747 LT
Operations	2,800 LT	3,350 LT
Payload (mission)	340 LT	610 LT
Speed:		
Cruise	12 knots	10 knots
Trial	13 knots	12 knots
Power:		
Installed	2,790 KW	4,200 KW
Propulsion	2,400 KW	2,010 KW
Propulsion Type	DC Electric	DC Electric
Number of Struts	Two per Side	Two per Side
Steering Type	Rotational Thrusters	Conv. Overhanging Rudder
Design Sea State	6	5
Cost (w/o mission outfit)	Less than $20M	Less than $20M

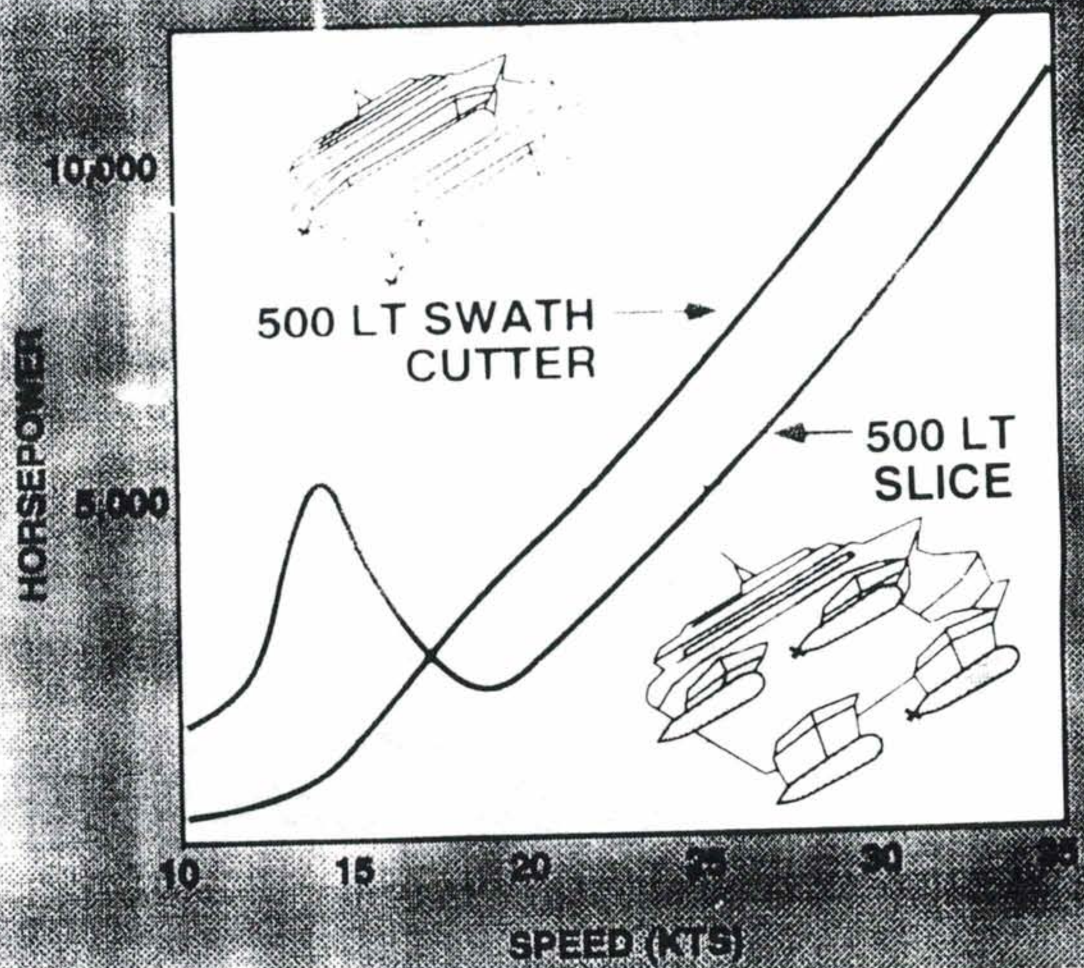

MARINE SYSTEMS
SLICE ATD
A NEW MULTI-USE CRAFT

MARINE SYSTEMS

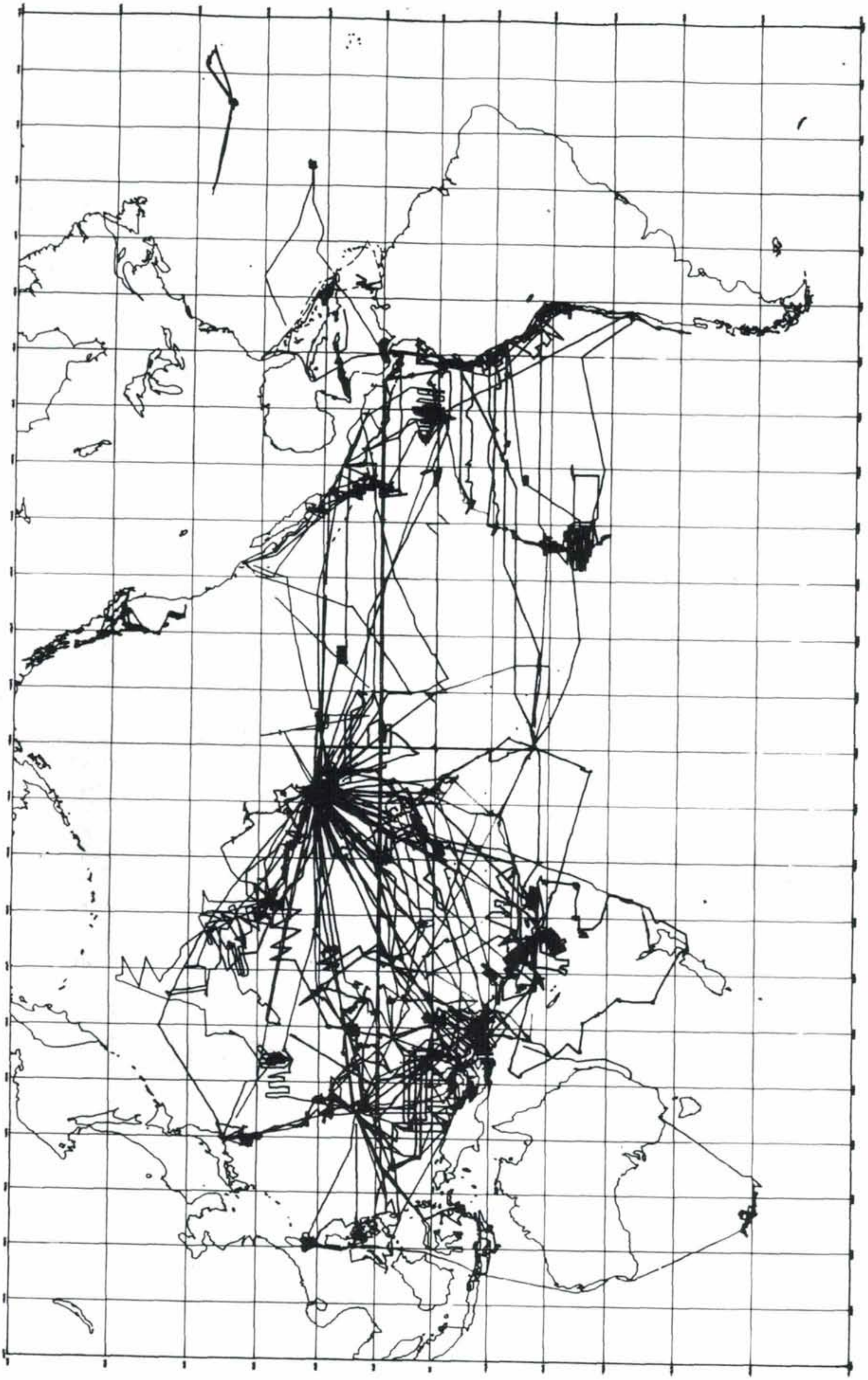
SLICE

THE SLICE PERFORMANCE ADVANTAGE

- SLICE REQUIRES LOWER INSTALLED POWER AT HIGH SPEEDS
- SLICE ATTAINS HIGHER SPEED WITH SAME INSTALLED POWER



APPENDIX X



NATIONAL GEOPHYSICAL DATA CENTER (1,000s nm

INST.	LEGS	NAV.	BATHY.	MAG.	GRAV.	SEIS.	S.S.
LAMONT	656	2639	2493	2122	1905	1751	285
SCRIPPS	620	2369	2164	1652	455	1048	7
HAWAII	217	776	739	441	481	598	145
WHOI	197	820	749	374	340	315	20
TEXAS	84	143	119	91	0	59	0
OREGON	75	179	166	126	118	60	27
TAMU	63	174	138	132	0	171	0
RHODE I.	41	146	144	80	0	28	0
WASH.	26	72	52	0	0	20	0
RSMAS	21	222	0	190	0	129	0

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

NEW Release

MARINE GEOPHYSICAL TRACKLINE DATA - WORLDWIDE -

CD-ROM Set, Version 3.2

with data assimilated through December, 1995

NOAA · NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION · U.S. DEPARTMENT OF COMMERCE

Data Announcement 96-MGG-01

APPENDIX XI

REVISED SCIENTIFIC MISSION REQUIREMENTS FOR OCEANOGRAPHIC RESEARCH SWATH SHIP TO REPLACE R/V MOANA WAVE (12/10/96)

General: The ship is to serve as a general-purpose research vessel, primarily for operations in the central and circum-Pacific. The overriding requirement is that the ship provide the most stable environment possible in order to allow both overside and laboratory work to proceed in greater capacity, at higher speeds, and in higher sea states than is now possible. Other general requirements are reliability, flexibility, cleanliness, minimal vibration and noise, and an overall upgrading of quality for doing science and engineering at sea.

Size: The size is ultimately determined by the requirements. It seems likely that these will result in about a vessel of ~~at least~~ 3000 long tons total displacement. The maximum beam encompassing the lower hulls shall be no greater than 104 feet, to allow passage through the Panama Canal, and the maximum draft in port shall be no greater than 24 feet.

Speed: Minimum 15 knot cruising speed in sea state 6, 10 knots in sea state 7, with speed control +-0.1 knot in 0-6 knot range and +-0.2 knot in 6-15 knot range. The highest possible speeds consistent with fuel economy are desirable (for transit and multi-narrow beam swath mapping). Diesel-electric/SCR propulsion is envisioned, with the diesel generators above the water line for noise/vibration suppression.

Seakeeping: The ship shall be designed to provide exceptionally stable seakeeping capabilities. Design targets for the at rest (dead in the water) condition for any orientation of the ship in the following sea states (and significant wave heights) are:

	SS-4 (7 ft.)	SS-5 (12 ft.)
Pitch (ampl.)	2.0 degrees	3.0 degrees
Roll (ampl.)	2.5 degrees	4.0 degrees
Heave (ampl.)	1.7 feet	3.0 feet
Vert. Accel.	0.06 g	0.09 g
Horiz. Accel.	0.06 g	0.11 g

Endurance: Fifty days; providing the ability to transit 25 days at cruising speed and 25 days station work (see station keeping and towing); 10,000 nautical mile total range at cruising speed with 15% fuel reserve.

Ice Strengthening: None. Not intended for icebreaking or work in pack ice.

Accommodations: 25 scientific personnel (plus ship's crew) in 11 two-person staterooms and 3 single-person staterooms. Science library-lounge with conference capability (~250 sq ft). Science office (~150 sq ft). Provide general access restrooms and wash facilities.

Station Keeping: Allow normal station and deck work through sea state 6, limited work through sea state 7, and survivability through sea state 9. Assure relative positioning at best heading in 35 knot winds, 2 knot current, and sea state 5, within +- 5 degrees of heading and +- 150 ft maximum excursion from a point or trackline. Maintain a precision trackline while towing at speeds as low as 0.5 knots with a heading deviation up to 45 degrees from the prescribed trackline using GPS or bottom navigation as reference. (See navigation and positioning). Speed control along track should be maintained +-0.1 knot (averaged over one minute intervals). Trackline requirements should be met 95% of the time considering the range of sea states specified. Maintain maneuverability while working with over the side lines and gear - i.e. be able to keep gear out of the props.

Towing: Capable of towing scientific packages up to a total tension of 10,000 pounds at 10 knots, 12,000 pounds at 8 knots, and 25,000 pounds at 2.5 knots.

Working Configuration: Minimum 5,000 sq ft open working deck area, with minimum contiguous work areas of 25 ft along full width of stern and 20 x 50 ft along bow, both as close to sea level as possible to facilitate access to the sea surface. Provide for deck loading up to 1,200 lbs/sq ft and an aggregate total of up to 150 tons of installed systems (A-frames, cranes, winches, hydraulics, work boats, etc) plus 50 tons of variable payload (vans, deployable vehicles, scientific equipment, and additional cranes, supplies, etc). Install oversize holddowns on 2-ft centers as a highly flexible means to accommodate large and heavy equipment. Provide removable bulwarks and railings, with the lower hulls and screws not protruding beyond upper hulls. All working decks accessible for power, water, air, and data and voice communication ports.

Cranes: A suite of cranes (1) articulated to work close to deck and water surface, (2) able to lift a max of 20 tons, service the entire usable deck space, and lift 10 tons at the limit of their working areas, (3) overside cranes to have servo controls, to be usable as overside cable fairleads at sea, and at least one to be positioned to lift 10 tons from an adjacent dock/pier. Ship to be capable of carrying portable cranes for specialized purposes such as deploying and towing special instruments

Winches: Oceanographic winch systems with fine control (0.5m/min), both local and remote, and wire monitoring systems with inputs to laboratory panels and digital shipboard recording systems. Permanently installed general-purpose winches shall include:
- Two winches capable of handling 30,000 ft of wire rope or electromechanical/fiber optic cables having diameters from 1/4" to 3/8".
- A winch complex capable of handling 40,000 ft of 9/16" trawling or coring wire and 30,000 ft of 0.68" electromechanical cable (up to 10 KVA power transmission and fiber optics). This could be two separate winches or one winch with two storage drums.

Additional special purpose winches may be installed temporarily at various locations along working decks. Winch sizes may range up to 40 tons (140 sq ft) and have power demands to 300 hp.

Overside Handling: A versatile combination of frames, booms, and other handling gear to accommodate wire, cable and free launched arrays. Matched to work with winch and crane locations but able to be relocated as necessary. Permanently installed general-purpose systems shall include:
- Stern A-frame, mounted on lowest (lab) deck without overhead, to have 20 ft minimum horizontal, and 30 ft vertical, inside clearance, with 15 ft inboard and outboard reaches; safe working load up to 30 tons.
- Capability to install 20 ft pivoted booms on aft corners of lower deck.
- Climate controlled control stations to give operator protection and operations monitoring and to be located for maximum visibility of overside work.

Laboratories: At least 2,500 sq ft of laboratory space including the following (minimum area): Main lab (1,000 sq ft); Wet lab (300 sq ft) located contiguous to sampling areas; Bio-chem Analytical lab (200 sq ft); Electronics/Computer lab and associated users space (500 sq ft, sub dividable); Dry lab (200 sq ft) located proximal to forward meteorological tower; Darkroom (100 sq ft), climate-controlled chamber (100 sq ft), and freezer (100 sq ft). Labs should be located so that none serve as general passageways. Access between labs should be convenient. Labs, offices, storage, and all main deck levels to be served by man-rated freight elevator having clear inside dimensions of at least 4 ft by 6 ft. Labs to be fabricated using uncontaminated and "clean" materials and constructed to be maintained as such. Furnishings, HVAC, doors, hatches, cable runs, and fittings to be planned for maximum lab cleanliness. Fume hoods shall be permanently installed in the Wet and Analytical labs. Cabinetry shall be high-grade laboratory quality (not metal). Flexible lab configurations shall be aided by the use of bulkhead unistruts, deck holddowns, and bench tops that can secure a surface of easily replaceable plywood (that can be drilled and nailed into at will). Provide heating, ventilation, and air conditioning (HVAC) appropriate to labs, vans, and other science spaces being served. Labs shall maintain temperature of 70-75°F, 50% relative humidity, and 9-11 air changes per hour, with individual HVAC controls in each lab. Provide filtered air to analytical labs and compressed gas bottle racks. Each lab area shall have a separate electrical circuit on a clean bus with continuous delivery capability of at least 40-volt amperes per sq ft of lab deck area. Labs shall be furnished with 110 v and 220 v AC. Total estimated lab power demand is 100 KVA. Provide uncontaminated sea water supply and clean compressed air supply, free of oil, to most labs, vans, and several key deck areas. Provide 20 ft tower (with sampling platform, power, gas and electro-optical data lines) atop forward super-structure for aerosol, gas and rain sampling, optical measurements, and meteorological observations.

Vans: To carry three standardized 8 ft by 20 ft vans which may be lab, berthing, storage, or other specialized use. Hookup provision for power, HVAC, fresh water, uncontaminated sea water, compressed air, drains, communications, data and shipboard monitoring systems. Van access direct to ship interior. Provision to carry up to three additional portable non-standard vans (450 sq ft total) on working decks. Supporting connections at several locations around ship including lower fantail and foredeck (see working configuration). Ship should be capable of loading and offloading vans using own cranes.

Workboats: At least one 19-ft inflatable (or semi-rigid) boat located for ease of launching and recovery. A scientific work boat 25-30 ft LOA specially fitted out for supplemental operations at sea including collecting, instrumentation, and wide-angle signal measurements. 12-hour endurance including both manned accommodations and automated operation. "Clean" construction. To be carried as one of three van options above.

Science Storage: Total of 15,000 cubic ft of scientific storage accessible to labs by freight elevator and weatherdeck hatch(es). Half to include suitable shelving, racks, and tie downs; remainder open

Acoustical Systems: Ship to be as acoustically quiet as practicable in the choice of all shipboard systems, their location and installation. Hulls, transducer wells and bow thruster should be designed to minimize the presence of bubble layers in front of the transducers (e.g., bow thruster on different pontoon/pod than transducers). Design target is operationally quiet noise levels at 15 knots cruising in sea state 5 (and preferably, at higher speeds and sea state 6) at the following frequency ranges:
4 Hz - 500 Hz seismic
3 kHz - 50 kHz echo sounding and acoustic navigation
75 kHz - 300 kHz Doppler current profiling
Ship to have (1) 12 kHz and 3.5 kHz echo sounding systems and provision for additional systems, (2) acoustic Doppler current profiler systems operating at about 150 kHz and 75 kHz, together with some system (acoustic or otherwise) for measuring currents in the 0-20 m depth range (shallower than presently usable ADCP data), (3) phased array, multi-narrow beam precision echo sounding system (equivalent to "SeaBeam 2100" or "Simrad EM" series or better) - this requires pontoons/pods at least 25 ft wide, (4) transducers appropriate for dynamic positioning system, (5) transducer wells (20") located forward and aft, (6) large pressurized sea chest (4 ft x 8 ft) located at optimum acoustic position for at-sea installation and servicing of transducers and transponders.

Environmental Systems: Ship to have (1) underway standard meteorological sampling (from tower on forward superstructure) - this could be satisfied with the "IMET" system plus an optical raingauge, (2) continuous seawater sampling system, including intake from the nose of one pontoon, proximal measurement of temperature and salinity (using a "Sea-Bird SBE-21" thermosalinograph or equivalent), two pumps (centrifugal, 150 litre/min) and two separate supply lines (1" fiberglass pipe and 1-1/2" polypropylene tubing) to deliver water to the hydro and wet labs and the following instruments: flow-though fluorometer, nutrient analyser, transmissometer, and CO2/O/pH/H2O2 meters, (3) deployable bow boom or other system for air-sea interface sampling, (4) facility to attach additional sensors and through-hull data links (e.g., to measure turbulence) to the nose of the pontoon without acoustic systems.

Geophysical Systems: Ship to have (1) gravity meter installed as near as possible to the center of motion, (2) shipboard (not towed) 3-component magnetometer system, (3) compressors capable of generating 500 scfm at 2500 psi, with high-pressure plumbing connecting to large sound sources (airguns) and their deployment systems; with the ability to expand the sound source capacity to 2000 scfm at 2500 psi by the addition of compressors in vans, (4) the capability to carry out multichannel seismic profiling surveys using these sound sources and long streamers (3-6 km).

Navigation and Positioning: Ship to have (1) DGPS and P/Y-code GPS, (2) GPS attitude determination to 0.1 degree or better (e.g. "Ashtech 3DF-ADU2" or equivalent), (3) short baseline acoustic navigation system, (4) "dynamic positioning" capability to maintain the ship on station or on trackline to the station keeping specifications under automatic control and appropriate navigational reference.

Internal Communications: Internal communication system providing high-quality voice communications throughout all science spaces and working areas. Optical fiber Ethernet cabling and connections shall connect all science spaces including staterooms, labs, vans, meteorological tower, pontoon nose and key working areas. Data and power cable races shall be kept separate and as far from each other as possible. Provide closed-circuit televison monitoring and recording of all working areas including subsurface performance of equipment and its handling. Monitors for all ship control, environmental parameters, science and overside equipment performance shall be provided in all, or most, science spaces.

External communications: Provide (1) reliable voice channels for continuous communications to shore stations (including home laboratories), other ships, boats, and aircraft; this includes satellite, VHF, and UHF, (2) facsimile communications to transmit high-speed graphics and hard-copy text on regular schedules, (3) high-speed data communications (56 K baud) links to shore labs and other ships on a continuous basis.

Satellite Monitoring: Carry transponding and receiving equipment including antenna to interrogate and receive satellite readouts of environmental remote sensing. Satellite antennas and the GPS-attitude sensor should be positioned with a reasonably clear view of the sky and adequate distance from radar and other ships antennas.

Ship Control: Chief requirement is maximum visibility of deck work areas during science operations and especially during deployment and retrieval of equipment. This may require additional or portable control stations besides the bridge-pilot house. The functions, communications, and layout of the ship control station(s) should be designed to enhance the interaction of ship and science operations. For example, ship course, speed, attitude, and positioning will often be integrated with scientific operations requiring control to be exercised from a laboratory area.

Sea State	Description	Height (ft)
0	Calm-glassy	0
1	Calm-rippled	0-0.5
2	Smooth-wavelets	0.5-1.5
3	Slight	1.5-4
4	Moderate	4-8
5	Rough	8-13
6	Very Rough	13-20
7	High	20-30
8	Very high	30-45
9	Phenomenal	Over 45

APPENDIX XII

	MOANA WAVE	MidPac SWATH
Design	Monohull	Tandem Strut SWATH/SLICE
Length	210 ft.	~200 ft.
Beam	36 ft.	90-104 ft.
Pontoons/Pods	N.A.	~25 ft. wide
Draft	15 ft.	<24 ft.
Displacement	2420 tons	~3000 tons
Sci. Payload	80/50 tons	150/50 tons
Crew	13	16
Science Staff	19	25
Speed	11 knots	15+ knots
Range	14,000 nm	10,000 nm
Endurance	50 days	50 days
Lab Space	1,836 sq.ft.	>2,500 sq.ft.
Deck space	1,400 sq.ft.	>5,000 sq.ft.
Moon Pool	None	None
Ice Strength.	None	None

APPENDIX XIII

January 6, 1997

CLASS II/III GENERAL PURPOSE RESEARCH VESSEL
SCIENCE MISSION REQUIREMENTS
FOR CENTRAL PACIFIC OPERATING AREA

This report is in response to the Office of Naval Research (ONR) letter dated 7 November 1996 requesting Science Mission Requirements (SMR) for a Class II/III general purpose research vessel. The University-National Oceanographic Laboratory System (UNOLS) Fleet Improvement Committee (FIC), augmented by representatives from the University of Hawaii (UH) and Pacific Ocean research scientists, met in San Francisco on 12-13 December to deliberate on the requirements. A list of attendees is included as **Enclosure 1.**

In response to the ONR letter, Ken Johnson provided the FIC with a charge through his e-mail message dated 14 November 1996 **(Enclosure 2).** In addition, Sujata Millick provided additional guidance in her remarks at the FIC meeting. The FIC working group was instructed that economic issues were relevant, not only for the moneys available for construction but the life cycle cost as integrated into the total UNOLS Fleet operating budget. The instructions to develop SMRs for a Class II/III ship suggest both cost and size constraints. Sujata further explained that when the SMRs are evaluated for design concepts a monohull would not be ruled out.

Brian Taylor presented a revised set of science mission requirements. This revision was in response to the community comments and represented a reduced size/capacity from the first draft provided by UH. Community response overwhelmingly recommended that the ship be built for operations in the central and circum-Pacific including, ice-free high latitudes. These SMRs were again updated by UH based on the deliberation of the FIC working group and are forwarded as **Enclosure 3.** The values used in these SMRs represent UH's interpretation of the FIC work and not necessarily a consensus of the assembled FIC working group.

REQUIREMENTS: The Committee deliberated on 11 requirements that were considered as "drivers" with respect to ship size, design and cost. The requirements considered were: Sea Keeping; Station Keeping; Endurance; Speed; Draft; Range; Science Staff; Science Payload; Lab Space; Deck Space and Hold Space. A detailed discussion of each of these is provided below which constitutes the substance of this report.

REQUIREMENT RANGE: A range of values was established for each of these requirements. The requirement range included the "Minimum" acceptable, "Desirable" and the "Maximum" considered reasonable for each of the requirements. An attempt was made to keep the "Desirable" within practical cost limits; however, the limited ship design expertise of the working group suggests that a priority system would be necessary to temper excessive enthusiasm. The "Maximum" of the range suggests a goal when it does not compromise other requirements.

The Committee began its discussion of each requirement by reviewing the values reported in existing UNOLS Science Mission Requirements for Class II and Class III monohull research vessels and Class I and III SWATH research vessels (ref: FIC Report 'Scientific Mission

Requirements for Oceanographic Research Vessels", Nov. 1989). The minimum acceptable and desirable values were then set.

PRIORITY: A priority system was devised to assist designers with tradeoffs that might be necessary between Minimum and Desirable requirements. High priorities suggest the design should attempt to meet the 'Desirable" requirement in the Range. For the lower priorities at least the minimum should be met. To develop the priorities a vote was taken on each of the requirements. The voter had a choice of High, Medium or Low priority. A point value was assigned to each of these with High=3, Medium=2 and Low=1 point. The votes were counted and values tallied. A perfect High, where all present voted for a high priority, would equate to a score of 63 (21 people voted).

It should be noted that the priorities refer only to tradeoffs between Minimum and Desirable values in the requirements. If it is not possible to meet Minimum values, then the priorities will differ dramatically. For example, the ship's range received a relatively low priority ranking of 36. However, the minimum range of 9000 nm was considered to be of very high importance. If it could not be met in an affordable design, then minimum ranges for other factors such as science payload or sea keeping should be lowered first. There was not an extensive discussion of the ranking of Minimum priorities, however, as it was considered to be premature until the constraints of the SMRs on the ship's characteristics were considered by NAVSEA.

CLASS II/III MONOHULLS AND SWATH SMR VALUES - To provide a perspective of the SMRs recommended, the SMR values from previous FIC reports of Class II and Class III monohull and SWATH vessels has been included where available.

DISCUSSION, RANGE AND PRIORITY OF EACH REQUIREMENT

1. SEA KEEPING (on station) was the only requirement with a perfect high priority score. A maximum range was not considered applicable and not included. Discussion followed that working in Sea States of 6 and 7 were paramount if this vessel was to have improved characteristics over existing research vessels. A concern for survivability was expressed. Design requirements must include survivability through Sea State 9.

The Minimum values were derived from the Circular of Requirements (COR) for the AGOR 23 (THOMPSON) class, while the Desirable values were based on the COR for the TAGOS-19 SWATH surveillance ships that have been built by the Navy.

The AGOR 23 COR did not include a Heave value, and the Committee suggested a value of six feet. THOMPSON was reported to meet the requirements of the minimum values. The UNOLS FIC report, 'Preliminary Design for Medium Endurance General Purpose Oceanographic Research Vessel," suggests that a smaller vessel with a broad beam and shallow draft can also meet the Minimum requirements. A SWATH design is likely to be necessary to meet the Desirable requirements.

Published SMRs for:

Class II		Class III	
Monohull:	SWATH:	Monohull:	SWATH:
NA	NA	NA	NA

REQUIREMENT	MINIMUM	DESIRABLE	MAXIMUM
SEA KEEPING	Sea State 6	Sea State 7	NA
Pitch	4 degrees	3 degrees	NA
Roll	8 degrees	6 degrees	NA
Heave	6 ft.	4 ft.	NA
Vertical Accel.	0.4 g	0.09 g	NA
Horizontal Accel.	0.2 g	0.11 g	NA

Priority score: 63 (H=21/M=0/L=0)

2. DECK SPACE DISTRIBUTION was discussed in general terms and considered a function of the hull form. The requirement was considered significantly important and as a minimum, 2,000 square feet of space should be available. However, the priority for the space was assigned on the basis of configuration, rather than square footage. The deck space must be arranged to allow easy handling of oceanographic gear, and to facilitate typical oceanographic operations such as itemized below.

Published SMRs for:

Class II		Class III	
Monohull:	SWATH:	Monohull:	SWATH:
NA	NA	NA	NA

Priority score: 58 (H=16/M=5/L=0)

3. STATION KEEPING was considered a high priority and related to the ability of the vessel to remain on station with dynamic positioning. The dynamic positioning parameters were considered as +/- 50 meters deviation with +/- 5 degrees on the most favorable heading. It was agreed that the desire for station keeping in higher sea states would necessitate an increase in air gap between the main ship's body and the sea. Survivability through Sea State 9 would be required.

The desirable value for operations in Sea State 7 would significantly expand routine operations into the high latitudes during winter months. Station keeping in Sea State 7 would likely require a SWATH design.

Published SMRs for:

Class II		Class III	
Monohull:	SWATH:	Monohull:	SWATH:
SS-5	SS-6	SS-5	SS-5

REQUIREMENT	MINIMUM	DESIRABLE	MAXIMUM
STATION KEEPING	Sea State 6	Sea State 7	Sea State 7

Priority score: 57 (H=15/M=6/L=0)

4. SCIENCE PAYLOAD is discussed as it relates to that variable load that a science party can bring aboard. This may include vans, moorings (including anchors, floats, cable and instrumentation), ROVs, coring equipment and mission specific scientific gear. The minimum of 60 tons was driven by the weight of a typical set of mooring arrays that would be carried on a NOAA TOGA/TAO cruise. Science outfitting requirements such as winches, cranes and A-frames will be driven by the overall science mission requirements and the load of this non-itinerant equipment is not included in the Science Payload discussed here as there are a variety of options available for outfitting this equipment that will control its weight.

Published SMRs for:

Class II		Class III	
Monohull:	SWATH:	Monohull:	SWATH:
90 tons	100 tons	60 tons	50 tons

ELEMENT	MINIMUM	DESIRABLE	MAXIMUM
SCIENCE PAYLOAD	60 tons	100 tons	120 tons

Priority score: 47 (H=7/M=12/L=2)

5. LENGTH/BEAM/DRAFT were discussed with a consensus that only harbor draft was a limiting factor for the working group to provide a recommendation. The Panama Canal limitation of 104-foot maximum beam was considered a given requirement. Harbor draft could determine which harbors would be available for this vessel. A SWATH design with variable draft would solve this problem, but it could also compromise some of the other features desired of the vessel. Consensus was not reached on the maximum draft. The majority agreed on 24 feet, however, a significant minority argued that this was not practical and would provide significant operational limitations. It was noted that draft can be a limiting value of range.

Published SMRs for:

Class II		Class III	
Monohull:	SWATH:	Monohull:	SWATH:
NA	NA	NA	NA

REQUIREMENT	MINIMUM	DESIRABLE	MAXIMUM
Draft	NA	20 ft.	24 ft

Priority score: 46 (H=7/M=11/L=3)

6. LABORATORY SPACE is considered as the sum of all internal laboratories. The spatial distribution of these spaces is important and should be a topic of study after basic hull forms are determined. The desired lab space requirements correlate to the desired science staff requirements. The formula used in determining the lab space is:

(number of scientists x 100 sq. ft) + 500 sq. ft

This formula was derived from the experience of the group that multi-disciplinary cruises on the current generation of intermediate vessels were regularly running out of laboratory space, and this trend was likely to continue as science operations become more complex.

Although specific layouts of the laboratories were not considered, they should be convenient to the main working deck and the success of the AGOR 23 design suggests that the labs should all be on one deck if possible.

Published SMRs for:

Class II		Class III	
Monohull:	SWATH:	Monohull:	SWATH:
3000 sq ft	4000 sq ft	2000 sq ft	2000 sq ft

ELEMENT	MINIMUM	DESIRABLE	MAXIMUM
LAB SPACE	2500 sq. ft	3000 sq. ft	3500 sq. ft

Priority score: 44 (H=6/M=11/L=4)

7. SCIENCE STAFF size is a major driver in ship utility, as evidenced by the success of R/V SEWARD JOHNSON. The minimum science party size was set by the number of science berths available on WECOMA. It was recognized that multi-disciplinary cruises will require even more science personnel, which set the desirable value at 25. The science staff is only a portion of the berthing requirement of a vessel. Because the crew size will be influenced by the U.S. Coast Guard requirements of an "inspected vessel", the working group decided to only address the science staff requirements. The group agreed that the crew size should be the minimum possible and serviceable consistent with USCG requirements.

Published SMRs for:

Class II		Class III	
Monohull:	SWATH:	Monohull:	SWATH:
20-25	30-35	15-20	20

REQUIREMENT	MINIMUM	DESIRABLE	MAXIMUM
SCIENCE STAFF (berths)	20	25	30

Priority score: 41 (H=1/M=18/L=2)

8. SPEED (CRUISING) was discussed and a number of issues were identified. Work in the central Pacific will necessarily involve many long transits. Although high speeds are desirable for transit they must be tempered by the cost and the range of the ship. Higher speeds can also be a detriment with respect to some science systems. The potential speed attainable in a SLICE design may differ significantly with a SWATH design or monohull. Sea state was a consideration in the recommended speed range.

Published SMRs for:

Class II		Class III	
Monohull:	SWATH:	Monohull:	SWATH:
14 kts	15 kts	14 kts @ SS4	12 kts @ SS4

REQUIREMENT	MINIMUM	DESIRABLE	MAXIMUM
SPEED (Cruising)	10kts @ SS 6	15kts @ SS 6	17kts @ SS 6

Note: 20kts for the maximum speed value is recommended by SOEST. A full consensus has not been reached.

Priority score: 39 (H=5/M=8/L=8)

9. ENDURANCE was considered that period of time a ship could be at sea without re-supplying food. Although fuel can be an element of endurance, the fuel limitations were considered more critical in the ship's range which is discussed below. The food endurance recommended probably parallels the endurance of science personnel.

Published SMRs for:

Class II		Class III	
Monohull:	SWATH:	Monohull:	SWATH:
50 days	45 days	30 days	30 days

REQUIREMENT	MINIMUM	DESIRABLE	MAXIMUM
ENDURANCE	40 days	50 days	50 days

Priority score: 37 (H=0/M=16/L=5)

10. CRUISING RANGE and speed are elements that have a direct relationship to the size and thus, the cost of the vessel. Increasing the range of the vessel will require greater fuel carrying capacity and as a result will impact the weight of the ship. The ranges recommended below resulted from the fact that the operating area for this vessel is considered to be the Pacific Ocean. A cruise from Hawaii to Easter Island and return would require a minimum range of 8K nm, as would some cruises to service TOGA/TAO arrays. These cruises set the minimum desirable range.

Published SMRs for:

	Class II		Class III	
	Monohull:	SWATH:	Monohull:	SWATH:
	12K	12K	8K	6K

REQUIREMENT	MINIMUM	DESIRABLE	MAXIMUM
CRUISING RANGE (nm)	9K	10K	10K

Priority score: 36 (H=6/M=3/L=12)

11. SCIENTIFIC HOLD SPACE will be a function of expeditionary planning. More is considered better; however, staging in outports is an alternative to a large hold capacity. As a minimum the ship should have sufficient hold space to accommodate a second cruise.

Published SMRs for:

	Class II		Class III	
	Monohull:	SWATH:	Monohull:	SWATH:
	15K	20K	10K	5K

ELEMENT	MINIMUM	DESIRABLE	MAXIMUM
SCIENTIFIC HOLD	10K cubic ft	15K cubic ft	NA

Priority score: 30 (H=0/M=9/L=12)

SCIENCE OPERATIONS: The working group discussed a possible array of science operations envisioned by this ship. Below is a list of operations suggested. The list is not considered to be all inclusive but should be the subject of further discussion.

1. ROVs
2. Mooring Deployment & Recovery
3. Free-Fall Instrument Deployment & Recovery
4. Hydrography
5. Seasoar Towing
   MOCNESS & other nets
6. Deep Towing
7. Multi-Beam Bathymetry
8. Ocean Bottom Observatories (Borehole Re-entry)
9. Coring - Piston, Box
10. Cable-Laying - Lightweight Electro-Fibre Cables
11. Atmospheric Observations
    - Lidars, Radars, Sodars, Balloons
    - Chemical Sampling (Space Distribution Issue)
12. Satellite Receiving & Telecommunication (Deck layout superstructure obstructions)
13. Seismic Streamers, Towed Arrays

14. Hull-Mounted Sampling Systems/Sensors (ADCPs, seawater sampling)

RECOMMENDATION: It is recommended that the design of this vessel will be an evolutionary process that may require large changes in some of the SMRs outlined above. To facilitate this process it is recommended that a FIC ad hoc committee be formed to work with ONR/NAVSEA in the further development of these science mission requirements. It is envisioned that this committee be made up of seagoing scientists and be limited to three in number.

ENCLOSURE 1

FLEET IMPROVEMENT COMMITTEE MEETING
DECEMBER 12-13, 1996

PARTICIPANTS

Fleet Improvement Committee:

Chris Mooers, FIC Chair
Larry Atkinson
Tom Crowley
Eric Firing
Bill Smethie
Suzanne Strom
Bess Ward
Tom Weingartner
Joe Coburn (ex-officio)

UNOLS:

Ken Johnson, Chair
Jack Bash, UNOLS Office
Annette DeSilva, UNOLS Office

Invited Participants:

Mark Brzezinski, UCSB
Curt Collins, NPS
Doug Hammond, USC
Bruce Howe, UW/APL
Bob Knox, SIO
Russ McDuff, UW
Chris Measures, UH
Hugh Milburn, PMEL
John Orcutt, SIO
Brian Taylor , UH

Federal Agency Representatives:

Don Heinrichs, NSF
Sujata Millick, ONR

Observers:

Barry Raleigh, UH
Bob Wall, UNOLS Council

ENCLOSURE 2

From johnson@mlml.calstate.edu Fri Nov 15 08:40:39 1996
Date: Thu, 14 Nov 96 18:19:26 EST
To: unols@gsosun1.gso.uri.edu
From: johnson@mlml.calstate.edu (Kenneth S. Johnson)
Subject: FIC meeting letter

Dear Colleague

I have received a letter (enclosed) from Fred Saalfeld at ONR regarding the construction of the University Operated, Navy owned research ship that is included in the 1997 budget. The letter states that the requirements for the vessel will be developed by ONR with input from UNOLS and the University of Hawaii. They have requested that UNOLS convene a group to develop mission requirements for a Class II/III general purpose research vessel. ONR will then review the requirements and forward them to Naval Sea Systems Command to conduct an assessment of vessel designs, including SWATH, SLICE and monohull designs, that could accommodate the requirements within the amount of money that is budgeted ($45M). Once the design assessment is completed NAVSEA will issue an RFP for vessel construction and ONR will begin operator selection.

UNOLS is to report to ONR by January 27, 1997. The timeline to respond is therefore very short. We have scheduled a meeting of the Fleet Improvement Committee to begin developing the SMR's on December 12 and 13 in San Francisco before the AGU meeting. Representatives from West Coast universities and laboratories with seagoing experience in the Pacific have been invited to the meeting to present their input on the SMR's required for a Central Pacific vessel. We have focused on the Pacific because the MOANA WAVE is nearing retirement and there is a clear need for a vessel to operate in the Central Pacific. Although the SMR's should be developed with the science mission as the critical element, ONR has directed UNOLS to focus on Class II/III size vessels.

The SMR's produced by this group will then be passed to the UNOLS Council for approval. The Council is scheduled to meet in mid-January, 1997.

Development of this research vessel is an excellent opportunity for the science community, and I am looking forward to all of your input.

Sincerely yours,
Kenneth S. Johnson
UNOLS Chair

****
Kenneth S. Johnson 408 755 8657 tel
Moss Landing Marine Laboratories 408 753 2826 fax
PO Box 450
Moss Landing, CA 95039
****

ENCLOSURE 3

REVISED SCIENTIFIC MISSION REQUIREMENTS FOR OCEANOGRAPHIC RESEARCH SWATH SHIP TO REPLACE R/V MOANA WAVE (SOEST, 12/26/96)

General: The ship is to serve as a general-purpose research vessel, primarily for operations in the central and circum-Pacific. The overriding requirement is that the ship provide the most stable environment possible in order to allow both overside and laboratory work to proceed in greater capacity, at higher speeds, and in higher sea states than is now possible. Other general requirements are for larger scientific parties, less vibration and noise, and greater flexibility in the use of lab/deck spaces than is now available aboard intermediate-size research ships.

Size: The size is ultimately determined by the requirements. Available information indicates that these will result in a vessel of about 200 ft LOA and 3000 long tons total displacement. The maximum beam encompassing the lower hulls shall be no greater than 104 feet, to allow passage through the Panama Canal, and the maximum draft in port shall be no greater than 24 feet.

Speed: Minimum 15 knot cruising speed in sea state 6, 10 knots in sea state 7, with speed control +-0.1 knot in 0-6 knot range and +-0.2 knot in 6-15 knot range. The highest possible speeds consistent with fuel economy are desirable (for transit and multi-narrow beam swath mapping). Diesel-electric/SCR propulsion is envisioned, with the diesel generators above the water line for noise/vibration suppression.

Seakeeping: The ship shall be designed to provide exceptionally stable seakeeping capabilities. A tandem-strut SWATH or SLICE design is envisaged. Design targets for the at rest (dead in the water) condition for any orientation of the ship in sea state 6 (significant wave height 3D 17 ft) are:

	Minimum	Desirable
Pitch (ampl.)	4 degrees	3 degrees
Roll (ampl.)	8 degrees	6 degrees
Heave (ampl)	6 feet	4 feet
Vert. Accel.	0.4 g	0.1 g
Horiz. Accel.	0.2 g	0.1 g

Endurance: Fifty days; providing the ability to transit 25 days at cruising speed and 25 days station work (see station keeping and towing); 10,000 nautical mile total range at cruising speed with 15% fuel reserve.

Ice Strengthening: None. Not intended for icebreaking or work in pack ice.

Accommodations: 25 scientific personnel (plus ship's crew) in 11 two-person staterooms and 3 single-person staterooms. Science library-lounge with conference capability (~250 sq ft). Science office (~150 sq ft). Provide general access restrooms, wash facilities and exercise room.

Station Keeping: Allow normal station and deck work through sea state 6, limited work through sea state 7, and survivability through sea state 9. Assure relative positioning at best heading in 35 knot winds, 2 knot current, and sea state 6, within +- 5 degrees of heading and +- 150 ft maximum excursion from a point or trackline. Maintain a precision trackline while towing at speeds as low as 0.5 knots with a heading deviation up to 45 degrees from the prescribed trackline using GPS or bottom navigation as reference. (See navigation and positioning). Speed control along track should be maintained +-0.1 knot (averaged over one minute intervals). Trackline requirements should be met 95% of the time considering the range of sea states specified. Maintain maneuverability while working with over the side lines and gear - i.e. be able to keep gear out of the props.

Towing: Capable of towing scientific packages up to a total tension of 10,000 pounds at 10 knots, 12,000 pounds at 8 knots, and 25,000 pounds at

2.5 knots.

Working Configuration: Minimum 3,500 sq ft open working deck area, with minimum contiguous work areas of 25 ft along full width of stern and 20 x 50 ft along bow, both as close to sea level as possible to facilitate access to the sea surface. Provide for working deck loading up to 1,200 lbs/sq ft and an aggregate total of 100 tons of installed systems (A-frames, cranes, winches, hydraulics, work boats, etc.) plus at least 60 tons (and preferably 100 tons) of itinerant payload (vans, deployable vehicles, scientific equipment, and additional cranes, supplies, etc.). Install one-inch bolt-down fittings on 2-ft centers grid pattern to accommodate portable equipment. Provide removable bulwarks and railings, with the lower hulls and screws not protruding beyond upper hulls. All working decks accessible for power, water, air, and data and voice communication ports.

Cranes: A suite of cranes (1) articulated to work close to deck and water surface, (2) able to lift a max of 20 tons, service the entire usable deck space, and lift 10 tons at the limit of their working areas, (3) overside cranes to have servo controls, to be usable as overside cable fairleads at sea, and at least one to be positioned to lift 10 tons from an adjacent dock/pier. Ship to be capable of carrying portable cranes for specialized purposes such as deploying and towing special instruments

Winches: Oceanographic winch systems with fine control (0.5m/min); constant tensioning. Local and remote controls. Wire monitoring systems with inputs to laboratory panels and digital shipboard recording systems. Permanently installed general-purpose winches shall include:
- Two winches capable of handling 30,000 ft of wire rope or electromechanical/fiber optic cables having diameters from 1/4" to 3/8".
- A winch complex capable of handling 40,000 ft of 9/16" trawling or coring wire and 30,000 ft of 0.68" electromechanical cable (up to 10 KVA power transmission and fiber optics). This is envisioned as one winch with multiple storage drums that can be interchanged.

Additional special purpose winches may be installed temporarily at various locations along work-ing decks. Winch sizes may range up to 40 tons (140 sq ft) and have power demands to 300 hp.

Overside Handling: A versatile combination of frames, booms, and other handling gear to accommodate wire, cable and free launched arrays. Matched to work with winch and crane locations but able to be relocated as necessary. Permanently installed general-purpose systems shall include:
- Stern A-frame, mounted on lowest (lab) deck without overhead, to have 20 ft minimum horizontal, and 30 ft vertical, inside clearance, with 15 ft inboard and outboard reaches; safe working load up to 30 tons.
- Capability to install 20 ft pivoted booms on aft corners of lower deck.
- Climate controlled control stations to give operator protection and operations monitoring and to be located for maximum visibility of overside work.

Laboratories: At least 2,500 sq ft (preferably 3,000 sq ft) of laboratory space including the following (minimum area): Main lab (1,000 sq ft); Wet lab (300 sq ft) located contiguous to sampling areas; Bio-chem Analytical lab (200 sq ft); Electronics/Computer lab and associated users space (500 sq ft, sub dividable); Dry lab (200 sq ft) located proximal to forward meteorological tower; Darkroom (100 sq ft), climate-controlled chamber (100 sq ft), and freezer (100 sq ft). Labs should be located so that none serve as general passageways. Access between labs should be convenient. Labs, offices, storage, and all main deck levels to be served by man-rated freight elevator having clear inside dimensions of at least 4 ft by 6 ft. Labs to be fabricated using uncontaminated and "clean" materials and constructed to be maintained as such. Furnishings, HVAC, doors, hatches, cable runs, and fittings to be planned for maximum lab cleanliness. Fume hoods shall be permanently installed in the Wet and Analytical labs. Cabinetry shall be high-grade laboratory quality (not metal). Flexible lab configurations shall be aided by the use of bulkhead unistruts, deck holddowns, and bench tops that can secure a surface of easily replaceable plywood (that can be drilled and nailed into at will). Provide heating, ventilation, and air conditioning (HVAC) appropriate to labs, vans, and other science spaces being served. Labs shall maintain temperature of 70-75 BOF, 50% relative humidity, and 9-11 air changes per hour, with individual HVAC controls in each lab. Provide filtered air to analytical labs and compressed gas bottle racks. Each lab area shall have a separate electrical circuit on a clean bus with continuous delivery capability of at least 40-volt amperes per sq ft of lab deck area. Labs shall be furnished with 110 v and 220 v AC. Total estimated lab power demand is 100 KVA. Provide uncontaminated sea water supply and clean compressed air supply, free of oil, to most labs, vans, and several key deck areas. Provide 20 ft tower (with sampling platform, power, gas and electro-optical data lines) atop forward super-structure for aerosol, gas and rain sampling, optical measurements, and meteorological observations.

Vans: To carry three standardized 8 ft by 20 ft vans which may be lab, berthing, storage, or other specialized use. Hookup provision for power, HVAC, fresh water, uncontaminated sea water, compressed air, drains, communications, data and shipboard monitoring systems. Van access direct to ship interior. Provision to carry up to three additional portable non-standard vans (450 sq ft total) on working decks. Supporting connections at several locations around ship including lower fantail and foredeck (see working configuration). Ship should be capable of loading and offloading vans using own cranes.

Workboats: At least one 19-ft inflatable (or semi-rigid) boat located for ease of launching and recovery. A scientific work boat 25-30 ft LOA specially fitted out for supplemental operations at sea including collecting, instrumentation, and wide-angle signal measurements. 12-hour endurance including both manned accommodations and automated operation. "Clean" construction. To be carried as one of three van options above.

Science Storage: Total of 15,000 cubic ft of scientific storage accessible to labs by freight elevator and weatherdeck hatch(es). Half to include suitable shelving, racks, and tie downs; remainder open. Chemical reagent storage in suitable location.

Acoustical Systems: Ship to be as acoustically quiet as practicable in the choice of all shipboard systems, their location and installation. Hulls, transducer wells and bow thruster should be designed to minimize the presence of bubble layers in front of the transducers (e.g., bow thruster on different pontoon/pod than transducers). Design target is operationally quiet noise levels at 15 knots cruising in sea state 5 (and preferably, at higher speeds and sea state 6) at the following frequency ranges:
4 Hz - 500 Hz seismic
3 kHz - 50 kHz echo sounding and acoustic navigation
75 kHz - 300 kHz Doppler current profiling
Ship to have (1) 12 kHz and 3.5 kHz echo sounding systems and provision for additional systems, (2) acoustic Doppler current profiler systems operating at about 150 kHz and 75 kHz, together with some system (acoustic or otherwise) for measuring currents in the 0-20 m depth range (shallower than presently usable ADCP data), (3) phased array, multi-narrow beam precision echo sounding system (equivalent to "SeaBeam 2100" or "Simrad EM" series or better) - this requires pontoons/pods at least 25 ft wide, (4) transducers appropriate for dynamic positioning system, (5) transducer wells (20") located forward and aft, (6) large pressurized sea chest (4 ft x 8 ft) located at optimum acoustic position for at-sea installation and servicing of transducers and transponders.

Environmental Systems: Ship to have (1) underway standard meteorological sampling (from tower on forward superstructure) - this could be satisfied with the "IMET" system plus an optical raingauge, (2) continuous seawater sampling system, including intake from the nose of one pontoon, proximal measurement of temperature and salinity (using a "Sea-Bird SBE-21" thermosalinograph or equivalent), two pumps (centrifugal, 150 litre/min) and two separate supply lines (1" fiberglass pipe and 1-1/2" polypropylene tubing) to deliver water to the hydro and wet labs and the following instruments: flow-though fluorometer, nutrient analyser, transmissometer, and CO2/O/pH/H2O2 meters, (3) deployable bow boom or other system for air-sea interface sampling, (4) facility to attach additional sensors and through-hull data links (e.g., to measure turbulence) to the nose of the pontoon without acoustic systems.

Geophysical Systems: Ship to have (1) gravity meter installed as near as possible to the center of motion, (2) shipboard (not towed) 3-component magnetometer system, (3) compressors capable of generating 500 scfm at 2500 psi, with high-pressure plumbing connecting to large sound sources (airguns) and their deployment systems; with the ability to expand the sound source capacity to 2000 scfm at 2500 psi by the addition of compressors in vans, (4) the capability to carry out multichannel seismic profiling surveys using these sound sources and long streamers (3-6 km).

Navigation and Positioning: Ship to have (1) DGPS and P/Y-code GPS, (2) GPS attitude determination to 0.1 degree or better (e.g. "Ashtech 3DF-ADU2" or equivalent), (3) short baseline acoustic navigation system, (4) "dynamic positioning" capability to maintain the ship on station or on trackline to the station keeping specifications under automatic control and appropriate navigational reference.

Internal Communications: Internal communication system providing high-quality voice communications throughout all science spaces and working areas. Optical fiber Ethernet cabling and connections shall connect all science spaces including staterooms, labs, vans, meteorological tower, pontoon nose and key working areas. Data and power cable races shall be kept separate and as far from each other as possible. Provide closed-circuit televison monitoring and recording of all working areas including subsurface performance of equipment and its handling. Monitors for all ship control, environmental parameters, science and overside equipment performance shall be provided in all, or most, science spaces.

External communications: Provide (1) reliable voice channels for continuous communications to shore stations (including home laboratories), other ships, boats, and aircraft; this includes satellite, VHF, and UHF, (2) facsimile communications to transmit high-speed graphics and hard-copy text on regular schedules, (3) high-speed data communications (56 K baud) links to shore labs and other ships on a continuous basis.

Satellite Monitoring: Carry transponding and receiving equipment including antenna to interrogate and receive satellite readouts of environmental remote sensing. Satellite antennas and the GPS-attitude sensor should be positioned with a reasonably clear view of the sky and adequate distance from radar and other ships antennas.

Ship Control: Chief requirement is maximum visibility of deck work areas during science operations and especially during deployment and retrieval of equipment. This may require additional or portable control stations besides the bridge-pilot house. The functions, communications, and layout of the ship control station(s) should be designed to enhance the interaction of ship and science operations. For example, ship course, speed, attitude, and positioning will often be integrated with scientific operations requiring control to be exercised (possibly by computer) from a laboratory or working deck area.

Noise Control: Laboratories, working deck areas, ship control stations and library/conference room must meet Category "A-12" airborne noise criteria. Other spaces (except machinery) must meet "A-3".

Sea State	Description	Height (ft)
0	Calm-glassy	0
1	Calm-rippled	0-0.5
2	Smooth-wavelets	0.5-1.5
3	Slight	1.5-4
4	Moderate	4-8
5	Rough	8-13

6	Very Rough	13-20
7	High	20-30
8	Very high	30-45
9	Phenomenal	Over 45

At its 12-13th Dec 96 meeting, the UNOLS Fleet Improvement Committee, plus invited scientific representatives from Pacific coast marine institutions, considered a set of SMRs submitted by SOEST that was substantially revised (12/10/96) following community wide responses to a draft version (10/24/96).

The further revised SMRs (above) seek to incorporate comments from that meeting and to reflect the consensus view noted in the following table. The meeting participants gave the key SMR design parameters consensus ranges (minimum/desirable/maximum) and then ranked them in order of priority for achieving the desirable (as against minimum) specification.

Parameter	Minimum	Desirable	Max	Vote (hi/med/lo/total)	Notes
Sea Keeping:	SS-6 (17 ft.)	SS-6 (17 ft.)	-	21/0/0/63	
Pitch (ampl.)	4 degrees	3 degrees	-		
Roll (ampl.)	8 degrees	6 degrees	-		
Heave (ampl.)	6 feet	4 feet	-		
Vert. Accel.	0.4 g	0.1 g	-		
Horiz. Accel.	0.2 g	0.1 g	-		
Deck Space:	2000 sq ft	-	-	16/5/0/58	(priority is configuration)
Station Keeping:	SS-6	SS-7	SS-7	15/6/0/51	(+-50m & 5 BO, best heading)
Science Payload:	100/60	100/100	-	7/12/2/47	(installed/ itinerant tons)
Draft (ft):	-	20	24	7/11/3/46	(variable draft desirable)
Lab Space (sq ft):	2,500	3,000	3,500	6/11/4/44	
# Science Staff:	20	25	30	1/18/2/41	
Cruising Speed: (kts in SS-6)	10	15	20	5/8/8/39	(max only if SLICE (higher speeds lose some science systems))
Range (nm)	9,000	10,000	10,000	6/3/12/36	
Endurance (days):	40	50	50	0/16/5/35	
Science Hold (cu ft):	10,000	12,000	15,000	0/9/12/30	

APPENDIX XIV

PROJECTED SCHEDULE OF CONSTRUCTION, MID-LIFE REFIT AND RETIREMENT OF SHIPS IN THE UNOLS FLEET																																		
	BUILT	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
CLAS I/II																																		
MELVILLE	1969	---	---	---	---	---	---	---	---	---	---	X	---	---	---	---	---	---	---	---	R													MELVILLE
KNORR	1970	---	---	---	---	---	---	---	---	---	---	X	---	---	---	---	---	R																KNORR
THOMPSON	1991	---	---	---	---	---	---	---	---	---	---	---	M	---	---	---	---	---	---	---	---	---	---	---	---	---	R							THOMPSON
REVELLE	1996	C	---	---	---	---	---	---	---	---	---	---	---	---	---	---	M	---	---	---	---	---	---	---	---	---	---	---	---	---	---	R		REVELLE
EWING	1983	---	---	---	---	M	---	---	---	---	---	---	---	---	---	---	---	---	---	X	---	---	---	---	R									EWING
MOANA WAVE	1973	---	---	---	X	---	---	---	---	R																								MOANA WAVE
CLASS III																																		
SEWARD JOHNSON	1985	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	R													SEWARD JOHNSON
WECOMA	1976	---	---	---	---	---	---	---	---	---	---	---	---	---	X	---	---	---	---	R														WECOMA
ENDEAVOR	1977	---	---	---	---	---	---	---	---	---	---	---	---	X																				ENDEAVOR
GYRE	1973	---	---	---	---	---	---	---	X																									GYRE
OCEANUS	1976	---	---	---	---	---	---	---	---	---	---	---	---	---	X	---	---	---	---	R														OCEANUS
NEW HORIZON	1978	---	---	---	---	---	---	---	---	---	---	---	---	---	---	X	---	---	---	---	---	R												NEW HORIZON
EDWIN LINK	1982	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	R																EDWIN LINK
CLASS IV																																		
POINT SUR	1981	---	---	---	---	---	---	---	---	---	---	---	---	---	---	X	R																	POINT SUR
CAPE HATTERAS	1981	---	---	---	---	---	---	---	---	---	---	---	---	---	---	X	R																	CAPE HATTERAS
ALPHA HELIX	1966	---	X	---	---	R+																												ALPHA HELIX
SPROUL	1981	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	X	---	---	---	R													SPROUL
CAPE HENLOPEN	1976	---	---	---	---	---	---	---	---	X	---	R																						CAPE HENLOPEN
WEATHERBIRD II	1981	---	---	M	---	---	---	---	---	X	---	---	---	---	---	---	---	---	R															WEATHERBIRD II
SEA DIVER	1959	---	---	---	---	---	---	R																										SEA DIVER
PELICAN	1985	---	---	---	---	---	---	---	---	---	R																							PELICAN
LONGHORN	1971	---	---	---	---	---	R																											LONGHORN
<CLASS IV																																		
URRACA	1986	---	>																															URRACA
LAURENTIAN	1974	---	>																															LAURENTIAN
BLUE FIN	1972	---	---	---	---	---	R																											BLUDE FIN
CALANUS	1971	---	---	---	---	---	R																											CALANUS
BARNES	1966	---	>																															
SPECIAL PURPOSE SHIP																																		
ATLANTIS	1997	---	C	---	---	---	---	---	---	---	---	---	---	---	---	---	---	M	---	---	---	---	---	---	---	---	---	---	---	---	---	---	R	
ATLANTIS II		X																																

C = CONSTRUCTION
M = MID-LIFE REFIT
X = FIP95 RETIREMENT DATE
R = RETIREMENT

UNOLS VESSEL ESTIMATED USEFUL LIFE

Based on the responses to the UNOLS e-mail message dated 11/18/96 regarding vessel use-life, we have compiled a table listing the vessels and their dates of construction, conversion/mid-life, and predicted retirement from the the UNOLS fleet. The 1995 Fleet Improvement Plan, Figure I-1 on page 12 was used as a starting point. The figure's retirement dates were modified in accordance with the feedback received from you. When feedback was not received, we used the dates as presented in the figure.

****
****

SHIP	BUILT	CNV/MDR	RETIRED
CLASS I/II			
MOANA WAVE	1973	1984	2004
MELVILLE	1969	1991	2015
KNORR	1970	1989	2012
EWING	1983	1990	2019
THOMPSON	1991	2007	2021
REVELLE	1996	2011	2026
ATLANTIS	1997	2012	2027
CLASS III			
GYRE	1973	1980	2003
ENDEAVOR	1977	1993	2008+
NEW HORIZON	1978	1996	2016
EDWIN LINK	1982	1988	2012
WECOMA	1976	1994	2014
OCEANUS	1976	1994	2014
SEWARD JOHNSON	1985	1995	2015
CLASS IV			
ALPHA HELIX	1966	1984	+
LONGHORN	1971	1986	2001
SEA DIVER	1959	1992	2002
PELICAN	1985		2005
CAPE HENLOPEN	1976		2006
POINT SUR	1981		2011
CAPE HATTERAS	1981	1998	2011
SPROUL	1981	1985	2015
WEATHERBIRD II	1981	1993	2013
<CLASS IV			
URRACA	1986	1994	
LAURENTIAN	1974		
BLUE FIN	1972	1975	2001
CALANUS	1971		2001+
BARNES	1966	1984	

From unols@gsosun1 Wed Dec 4 15:06:10 1996
Date: Mon, 18 Nov 1996 15:49:32 -0500 (EST)
From: UNOLS Office <unols@gsosun1>
Subject: Vessel Use-Life Prediction
To: mailinglist rvoc <rvoc@diu.cms.udel.edu>
cc: ken Johnson <johnson@mlml.calstate.edu>, chris mooers <cmooers@rsmas.miami.edu>, "office,uri unols" <unols@gsosun1.gso.uri.edu>

To: RVOC
From: UNOLS Office

The UNOLS Fleet Improvement Committee is in the process of updating the Fleet Improvement Plan. For our upcoming meeting, we would like to look at the age of the fleet and determine the useful life of each vessel. The formula used to-date has predicted the ship life at 20 years. If a ship has received a mid-life refit the life the useful life is extended to 30 years. Recent feedback from operators has indicated that this formula may or may not always be valid.

We are taking a poll of each of the UNOLS vessels operators. If your institution's formula differs from the formula provided above, please let us know the formula. Also, please provide the year you predict your vessel(s) will be removed from operation in the UNOLS fleet.

A table summarizing this information will be circulated prior to the FIC meeting.

Thank you for your help,
Annette
****

From pfeiffer@udel.edu Tue Nov 19 09:06:33 1996
Date: Mon, 18 Nov 1996 17:00:10 -0500 (EST)
From: Timothy Pfeiffer <pfeiffer@udel.edu>
To: UNOLS Office <unols@gsosun1.gso.uri.edu>
Subject: Re: Vessel Use-Life Prediction

I'd say that in general I agree with the 20/30 year spans. We're just finishing 20 and are planning to request funds for some rennovations and upgrades this year. We expect to run at least another 10 years after that so 2006 would be a reasonable retirement date for the CAPE HENLOPEN. Since the CAPE HATTERAS and PT SUR will follow shortly this means that the science mission requirements for new coastal zone vessels should become a matter of some urgency within a year or two.

Regards, Tim

****

From jcoburn@whoi.edu Wed Nov 20 07:39:26 1996
Date: Tue, 19 Nov 1996 14:26:20 -0500
To: UNOLS Office <unols@gsosun1.gso.uri.edu>
From: Joe Coburn <jcoburn@whoi.edu>
Subject: Re: Vessel Use-Life Prediction

GENERAL

The expected service life of a ship depends on many factors. For examples: initial design and construction, quality of care over its lifetime, and equipment obsolescence. A ship that is well-maintained to ABS, Coast Guard, UNOLS and Navy standards could last a long time but at some point becomes a financial burden. With no upgrade or midlife renovation, 30 years would be a good planning lifetime. Ships receiving extensive upgrades should have extended life expectancy, as a result helping to amortize such expeditures.

SHIP-SPECIFIC COMMENTS

KNORR

KNORR underwent a major conversion. The conversion involved:
- Reengining: diesel/electric
- New propulsors - 3 z-drives
- Extensive repiping throughout the ship
- Extensive rewiring throughout the ship
- SeaBeam 2112 is new and the same state-of-the-art as REVELLE and ATLANTIS.
- Other shipboard electronics are new.
- Both hydrowinches are new Markey DESH-5's.

Much work has been done post-delivery to correct all shipyard deficiencies.

Expected service life 1992 plus 20 years or 2012.

OCEANUS

OCEANUS underwent mid-life overhaul in 1994.
Significant work incident to MLO:
- New superstructure
- Completely rehab'd laboratories
- New HVAC system
- New Reefer and freezer
- New windlass and capstan
- New traction/trawl winches
- Upgraded Science Information System
- Main engine upgrade
- New generators
- New emergency generator

These vessels are simple in design and intrinsically easy to maintain. OCEANUS can be expected to operate cost-effectively until 1994 plus 20 years or 2014.

Regards,
Joe Coburn

****

From quentinl@duncoc.ml.duke.edu Wed Nov 20 07:37:08 1996
Date: Tue, 19 Nov 96 10:42:50 EST
To: UNOLS Office <unols@gsosunl.gso.uri.edu>
From: "Quentin M. Lewis, Jr." <quentinl@duncoc.ml.duke.edu>
Subject: Re: Vessel Use-Life Prediction

Hi Annette:
The CAPE HATTERAS was completed and put in service in July, 1981. We are currently planning a midlife refit in late 1998 or early 1999. This would give the vessel a useful life to at least 2011, based on the current 30 year

formula. Given the excellent condition of the vessel now, and our current level of maintenance, I would predict that the HATTERAS could go as long as 2016, without significant increase in maintenance and operating costs.

Anything else you need, let me know. Thanks............

****

From TAskew@HBOI.edu Wed Nov 20 07:39:02 1996
From: Tim Askew <TAskew@HBOI.edu>
To: UNOLS Office <unols@gsosun1.gso.uri.edu>
Subject: RE: Vessel Use-Life Prediction
Date: Tue, 19 Nov 1996 13:39:00 -0500

Annette,
Here is information on Harbor Branch Vessels

R/V SEWARD JOHNSON - Built in 1985; Midlife in 1995; 20 years in 2015 +/- 2 years
R/V EDWIN LINK - Built in 1982; Converted/Midlife in 1988; 20 years in 2012 +/- 2 years
R/V SEA DIVER - Built in 1959; Extended/Midlife in 1992; 20 years 2002 +/- 2 years

Hope this information helps. Regards, Tim Askew
Harbor Branch Marine Operations

****

From dpowell@rsmas.miami.edu Wed Nov 20 07:39:16 1996
Date: Tue, 19 Nov 1996 13:52:54 -0500
To: UNOLS Office <unols@gsosun1.gso.uri.edu>
From: Dave Powell <dpowell@rsmas.miami.edu>
Subject: Re: Vessel Use-Life Prediction
Cc: dpowell@rsmas.miami.edu

Annette
I don't know that there was ever an institutional formula for ship life. The Iselin was 22/23 years in service when it was grounded in 1994. There was a clear plan that it had substantial life remaining and would continue in service. The work done on it due to the grounding would constitute a mid/late life refit. I would suggest there is 10+ years of service in it and that puts it at 30-35 years total.

The R/ V Calanus is of a similar vintage. We are working on getting started with a replacement but we would consider the Calanus to have a number of years of life left.

There have been a number of other vessels here at RSMAS but I know very little about their age, what retirement criteria were used, etc.

Regards
Dave Powell

****
From fnts@aurora.alaska.edu Thu Nov 21 08:39:40 1996
Date: Wed, 20 Nov 1996 14:20:46 -0900 (AKST)
From: SMITH TOM _ <fnts@aurora.alaska.edu>
To: UNOLS <UNOLS@gsosun1.gso.uri.edu>
Cc: Tom Weingartner <weingart@ims.alaska.edu>
Subject: Vessel Use - Life Prediction

We do not have a formula regarding life predicition for the Helix. The vessel is maintained to ABS class. As such it has all equipment, spaces, machinery, hull guaging inspected by ABS every 5 years. The vessel is according to ABS Inspefctors and shipyard workers in excellent shape. Hull guaging show little wear over the vessel's life.

I do not believe a vessel's useful life fits well into any formula. I suggest that you use the 20 years as a rule at which all vessels are surveyed throughly by an independent agency and its remaining life expectancy forecast based on the survey and future operations. This seems a more realistic approach than asking the vessel operators for a prediction.//Tom
Smith

****
From lblack@bbsr.edu Mon Nov 25 07:46:30 1996
Date: Fri, 22 Nov 1996 10:43:50 -0400
To: UNOLS Office <unols@gsosun1.gso.uri.edu>
From: lblack@bbsr.edu (Lee Black)
Subject: Re: Vessel Use-Life Prediction
Cc: dennis@sargasso.bbsr.edu, mpollak@bbsr.edu,
        sspurling@bbsr.edu (Sandy Spurling)

Hello Annette,

The WEATHERBIRD II had a major conversion in 1993. This would extend it's usefull life by at least 20 years to 2013.

Some of the work included:

Complete re-work of accommodations
Added accommodations
New wheelhouse and aft-control station
New bow-thruster and compartment
New main lab and CTD garage
New Markey DUSH-5 CTD winch
Re-built main engines
New generators

Cheers,

Lee Black

****

From jonesf@ucs.orst.edu Mon Nov 25 07:47:15 1996
From: "Fred J. Jones, Mar. Supt." <jonesf@ucs.orst.edu>
To: 'UNOLS Office' <unols@gsosun1.gso.uri.edu>
Cc: "'G. Brent Dalrymple'" <gbd@oce.orst.edu>
Subject: RE: Vessel Use-Life Prediction
Date: Thu, 21 Nov 1996 11:33:02 -0800

Annette, I'd use the same points Joe a WHOI did for OCEANUS to estimate WECOMA's replacement as 2014, 20 years beyond the 1994 "mid-life."

--- Fred
****
From bcoste@poha.soest.hawaii.edu Wed Dec 4 15:23:38 1996
Date: Tue, 26 Nov 1996 10:22:26 -1000 (HST)
To: unols@gsosun1.gso.uri.edu
From: bcoste@poha.soest.hawaii.edu (Bill Coste)
Subject: Ship Use-Life Prediction
Cc: b.taylor@soest.hawaii.edu, snug@soest.hawaii.edu

Regarding the subject inquiry, we don't have a formula for predicting useful life of a vessel. I agree with Joe Coburn that it depends on construction, maintenance, mission requirements and operating area. Certainly, 30 years is reasonable and many ships are still in service after more than 40 years. Frankly, a lot would depend on the economics of repair/maintenance versus replacement. Obviously, an owner who couldn't afford replacement would view useful life far differently from one who could.

Addressing MOANA WAVE, since she is owned by the Navy, they would determine replacement/retirement. She is in good enough condition to safely operate through 2004 (30 years), but is becoming obsolete as a research vessel due to changing technology (dynamic positioning, SeaBeam, etc) and major modifications/upgrades are not feasible due to her age. In other words, her usefulness to the science community (user days) will dictate her eventual demise before her material condition.

Bill Coste

****

From b_hahn@gsosun1.gso.uri.edu Thu Dec 5 13:20:17 1996
Date: Thu, 05 Dec 1996 11:09:34 -0500
To: unols@gsosun1.gso.uri.edu
From: Bill Hahn <b_hahn@gsosun1.gso.uri.edu>
Subject: Retirement of ENDEAVOR

Annette:

This is our response to your question on retirement.

>In principle URI/GSO agrees with the existing retirement formula of 30 years with a mid-life refit. This would mean that the ENDEAVOR would be retired in the fall of 2008. There are many considerations that go along with picking this date however and, we feel that the ENDEAVOR could physically extend well beyond that date. The question is would anyone want her to.
>
>The mid-life done on the ENDEAVOR did not touch the bottom end of the main engine, ship's generators or their prime movers, the main switchboard, or the hull of the vessel. This machinery and structure will suffer breakdowns, increasing in frequency with time, and will have to be ultimately replaced or repaired at great cost. The cost effectiveness of doing this will be based on several things. The need for the ship in the UNOLS fleet or the availability of a replacement.

A lot of the effort and dollars invested in the ENDEAVOR during her mid-life refit were to improve her ability to meet the needs of the science being done now and into the future. In ten years mission obsolescence may be a factor again. Will there be money to bring ENDEAVOR's outfit back to the level required for the science being done at that time, and will such an investment be considered a good one? We believe increasing bunk space and/or lab space, to meet changing mission requirements, could not cost effectively be accomplished on a vessel of ENDEAVOR's age and could affect her desirability in the future.

****

From marsupt@ldgo.columbia.edu Fri Dec 6 08:31:53 1996
Date: Fri, 6 Dec 96 00:20:36 GMT
To: UNOLS Office <unols@gsosun1.gso.uri.edu>
From: marsupt@ldgo.columbia.edu (Paul Ljunggren)
Subject: Re: UNOLS Vessels - Use-life Prediction

Annette:

Received the chart projected on retirements R/V's and would just like to offer a comment.

With regards to the life of a ship, I failed to reply and suddenly find myself a day late and a dollar short. My initial reaction was that Joe Coburns message on the life of a ship really said it all. If a ship is maintained IAW CG regulations, maintained per classification society standards it should not have a problem having a service life in excess of 30 year.

I think that in terms of the service our ship's see, a midlife refit is more critical from the perspective of keeping up with improving technology and being able to meet new /changing mission requirements.

Regards

Paul
****
From steve@skio.peachnet.edu Fri Dec 6 13:22:20 1996
Date: Fri, 6 Dec 96 13:13:21 EST
To: unols@gsosun1.gso.uri.edu
From: Steve Carignan <steve@skio.peachnet.edu>
Subject: Vessel Use-Life Prediction

Hello Annette
If possible, please include this information on the R/V Blue Fin. The Blue Fin was built in 1972 and went through a major conversion to a research vessel in 1975. The ship has a wood hull and has be well maintained over the years. I find the refit formula does not work very well in our case and estimate that the ship has 5 years of service left making the maximum replace date 2001. Skidaway Institute is in the process of design and replacement of this ship. The proposed replacement vessel is a new 85' fiberglass research ship designed for coastal and estuary work. Prospects are very good that this ship will replace the Blue Fin within the next 3 years.

Thanks Steve

****
From capt@mpl.ucsd.edu Mon Dec 9 09:11:04 1996
Date: Fri, 6 Dec 96 08:43:55 PST
To: desilva@gsosun1.gso.uri.edu
From: Thomas Althouse <capt@mpl.ucsd.edu>
Subject: Ship Life Expectancy
Cc: knox@sio.UCSD.EDU, seaweed@mpl.ucsd.edu, woodys@odf.ucsd.edu,
mfshop@mpl.ucsd.edu, joan@mpl.ucsd.edu, larry@mpl.ucsd.edu

Annette,

Sorry for the delay in responding to your request for estimates of ship life expectancy. I'm afraid it got lost in the rush of getting ROGER REVELLE ready for her first expedition which starts December 27th.

SIO feels that the following dates should be utilized for estimates of the useful lives of our ships.

MELVILLE -- 2015

As noted for KNORR, major material upgrades, system replacements and repairs during the mid-life refit which ended for MELVILLE in 1992 will result in a significant increase in the useful life of the ship. We estimate that the ship will provide excellent service to science until the year 2015.

NEW HORIZON -- 2016

The mid-life refit completed in May of 1996 improved material condition and upgraded systems which should result in this very capable intermediate ship successfully supporting science for 20 more years.

ROBERT GORDON SPROUL   2015

This ship entered service as an R/V in 1985. Useful service life at that time was based on 30 years from her completion of construction in 1981 which resulted in an end of service date of 2011. While the ship has not been given a major refit, continued incremental improvements have been accomplished and useful service is now projected until at least 2015. This will be extended if a major refit is scheduled.

ROGER REVELLE   2026

The current 30 year projection is considered valid. If a mid-life refit is scheduled at a future date, this date will be considerably extended.

Have a nice Christmas,

Tom