UNIVERSITY - NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

UNOLS
DEEP SUBMERGENCE SCIENCE COMMITTEE MEETING

SUMMARY REPORT

May 31, 1995
June 1-2, 1995

Carriage House
Woods Hole Oceanographic Institution
Woods Hole, MA

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MEETING REPORT SUMMARY

APPENDICES

PREFACE: Over the past year a sequence of events have transpired relating to the Deep Submergence Support Ship (DSSS) conversion. These events are outlined below and the correspondences referenced in the outline are included in ***Appendix 0***. We encourage you to refer to ***Appendix 0*** prior to reading these minutes. The correspondences will help bring you up to date on the status of the conversion options and schedule.

1) Pre-December 1994: KNORR is the designated platform for DSSS conversion. WHOI working with The Glosten Associates and the DESSC KNORR Conversion Subcommittee prepare a preliminary design package.

2) February 9, 1995: KNORR Conversion Subcommittee Chair, Karen Von Damm, sends a letter to WHOI and the community. The letter reviews plans for the

KNORR Conversion and provides the operator with community input and recommendations, see ***Appendix 0.***

3) February 27, 1995: Jeff Fox, Mike Perfit and Dick Pittenger meet with NSF, ONR and NOAA in separate meetings to present the proposed KNORR Conversion plans.

4) March 1995: Agencies advise WHOI and DESSC that the planned 1996 conversion KNORR will be delayed approximately six months. The delay will allow KNORR to conduct science operations on its return trip from the southern oceans in the first half of 1996. Additionally, the delay allows the agencies to explore alternative options for the DSSS Conversion.

5) April 6, 1995: Jeff Fox sends a letter to the community advising them of the delay in planned conversion of KNORR. He requests input on areas of interest for ALVIN diving in 1996, see ***Appendix 0.***

6) April 1995: ONR requests NAVSEA to assess feasibility of converting AGOR 25, ATLANTIS, to handle DSRV ALVIN.

7) April 24-25: At the UNOLS Council Meeting, Mike Perfit reviews community interest in ALVIN diving in 1996. Agencies, WHOI and UNOLS discuss DSSS Conversion issues, options and schedule.

8) May 31, June 1-2: DESSC Meeting is held at WHOI. DSSS conversion issues are deliberated. The meeting summary report follows.

9) June 2, 1995: DESSC sends letter to agencies recommending preferred DSSS conversion options, see ***Appendix 0.***

10) June 2, 1995: NAVSEA provides ONR with results from their study to assess the feasibility of converting AGOR 25 to a handling platform for ALVIN. Study indicates that this option is feasible subject to further design and analysis.

11) June 28, 1995: Mike Perfit, DESSC Chair, sends letter to Deep Submergence Research Community providing a status of DSSS conversion efforts. The letter also offers projected 1996/97 operating areas for ALVIN and ROV/Towed vehicles. This correspondence is provided as the ***Cover Letter*** to these meeting minutes.

Wednesday, 31 May:

I. WELCOME, INTRODUCTIONS AND MEETING GOALS: Jeff Fox, DESSC Chair, called the meeting to order at 8:30 a.m. The agenda was reviewed and is included as ***Appendix I.*** These minutes reflect the order in which items were addressed. A list of meeting participants is included as ***Appendix II.*** Jeff noted that Mike Perfit's appointment as the new DESSC Chair was endorsed by the UNOLS Council.

II. ACCEPT MINUTES: The minutes of the December, 1994 DESSC meeting were accepted as written.

Bob Gagosian, Director of WHOI, welcomed the DESSC. He stated that WHOI is dedicated to the support of the National Deep Submergence Facility. WHOI is willing to do everything they can to help with the transition of the submersible platform from KNORR to ATLANTIS if this is the preference of the agencies. WHOI will do what they can to help the community through this process. WHOI is also dedicated to the future of both submersible and ROV/towed vehicle operations.

STATUS REPORTS

III. REPORT ON WHOI/DESSC MEETINGS WITH NOAA/NSF/ONR: - In February Mike Perfit, Jeff Fox and Dick Pittenger met with NSF, NOAA and ONR. The objective of their meeting was two-fold: 1) To make one agency the lead agency for the deep submergence facility. This agency would be responsible for maintaining the funding for the facility. The agencies response to this concept was that they are dedicated to supporting the deep submergence facility, but they do not wish to change the structure of the Memorandum of Agreement (MOA). In other words, they do not support the concept of a lead agency at this time. 2) The second objective of the meeting was to present plans for conversion of KNORR to a deep submersible support platform. Under the Woods Hole plan, KNORR would return to Woods Hole and begin the conversion in the early part of 1996. This would mean that the ship would have to transit directly back from Kenya. The agencies did not support this time schedule and indicated that KNORR would have to work its way back to Woods Hole. WHOI also proposed to provide the funding to begin the conversion. They could be reimbursed by the agencies when funding was available. The agencies had not budgeted for the conversion and therefore did not have the funds to start the conversion in 1996. The agency response was to delay all plans for six months. ATLANTIS II would return to Woods Hole in August 1996. During the six month delay, the agencies would look at all of the options for providing a submersible platform for deep submergence. The feasibility of making AGOR 25 the submersible platform would be explored.

In April, Jeff Fox wrote to the community and gave them the status of the KNORR conversion plans. He asked that the community generate letters of interest for ALVIN work that might be able to be accomplished in 1996.

Mike Perfit continued with a summary of the DESSC report from the UNOLS Council Meeting. The Council and agencies stated that they were very concerned with the future utilization of the large ships in the UNOLS Fleet. NSF had been asked to develop budgets for a reduction of 20% by the year 2000. Their priorities are first, people; second, instruments and third, infrastructure/facilities. It was also noted at the Council meeting that overall ship use by agencies other than NSF is down. The budget does not appear to be able to support the conversion of KNORR along with the operation and maintenance of the other large ships in the UNOLS fleet. Don Heinrichs presented his "modest proposal" which shows retirement of ATLANTIS II in mid 1996 and some realignment and downsizing of the fleet (See Section V). The near term future of ALVIN operations was unclear. If ALVIN were available for science in 1996, proposals would need to be submitted and funded. Depending on which vessel is selected to be the ALVIN support ship and the timing of construction, ALVIN could potentially be out of service for a period of 18 months. During the Council meeting, Mike Perfit stressed that the initial response to the DESSC's request for letters of interest for ALVIN use in 1996 was very high. Additionally, Mike voiced concern over the potential for an ALVIN down period of 18 months, indicating that this could impact the future stability of the National Facility and deep submergence science programs .

Dolly Dieter responded to Mike Perfit's report of the Council Meeting by indicating that with NSF bracing itself for a 20% reduction by the year 2000, the option of amortizing the KNORR Conversion would not be feasible. Presently, NAVSEA is conducting a study on the feasibility of outfitting ATLANTIS (AGOR 25) as the support ship for ALVIN operations. Woods Hole was concerned that through this support ship transition phase, the ALVIN team must be kept viable. Ways to keep the pilots trained must be addressed. DESSC was also concerned with the effects of ALVIN downtime on science programs and time-series work. Dolly pointed out that NSF has always included a submersible support ship in their future fleet plans. She also noted scheduling for the large ships was looking grim because of the decrease in funded science.

IV. National Deep Submergence Facility Operations at WHOI:

A. 1995 Deep Submergence Field Programs: Completed and Scheduled -

1. ALVIN/ATLANTIS II - Barrie Walden gave the update on ALVIN/ATLANTIS operations in 1995, see ***Appendix III***. The year began with a standown in Woods Hole. Operations resumed with a Jeff Karson dive program. Unfortunately, power problems were experienced during the first half of his cruise because the batteries were not charging adequately. Problems with the CTFM were also adversely affecting the science objectives. However, Jeff was able to complete most objectives of the cruise despite the problems. The engineering dives prior to the Karson cruise did not encounter the battery and CTFM problems and it was not until actual diving that the problems were revealed. Compounding the situation was the difficulty in troubleshooting the problem both onboard and at WHOI. It was felt that additional engineering dives may have revealed the problem sooner, and lessened the impact on the science program. DESSC recommends that the agencies be asked to fund more deep-water engineering dives after standowns.

Following Karson's cruise, work continued in the Atlantic with dives for Von Herzen, Becker and Schultz at the MAR-TAG site before transiting to the Pacific. In April, there was a Mullineaux/Fisher cruise at 9°-10°N in the early part of the month. The month ended with ten dives off California by Smith and Druffle. In May, ALVIN had a two week stand-down period in San Diego. In 1995, 170 ALVIN dives are planned, corresponding to 317 ATLANTIS II operating days. 47 dives have been completed as of 25 May, with one day lost to weather. It was noted that NOAA funding for operations in 1995 has been received at WHOI.

2. Tethered Systems - Andy Bowen provided the status of tethered systems at WHOI, see ***Appendix IV***. Proposal interest using DSOG unmanned vehicles appears to be growing. The first viewgraph shows the proposals submitted by agency for the years 1992 through 1995. He continued with a review of 1994 and 1995 operations for JASON/MEDEA, ARGO II and DSL 120.

JASON/MEDEA underwent dock trials from August through December of 1994. Additional dock trials are planned for July through September of 1995. Dock trials are for proof of concept work for Dana Yoerger and Ken Stewart programs. Maintenance and upgrades were conducted during the first five months of 1995. In June, JASON/MEDEA operations are planned off of R/V ENDEAVOR in support of GLOBEC. Manipulator improvements have been conducted and will continue throughout 1995.

ARGO II and DSL 120 were used in operations at the Mid Atlantic Ridge TAG site in June of 1994. A second cruise is planned for the last two months of 1995. Both ARGO II and DSL 120 received maintenance and upgrades in July of 1994.

B. Equipment/Instrumentation Upgrades and Improvements -

DSOG Unmanned Vehicle Status - Andy Bowen continued his report with the status of upgrades and improvements planned for the unmanned vehicles, see ***Appendix IV***. Plans for JASON/MEDEA include rewiring the control van, finding a MEDEA replacement, telemetry debugging and continued manipulator testing. Plans for ARGO II include improving the obstacle avoidance forward looking sonar, analyzing video camera focus problems, upgrading thrusters, resolving LBL transducer noise and performing single van operations. The ARGO II operations planned this year off R/V ENDEAVOR will be from a single van. DSL 120 improvements include replacement of the depressor, low speed tow dynamics refinement, design and installment of a weight dropper and examining potential surface processing upgrades. Documentation for all unmanned systems will be developed.

ROV - JASON Manipulator Program - Andy Bowen provided the status of the JASON manipulator improvement program, (***Appendix IV***). As of June 1995, fiber optic connector mating/unmating has been demonstrated. Operational pressure tests of the arm have been completed. The gripper is being redesigned to achieve more gripping force. There is 7 pounds force now, and the goal is to get 20 pounds force. At full extension JASON's

manipulator can lift 60 lbs. DSL has been working to identify a hydrothermal fluid sampler trigger mechanism. Development of mechanical and electrical documentation is ongoing. DSL is also working to identify samplers to demonstrate the manipulative capabilities during the dock test program. Prior to the end of the year, they hope to complete installation and testing of the new gripper. DSL will implement polar coordinate control. Additional dock trials are planned. JASON with the manipulator installed will be pressure tested to 6,000 meters at the Navy's David Taylor facility. In November, the manipulator will be installed on ALVIN and tested during a science cruise to the EPR at 9°50'N.

Video System: Pan and Tilt Camera; New 3-chip Video - Andy reported that WHOI has studied the present 3-chip market and technology. They have analyzed present 3-chip performance and specifications and have monitored the MBARI 3-chip development effort. Specifications and a Request for Quote (RFQ) for compatibility with both ALVIN and JASON have been developed. The new camera is planned to be installed during the 1996 overhaul period.

A survey of pan and tilt commercial vendors has been conducted. Remote Ocean Systems (ROS) has been identified as the preferred vendor and a quote has been obtained. The performance history of the ROS units has been discussed with the users. The pan and tilt will be installed during the 1996 overhaul period, (***Appendix IV***).

Electronic Still Camera for JASON, ARGO II and ALVIN - Andy reviewed the vital and desirable characteristics for the Electronic Still Camera (ESC), see ***Appendix IV.*** The selected system must be adaptable to both ALVIN and ROV power and telemetry. WHOI has used a system from a local vendor, but decided that this would not be the most desirable unit. Cost of that system is prohibitive and performance spotty. Vital characteristics include analog display, time stamp, real-time control, high dynamic range and resolution, capability of data telemetry to the surface, minimization of custom software and hardware and a standard data format. Real-time control of focus, zoom and viewfinding are desirable. It is also desired to have image processing and mosaic capabilities. Presently, high quality mosaics have largely been generated at WHOI although other software packages are under development (e.g. University of Hawaii - Dr. M. Edwards). DESSC endorsed the need for electronic still camera capability for ALVIN and JASON in order to permit routine digital image mapping of seafloor sites.

Navigation Proposal Status - Jim Bellingham gave the status of the navigation proposal, see ***Appendix V.*** He began by outlining the features of the proposed system. It utilizes the Pelagos navigation software (Windows-based), has a mission replay capability, and can utilize customized software. The in-hull navigation can be satisfied by a Pentium-based computer and flat panel displays. The recommended surface ship hardware is the Nautronix 916 USBL/LBL. This system will be provided on the new AGORs. If KNORR is to be the new ALVIN support ship, a Honeywell 906 could be acquired from the Navy, then upgraded to a 916 system. Other aspects of the navigation upgrade include purchasing intelligent transponders and implementing a Doppler Velocity Log (DVL) for dead-reckoning in ALVIN.

Jim reviewed the list of constraints that had been imposed at the last DESSC meeting. All constraints can be met with two exceptions. The in-hull interface upgrade will require the present system to be disabled. Also, the constraint that the present system not be disabled until the new system is functioning will need to be relaxed if the volume and power are to stay within the present system envelop in-hull. WHOI plans to perform the in-hull modifications while ALVIN is undergoing its overhaul. A number of navigation upgrade concerns have been identified and are in the process of being addressed. Some of the concerns can be resolved by additional documentation.

Long BaseLine (LBL) upgrades and transponderless navigation were also addressed by Jim Bellingham and are included in ***Appendix V***. Common hardware/software across ALVIN's surface and in-hull navigation and ROV/AUV navigation is planned. The software upgrade will be accomplished through a cooperative effort between a commercial vendor and WHOI. A free post-processing tool set will be provided for scientists. WHOI will need to ensure that the navigation software supports integration of the new systems and that users are provided with clearly presented documentation. Well documented data files with raw data will be provided. The merging of surface and in-hull data files still needs to be addressed.

DESSC noted that excellent progress had been made on the navigation upgrade proposal by Jim Bellingham, Dana Yoerger, Andy Bowen, and Dudley Foster. They are ready to go to the agencies with a proposal for the upgrades. The next step in the proposal process will depend on which ship is selected to be ALVIN's support platform. There are still a number of uncertainties, but WHOI is ready to go ahead as soon as the support ship issue is resolved. DESSC recommends that the upgrade on ALVIN be complete when it comes out of its overhaul period. The navigation upgrade will be compatible with the unmanned systems and should be available on the unmanned vehicles for 1996 operations.

C. Plans/Options/Issues for 1996-1997 Operations:

1. ALVIN Overhaul: Scope and Timing - Barrie Walden provided an overview of the ALVIN overhaul and inspection schedule performed since 1989, see ***Appendix VI***. Hull inspections should be performed every five years, the last one was done in 1989. The ALVIN hull inspection is overdue and needs to be performed in 1996. NAVSEA has indicated that they will entertain waivers to extend the ALVIN hull inspection date past August 1996.

Barrie reviewed the work tasks planned for ALVIN's next overhaul period, see ***Appendix VI***. The tasks include the hull inspection, frame inspection and repair, testing of the VB/HP air spheres, navigation upgrades and items necessary for ALVIN to be compatible with the support ship conversion. Under ideal conditions, WHOI likes to perform the overhauls over the winter, so that it falls into two calendar years.

2. Support Ship: WHOI Perspective - Dick Pittenger began the discussion by reemphasizing Bob Gagosian's words from the morning; WHOI is dedicated to the National Deep Submergence Facility. Also, Dick stated that although various options are presently

being explored for the future submersible support ship, the option of converting KNORR should be kept alive.

WHOI is prepared to move forward with KNORR's conversion as stated in their April 1991 proposal to operate AGOR 25. They have downsized their original KNORR Conversion plans presented to the agencies in February to one that would be no cost to the agencies but still complies with the spirit and letter of the April 1991 proposal. The new plan would still allow KNORR to be a capable support ship for submersibles. An overview of the KNORR Conversion features is included as ***Appendix VII.*** The A-frame would be along the center-line of the ship versus offset to port. This is less expensive and uses less main deck lab space, but would require more deck space. The traction winch would be located on deck, versus below decks, and the crane would be moved off the main deck. Weight storage and handling would be as on ATLANTIS II. Navigation upgrades would be proposed separately per the DESSC subcommittee. Dick reviewed sketches of the proposed modifications. It was noted that this plan significantly differs from the original KNORR Conversion plan and has not been reviewed by the KNORR Conversion subcommittee chaired by Karen Von Damm. The Von Damm committee needs to continue to look at the effects of the proposed changes. Dick gave a comparison chart of the features of the past two WHOI support ships with that proposed for KNORR. It appears that KNORR would certainly have some benefits over the present ship, almost doubling the lab space. There was discussion regarding the fly-away capabilities of the tethered systems and overlap in expertise between ALVIN/ROV group members.

Short term objectives for WHOI include maintaining science support continuity and excellence, keeping ALVIN and ROVs viable, minimizing the impact on marine crews and minimizing the cost to agencies. The long-term objective is to build a first class national facility.

3. Timing Options for Deep Submergence Operations - Dick reviewed the schedule for implementing the revised KNORR modifications should it be selected as the support platform. Phase II design would be completed by late 1995. An RFP could then be issued in February of 1996. Long lead time material would be delivered by mid-1996. In October 1996, ATLANTIS II would return to Woods Hole for retirement and ALVIN would begin its overhaul. KNORR would enter the shipyard in November 1996 to begin the conversion process. KNORR with ALVIN would be ready for science by May 1997.

Dick continued by reviewing the AGOR 25 post-delivery schedule. Delivery is scheduled for April 1997 to be followed by a series of tests and a fitting-out period in July 1997. A post shakedown availability period is scheduled for the first two months of 1998. Ship construction funds run out in April 1998. Dick has a number of concerns regarding the AGOR 25 conversion to DSSS. Interfacing with the shipyard under the present contract could present difficulties. Dick ended his presentation with a summary of possible scenarios for deep submergence operations for 1996 and 1997, see the timelines included in ***Appendix VII.***

V. UNOLS: Jack Bash provided a brief summary of the activities of the UNOLS Council meeting held in Monterey, CA on 24-25 April 1995. Jack's report was confined to those issues

that were germane to the DESSC. The UNOLS meeting was dominated by a discussion on potential changes for the UNOLS fleet as a result of declining budgets. Don Heinrichs made the point that the funding shortfall was due primarily to declining support from other agencies. NSF has increased it's budget over the past three years by 22% while all other funding combined decreased by about 23%. Don said that projected funding would not be adequate to support the entire fleet when the two new AGORs come on line. NSF has been asked to develop plans for level funding for the next three years, to be followed by a one year 3% reduction, and then a 2% reduction per year for three years. With this gloomy outlook and no great influx of non-NSF funding on the horizon, Don predicted that the UNOLS fleet would be facing a reduction in size. He presented a strawman "modest proposal" which called for the retirement of five ships (ATLANTIS II, COLUMBUS ISELIN, GYRE, ALPHA HELIX and MOANA WAVE). This proposal further suggested the realignment of two ships, MELVILLE to Hawaii and OCEANUS to Alaska. Don also said that it is possible to require the retirement of one of the present active large ships. These dire predictions stimulated significant discussion.

In other UNOLS matters, the University of Miami is negotiating with Harbor Branch to combine their ship operations. This includes the technician organization of University of Miami operating from Harbor Branch ships as well as academic collaboration between the two institutions. COLUMBUS ISELIN has been repaired and is at the dock at Harbor Branch. The ship has no 1996 schedule and has been offered for sale.

Jack reported that Barry Raleigh of SOEST attended the UNOLS Council meeting and informed the group that SOEST would not be pursuing the acquisition of a SWATH ship as a replacement for MOANA WAVE. NOAA's Jim Baker met with Barry and suggested that an academic institution may be considered as the operator of the new NOAA AGOR and that Hawaii could be a candidate. Barry suggested that SOEST was interested and that they would envision a 50/50 NOAA/UNOLS operation with the AGOR. Barry also said that they would accept the transfer of MELVILLE if that decision were made.

VI. AGENCY REPORTS:

A. National Science Foundation (NSF) - Dolly Dieter gave the report for NSF. She began by reviewing the NSF budget for FY95 and the request for FY96, see ***Appendix VIII***. The total Ocean Science Division budget for FY96 is $205.6M. This may represent a 6.3% increase over FY95. The feeling is that may see an increase of 2% at most, but level funding is highly probable. Level funding means there is not enough money to keep all of the big ship's funded. There does not appear to be any financial help available from ONR or NOAA in the near future either. The future potential funding restraints are fleet wide and not just for ALVIN. NSF would prefer to see the older ships in the fleet tied-up if faced with lay-ups. NSF's future large ship requirements include:

- 1 MCS/MGG Ship
- 1 Deep Submersible Support Ship
- 3 General Purpose Ships.

The six ships that Don Heinrichs' "modest proposal" slated for retirement won't reduce NSF's budget as much as many perceive. NSF's support for these ships this year is approximately:

ISELIN = $250K
GYRE = $0
MOANA WAVE = $1.5M
ATLANTIS II = $3-4M
ALPHA HELIX = $800K

Dolly pointed out that since Navy owns ALVIN and most of the large ships, they will need to be a player in any decisions regarding realignments and lay-ups.

NSF is also concerned with the potential for a long hiatus in ALVIN operations and the effects it might have on crew/pilot stability. DESSC noted that with the 15 August proposal deadline quickly approaching, they need to be ready to provide guidance to the community. Agencies will meet to discuss the MOA within the next three months.

B. Office of Naval Research (ONR) - Jim Andrews provided the report for ONR. The change in ONR's course over the years has changed the amount of use of ALVIN. ONR does not have plans to support ALVIN cruises in the next few years.

The CNO Executive Board is scheduled to meet in June. They will look at the future of the Navy and its potential for taking the lead in oceanography. Hopefully this will have positive influences on blue water science and deep submergence asset use.

ONR, NAVSEA and Halter Marine, Inc. (HMI), the shipyard constructing AGOR 25, plan to meet in June to discuss HMI's interest in making AGOR 25 a submersible support ship for ALVIN. An initial study by NAVSEA indicated that it is feasible and will be at lower cost than converting KNORR. AGOR 25 can provide the community with a long term solution for submersible handling. ONR is aware of the short term problems that may be associated with making AGOR 25 the support ship. They would like to work in cooperation with DESSC and WHOI in this transition if AGOR 25 becomes the preferred platform. Jim noted that these conversion plans have not yet been approved at the highest levels of ONR. If HMI will outfit AGOR 25 as a submersible support ship during construction, there may be a window of opportunity for ALVIN operations in fall 1997. These operations would need to be relatively close to Woods Hole since this would fall within the warranty period for the ship. It was noted that any AGOR conversion time table was very "soft" at this time.

In other issues, ONR's Research Facility Program budget appears to be level funding for next year.

C. National Oceanic and Atmospheric Administration (NOAA) - Hank Frey gave the report for NOAA. He gave the recent history of FY95 funding woes regarding support for NURP. NURP was not included in the original NOAA 1995 budget, but Congress appropriated $18M. NURP then awarded three of their six centers one year grants for support. On February 27th,

Congress recommended a recission of the $18M for NURP. Later this recission was reduced to $3.5M. The three centers that did not receive their annual support are being funded month to month. The plan is to fund these centers through September, reduce spending at the National Office, pay off all obligations and distribute what ever may be left over among the National Office and the Centers. There will be no NURP/Navy operations coordinated from the National Office this year. Had there been funding, the operations would have been carried out on DOLPHIN.

One of NURP's top priorities is to continue support for ALVIN operations, but at what level is unclear. Jim Baker and Department of Commerce put NURP in the FY96 budget, but OMB removed it. An authorization bill is needed for NURP. The Centers are encouraging support from Congress. Funding in FY96 will depend on the success of the NURP Centers.

VII. NOAA AND U.S. DEEP SUBMERGENCE OPERATIONS:

A. NOAA/HURL Program - Hank Frey gave the report for Alex Malahoff who regretfully could not attend the DESSC meeting. He prepared a paper describing HURL's Project Unity, see ***Appendix IX.*** Project Unity was developed in response to HURL's rectification review of June 1994. The project concentrates on the completion and full integration of the ship, submersible and ROV into a smoothly operational 2000 meter diving system. Alex's paper addresses each element of the integration. Tests of the integrated system are planned for the spring of 1996 with a full science program in the summer of 1996. It is unclear what funding will be available for 1996. Western Pacific operations will be delayed for at least 2 years.

VIII. RECOMMENDATIONS ON 1996 OPERATIONS AT THE NATIONAL FACILITY:

A. Assessment of Letters of Intent and Tally of Funded Programs - A summary of ALVIN and ROV letters of intent were provided to DESSC and are included as ***Appendix X***. It was noted that this summary was compiled from all messages received at the UNOLS Office in response to Jeff Fox's memo to the community dated 6 April 1995.

The summary also included letters of intent, proposals, and ship time requests received by the UNOLS Office for ALVIN and ROV work. It was noted that some of these letters may no longer be current and as a result the total dives for each operating area may be a bit high.

Dolly Dieter commented that in the future, DESSC should consider moving the DESSC meeting back a bit. The NSF panels just met last week. As a result, the science program managers may not have had an opportunity to contact PI's proposing to use ALVIN on the outcome of their funding decisions. In reviewing the summary of letters of intents and proposals, Dolly can not give the status of specific proposals submitted. Additionally, it was also pointed out that the UNOLS Ship Scheduling Meeting may also need to be moved back a few weeks, since that meeting often constrains when DESSC needs to meet.

Annette DeSilva reviewed the summary and based on the latest information, it appears that approximately 65 funded dives are planned for 1996. This can be broken down to 26 dives in the Atlantic, 20 dives in Eastern North Pacific, four dives along the North East Pacific Rise and 15

dives on the Southern EPR. NERC-BRIDGE (British) has shown interest in using ALVIN in the Atlantic in 1996 and 1997. Purchase of some submersible time from US and French submersible operators is being considered by BRIDGE. Although the 15 August 1995 and 15 February 1995 NSF proposal deadlines are intended for 1997 operations, Dolly encouraged DESSC to prompt the community to submit proposals for 1996.

ROV science programs were reviewed. There are currently three funded field programs which will utilize ARGO II and the 120 kHz sonar, two of those programs will also utilize JASON. One program is on the Mid-Atlantic Ridge, one is on the Juan de Fuca Ridge, and the third program is on the southern East Pacific Rise near 17.5°S. The first two programs will be fielded in 1996 and the southern EPR program will likely occur either in late 1996 or early 1997 depending on logistics in mobilizing the ROV and towed vehicle equipment. Proposal pressure for ROV/towed vehicle programs continues to be good with approximately 5-7 proposals having been submitted to the last three NSF target dates. WHOI is working with potential PIs in helping them prepare proposals for use of ROVs. In DESSC's guidelines to the community, towed unmanned system's availability in 1996 and 1997 must be stressed.

To end the discussion for day one, it was emphasized that we need to develop a means for keeping the National Facility strong through this transitional period. It appears that there is some funded work in 1996 to put together a limited AII/ALVIN schedule. DESSC will request confirmation from NSF regarding additional support for 1996 and 1997 and the possibility that ALVIN/ROV proposals declined in June be allowed to be resubmitted in August. The timing for these operations will depend on a number of factors: The overhaul of ALVIN, ATLANTIS II inspection schedule and the support ship conversion schedule.

Day 2 - Thursday, June 2, 1995

US NAVY/NOAA Programs - CDR John Green provided the US Navy deep submergence presentation with a sequence of view graphs which are included as ***Appendix XI.*** John started with the operational activities of the Advanced Tethered Vehicle (ATV) and DSV-3 TURTLE. These vehicles worked in the Catalina Basin from 29 April to 8 May in a very successful operation with Craig Smith studying whale-fall communities. TURTLE made three dives for a total of 24.7 hours and ATV made seven dives for a total of 69.3 hours in the water. From 8 to 14 May these platforms supported a successful cruise at the San Diego Trough for Gordon Hendler of the Natural History Museum of Los Angles in a study of deep-sea brittlestar fish. TURTLE accomplished four dives for a total of 23.9 hours, and ATV made five dives for a total of 58.6 hours. Military operations were conducted in the fall of 1994 through March 1995 logging over 200 hours of ROV bottom time and recovering over $50M in hardware. Future operations include an 18 to 21 day operation off Hawaii with ATV and TURTLE to search for a Navy delivery system. LANEY CHOEST and the systems should be back in San Diego by 2 July. In August and September, approximately 20 days of scientific operations are planned using ATV and SEA CLIFF. Investigators Paul Dayton and Eric Vetter will study submarine canyons off the southern California coast. Cindy Lee Van Dover will investigate hydrothermal vents on the main Endeavor Field and Martin Fisk will conduct operations on the Mendocino Ridge.

John reviewed some of the recent projects and upgrades to their deep submergence vehicles. This included the acquisition of 3-chip CCD cameras for TURTLE and SEA CLIFF and the unmanned vehicles. They completed a lighting upgrade for the ATV and TUWVs. A Micro-laser scaling system was installed and navigational upgrades made. Improvements were made to the support ship's Sea Beam post processing and their e-mail capability. SCORPIO received a depth upgrade to 20,000 feet..

Navy plans to convert from a multimode cable to a single mode cable for ATV. This tether should have the same life as the vehicle. It will take approximately four months for the manufacturer to make the cable plus extensive conversion efforts before the new cable is ready for use. The conversion may begin in December.

The scientific operations presently carried out by the Navy's deep submersible assets are made possible through an MOA between NURP and Navy. Navy is in the process of developing another MOA with EPA for environmental monitoring operations. John commented that if NURP is disbanded, an MOA with another organization would be necessary to continue science operations.

VII. B. Recommendations for a 1996 Schedule of Operations - Don Moller started this segment by providing a 1996 schedule for ATLANTIS II based on the information available which included 50 dives, (excluding Southern EPR funded work), see ***Appendix XII***. His schedule had ATLANTIS II returning to Woods Hole in late 1995 and standing down for six months while ALVIN is overhauled. The ship departs Woods Hole in July 1996 to start engineering dives and operations in the Atlantic. It then transits to the Pacific in September for work in Guaymas Basin, off California and the Northern EPR. The ship and ALVIN would complete the year in the Panama area permitting it to return to Woods Hole or continue operations into 1997 in the Pacific.

C. Implications for 1997 and Beyond - Dick Pittenger presented possible options and schedules for ALVIN's support ship conversion. These options and schedules are provided as part of ***Appendix VII.*** Dick pointed out that ATLANTIS II must complete a USCG inspection as well as an ABS inspection by November of 1996.

NSF is willing to consider extending AII's operating schedule, but the final decision will depend on the timing of the DSSS conversion, budget and proposal pressure. Since AII is scheduled for retirement at the completion of operations, the added maintenance expense plus inspections and dry-dock to extend operations into 1997 is a major consideration.

NSF will explore entertaining proposals for 1996 operations in their 15 August submittal deadline. They do not wish to see a long hiatus in ALVIN operations. WHOI will need to provide NSF with cost estimates for the ALVIN overhaul and the ATLANTIS II maintenance and inspections. DESSC endorsed the 1996 operating schedule presented by Don Moller which shows ALVIN's overhaul in the first half of 1996. They felt that PIs would have a better chance of getting their work fielded by the end of the year.

The DESSC summarized the constraints facing the future ALVIN schedule and support ship conversion:

1) ALVIN requires a major overhaul (six months)
2) KNORR will work its way back to WHOI from the southern oceans.
3) ATLANTIS II will require ABS certification and USCG inspections in 1996.

D. Guidelines to the Community - DESSC reviewed the characteristics of ATLANTIS and noted features that would make it an attractive submersible handling platform. The Committee agreed to write a letter (see ***Appendix 0***) to the federal agencies with their recommendation and concerns regarding the conversion of a ship to be the submersible handling platform. It was the consensus of the Committee that the conversion of ATLANTIS (AGOR 25) would be the overall best option for the community. On the plus side, this ship is new and therefore has a longer anticipated life. The ship offers more science berths, more lab space and more deck space. Also, the traction winch is located below deck. DESSC noted a few concerns with designating ATLANTIS as the support ship. The effectiveness of ATLANTIS' bow thruster for use in ROV operations needs to be explored. The other potentially problematic aspect of going with ATLANTIS is the timing of its entrance into the fleet. With ATLANTIS II scheduled to be retired in 1996 and ATLANTIS not available until 1997 or 1998, there could be a long hiatus in ALVIN operations. With these concerns noted, DESSC felt that ATLANTIS would provide long term health for Deep Submergence Operations. DESSC's letter to the agencies would emphasize the need to maintain the integrity of the National Facility through these transitions. Also, DESSC would recommend to the agencies that the option to convert KNORR should be kept alive until the concerns regarding ATLANTIS can be adequately addressed. A subcommittee of Mike Perfit, Jeff Fox, Dan Fornari and WHOI personnel was formed to draft the letter. A copy of the letter, dated June 2, 1995, is included in ***Appendix 0***.

It was pointed out, that a new guideline at NSF prohibits PIs from resubmitting proposals for the next panel following original submittal. In light of recent events and the potential for ALVIN operations in 1996, DESSC would like NSF to reconsider this rule for the 15 August panel. They will include this request in their letter to the agencies.

DESSC plans to send a letter to the community regarding future deep submergence plans. However, they will wait a few weeks until they have further guidance from the agencies and information regarding the ABS certification. The intent of their letter will be to keep the community informed while also giving them some guidance on the timing for proposal submittal and potential geographic areas of operation. At this time, it appears that work along the southern EPR and the western Pacific will be postponed until after the deep submersible facility is integrated on a new support platform. (Note: This letter has been written and sent to the community. It is included as the ***Cover Letter*** to these minutes.)

IX. THIRD PARTY TOOL REVIEW:

A. Finalize Announcement for Third Party Tool Policy - A draft Third Party Tool Policy was sent by Barrie Walden and Jeff Fox to Don Heinrichs and Lisa Rom for review. A copy of this is included as ***Appendix XIII.*** The intent of the policy is to coordinate the community's efforts in

developing third party tools. It also will provide a structure for prioritizing use of the assets. The policy addresses DESSC's role and the process of developing tools.

The tool policy was reviewed and endorsed by DESSC and will be distributed appropriately. Mike Perfit, Hugh Milburn and Dan Fornari were tasked with drafting an Announcement to the community relative to the 3rd Party Tools Policy. It was decided that an ad-hoc committee will be assigned to address third party tool issues as needed. Dan Fornari will start compiling a list of third party tools.

B. Status Stakes/Holloway Drill - Debra Stakes provided an e-mail message providing a status report on the on-going development of the Stakes/Holloway drill, see ***Appendix XIV***. They continue to maximize capabilities for use with ALVIN. Efforts include modification and addition of valves. Also, where possible, aluminum components have been replaced with titanium. The drill is planned for use on Rodey Batiza's cruise this October. Debra Stakes conveyed to the Committee her concern about the issue of insurance for the Stakes/Holloway drill. Obtaining insurance by the party making use of the drill has proven to be very difficult. The committee discussed the issue and recommended that WHOI investigate purchasing insurance for the drill and other future third party tools. If insurance is purchased by the operator, the cost would be passed on to the user. Lisa Rom noted that the government considers itself to be self-insured and therefore will not purchase insurance. It was also pointed out that the cost of replacing the drill may actually be less expensive than insuring it. NSF indicated that they will entertain a proposal for replacement of the drill.

C. Other Systems - Hugh Milburn described the new NOAA manifold sampler which is still in the development stage. The old manifold has been used quite a bit in the past on ALVIN. There are also requests for its use on SHINKAI and ROPOS. Development of the new manifold is progressing along. They are experimenting with a new material "PEEK", a plastic with a high temperature rating. The major samplers on the manifold will have electric actuators, replacing the hydraulic actuators now used on ALVIN. The new manifold is planned to be modular and will be adaptable for use on ROPOS, ATV and possibly JASON. Other systems under development include WHOI's new temperature probe and water bottle system. WHOI is also in the early stages of developing a fiber optic data link that could pass data through an ALVIN view port eliminating the need for a through-hull penetration.

D. DUMAND Request for ROV Assets - DOE is funding a program, DUMAND Neutrino Astronomy Project, off the Island of Hawaii that has need of an ROV. The DUMAND Project spokesman and director, John Learned, has sent an e-mail to DESSC with a description of the DUMAND Project, a description of the ROV services needed, and a request that DESSC determine whether or not NSF ship and ROV time can be arranged, see ***Appendix XV***. The proposed use of the ROV is outside of oceanography and is intended to service the DUMAND system. Since DUMAND provides a means for interesting science, DESSC endorsed the principal and nature of the application of JASON. However, the issue of funding is out of the realm of DESSC. Learned indicated that funding for ROV and ship time had not been included in their budget. They would like NSF to support the facility time. NSF has indicated that since it is

a DOE funded science program, DOE should pay for the ship and ROV time. DESSC will respond to John Learned's correspondence reflecting the above view.

E. SONNE Program - Dan Orange brought the Committee's attention to the German funded SONNE program which plans the use of JASON and DSL 120 for investigation of cold seeps discovered in the Aleutians last year. The program would be a two leg operation in July and August, 1996, with a total of 47 funded ship days and 20 days of tethered vehicles. The German, GEOMAR principle investigators are Edwin Suess and Peter Linke. They are looking for U.S. support to fund the ROV time. Rich Lutz would be the main contact for the U.S. A science proposal for the U.S. participation in this project has not yet been submitted. The Committee enthusiastically endorsed the project providing it does not conflict with other JASON scheduling.

X. DESSC Discussion and Recommendations on Development Upgrades :

A. ALVIN Power - Dudley Foster provided the Committee with the history of ALVIN batteries. His view graphs, ***Appendix XVI***, provide a comparison of on-bottom time for ALVIN, NAUTILLE, CYANA, SHINKAI, 2000 and SHINKAI 6500. Also provided was a comparison of battery characteristics and cost factors. ALVIN and NAUTILLE both utilize Pb acid batteries. SHINKAI 6500 uses AgZn batteries. Although they have a very high power capacity, the AgZn batteries only get approximately 75 dives per set and are very expensive (approximate cost is $2 million per set).

Dudley showed a viewgraph of ALVIN's estimated bottom times over ten years, 1985 to 1995. Dan Fornari provided a graph showing the data used to generate these statistics. Over the ten years and nearly 1500 dives covered by the data used for this study, ALVIN's bottom time has shown a general decrease of approximately 45 minutes, however, there have been dives recently which have had bottom times as long as nearly six hours, which is equivalent to some of the longest dives in previous years. Compared to NAUTILLE and SHINKAI, on average ALVIN has had longer bottom time and costs much less per dive. Dudley reviewed the long and short-term variables affecting ALVIN power and bottom time, see ***Appendix XVI***. Dudley suggests that this trend is primarily attributed to an increase in power needs for the installed equipment. In an effort to improve battery life, WHOI is: a) continuing to monitor the battery market, b) continuing to optimize the charge cycle, c) continuing to optimize battery maintenance, d) increasing pilot efficiency training and e) continuing electronic monitoring development, and f) educating users on efficiency of power use. It was noted that pilots who astutely manage power use get significantly more time out of the batteries. John Green stated that the Navy had a study on NiCad batteries for SEA CLIFF and would share this report with WHOI.

Dudley and Barrie sent a fax to Jeff Fox dated 10 May, that reviews the status of ALVIN batteries and the hydraulic system. This fax is provided as ***Appendix XVII***. DESSC thanked Barrie, Dudley, Dan Fornari and Rick Chandler for their efforts in researching the battery issues. Dan Orange and Jim Bellingham offered to provide DESSC with some battery calculations. These are provided as ***Appendix XVIII***. The Committee suggested that the design of ATLANTIS should be investigated to determine if a new battery handling system could be accommodated.

B. Other - ALVIN continues to use the older hydraulic motor controllers which have proven reliable, however, use more power. MBARI has worked with MOAG, the manufacturer of the new pressurized motor controllers, for over a year and seems to have worked out the problems. It was suggested that WHOI continue to follow the progress of MBARI. Other items mentioned by the community that need improvement are the hand-held camera and the submersible's tape recorders. DESSC will continue to compile a list of equipment that the community needs.

The Committee suggested that WHOI develop and implement a strategy for improvements to ALVIN. With ALVIN's overhaul planned for 1996, this could offer the perfect opportunity for integrating improvements.

XI. DESSC DISCUSSION AND RECOMMENDATIONS ON CALIBRATION OF SCIENCE SENSORS: Barrie Walden began the discussion of the science sensors. He indicated that there is a need for a calibration schedule for routine equipment. Many scientists have requested calibrations before or just after cruises. Lisa Rom indicated that the policy is if scientists want equipment calibrated more than once a year, they need to pay for it out of their science budgets. Regardless, there is still the issue of scheduling calibrations. Lisa commented that WHOI should have a marine technician that coordinates this whole process. Other institutions routinely handle calibration scheduling and implementation though their marine technician programs. Additionally, the ALVIN manual should be modified to state that calibration of the CTD is performed once a year. If the scientists wish to have it done more often, they will have to pay for it.

XII. REVIEW OF USER COMMUNITY ASSESSMENTS OF THE NATIONAL FACILITY: Mike Perfit and Jeff Fox surveyed the users of ALVIN for the past year and reported on their comments. All were pleased with the operations and reported noticeable advancement. Many cited the professionalism of the ALVIN pilots and crew. Dan Fornari's efforts were reported as being very positive. Several users expressed their concern with the morale of the pilots and the stability of this vital group. Also of concern was the lack of pre-cruise coordination. There has been difficulty in getting responses for planning questions in that there are so many different persons to deal with at WHOI. Users do not see logical, coordinated and responsive shore support. A more comprehensive brochure and users manual would assist in this matter.

Mike listed some of the operational concerns:

1) Navigation is off by 10's of meters when transferring between transponders.
2) Overlays are needed for the 3-chip camera.
3) Pan and tilt cameras are needed.
4) More time should be devoted to engineering dives.
5) Strobes and hand-held cameras did not work 50% of the time.

Jeff Fox echoed Mike's comments about the supportive sea operations and the positive trend of improvement with the AII and ALVIN crews. Jeff also noted that delayed maintenance to ATLANTIS II was beginning to show.

XIII. RECOMMENDATIONS FOR DESSC MEMBERSHIP: Three members of the DESSC have terms expiring. Gary Taghon has just completed his second term and is ineligible for another. DESSC recommended potential candidates with benthic biology backgrounds for replacements. Carl Wirsen and Hugh Milburn both completed their first terms and have agreed to serve second terms. DESSC also discussed increasing their membership by one to have representation from someone with background in remote systems use. Potential candidates were identified. Mike Perfit will contact the candidates recommended by DESSC to determine their willingness to serve.

XIV. OTHER DESSC ISSUES:

A. DESSC and the Millennium - Two issues were discussed in regard to DESSC in the millennium: 1) the Memorandum of Agreement (MOA) and 2) deep submergence needs in the next century. A number of questions arose: Do we need a manned presence in the next century? If so, how would we like it to be characterized? How will AUVs and ROVs be folded into this picture? What will be the suite of instruments? It was noted that the Abyss Report had been widely distributed throughout the community, but there has been relatively little feedback.

From the agency reports, it was learned that initiating a new MOA is presently on hold. They would like to determine who the partners will be in the next agreement before proceeding. At that time, they will begin to identify the facilities that will be included as part of the facility. There was general agreement between the agencies that the agreement will be a partnership. The MOA will not identify a lead agency for the National Facility. It was noted that many times facilities and programs can gain better backing when supported through partnerships.

Dick Pittenger sketched a timeline depicting the deep submergence assets in the future from 1996 through the year 2020. It showed ATLANTIS coming on line in 1997 and operating beyond 2020. In 2005 ALVIN will be forty years old. The need for manned submersibles continues, but the characteristics of a new or replacement platform are unclear. The need for ARGO and JASON/MEDEA continues into the next century with next generation ROVs coming on line periodically. AUVs and other deep submergence tools also will be integrated into the deep submergence suite of assets. Dick also pointed out that the Federal Agencies have shown a long term dedication to deep submergence by designating ATLANTIS as the new support ship. Perhaps consideration of deeper diving manned submersible should begin to be considered.

There was a discussion on what assets should make up the National Facility. Barrie pointed out that the National Facility provides a means for the community to gain access to expensive assets. The less expensive items should not be included in this facility since they can be accessed relatively easy. The National Facility provides assets and services that other institutions cannot provide. This does not mean that just because some assets are not part of the National Facility they should not exist. Agencies should not be discouraged from funding other facilities just because they are not part of the National Facility.

DESSC's responsibility is to serve as an advisory/focal group on deep submergence issues for the community. The National Facility comprises a major component of their responsibilities. However, DESSC needs to continually look over the horizon and see where technology is going. If DESSC is to speak for the whole deep submergence community, they must encompass all elements. This will include being informed about happenings at other deep submergence activities such as HURL, MBARI and Navy. DESSC strengthens their voice if they welcome the views of all other assets. It is to DESSC's advantage to bring in ancillary groups to learn what they are doing so that we can maintain our National Facility to the highest standards. Communication links are important.

DESSC continued the discussion on the MOA and what they would like to see as elements of the MOA. The agencies have indicated that only the agency partners will be involved with drafting the agreement. DESSC believes that the MOA is necessary because of the specialized nature of the National Facility. The manned submersible should continue to be the main focus; however, sophisticated ROVs and AUV platforms should be considered. Research and development should be considered an integral part of our plans for the future. Ways of integrating smaller operations within the infrastructure with viable funding means needs to be addressed. Also, it was recommended that DESSC should begin to look forward with respect to ALVIN becoming older. Innovative funding sources to support the possible replacement of ALVIN in the long term should be considered. DESSC also discussed the future of JASON and modifications to the funding process. They recommend that the funding should be transparent to the other science programs as it is with ALVIN.

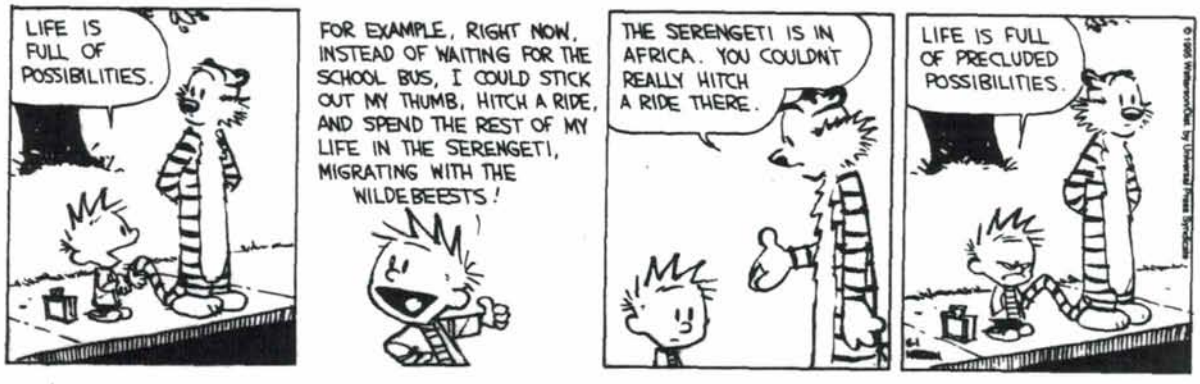
DESSC will request a meeting with the agencies at the appropriate time to provide them with an important prospective on science issues and future needs for consideration while developing the MOA. Prior to the Fall AGU Conference, DESSC will begin to communicate on the characterization of DESSC in the millennium.

XV. MEETING PLANS : Mike noted that a meeting may be necessary prior to the annual fall Planning Meeting at AGU. It appears that the September time frame in Washington, DC might be the best time and site if the additional meeting is necessary. In the mean time, DESSC will communicate via e-mail regarding upcoming agency decisions, ALVIN future operations, and the submersible support ship. As in the past, DESSC will hold their annual planning meeting on the Sunday prior to the AGU Conference in San Francisco. If necessary, arrangements can be made for the DESSC to convene on Saturday afternoon prior to the planning meeting.

Farewell to Jeff - The DESSC, UNOLS and WHOI extended their deep appreciation for Jeff Fox's dedication and long hours of support for the Committee and promotion of the National Deep Submergence Facility. They wished him well in his new venture.

The meeting was adjourned at 11:00 a.m.

CALVIN AND HOBBES by Bill Watterson



APPENDIX 0

UNIVERSITY-NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

An association of institutions for the coordination and support of university oceanographic facilities.

DATE: 9 February 1995

TO: Deep Submergence Community
WHOI, National Facility Operator
DESSC/FIC KNORR Conversion Subcommittee
DESSC
FIC

FROM: Karen Von Damm, Subcommittee Chair

SUBJECT: KNORR Conversion Subcommittee Meeting of January 31, 1995

This letter is a summary, including recommendations, from the meeting held on January 31, 1995 at Woods Hole Oceanographic Institution. In 1996 KNORR is to be converted to be the deep submergence support vessel for the US deep submergence science community, coinciding with the retirement of the ATLANTIS II. The purpose of the meeting was to review the present plans for KNORR conversion, and to provide the operators with community input and recommendations regarding the conversion. A list of attendees is attached. The recommendations of the earlier meeting of this committee (September 22, 1993) were also addressed.

The major recommendations follow:

- **The timing of the conversion was identified as a critical issue. We most strongly recommend that the conversion and ALVIN overhaul begin early enough in CY 1996 to permit the new KNORR/DSV/ROV system to be field tested in waters close to Woods Hole and to permit field work in the North Atlantic in fall 1996, prior to the KNORR transiting to the Pacific.**

It is prudent that the work be completed by late summer so that field testing need not occur at a distant site. It is also important to note that if the deep submergence science community working in the Atlantic is not accommodated during fall 1996, they are likely to face an extremely long hiatus in the availability of deep submergence assets. This will have a negative impact on the community, and may cause them to look elsewhere for facilities to accomplish their science. It was also noted that the UK is interested in purchasing US deep submergence time during this period of time for work in the central North Atlantic.

P.O. Box 392
Saunderstown, RI 02874

Phone: (401) 792-6825
FAX: (401)792-6486

- **We recommend that the proposed plan to have the DSV hangar located to port be adopted. An option discussed at the meeting, for which drawings are not yet available, incorporating the DSV shops into the modified hangar structure, appears to be an even better plan. This revision to the plan will result in no loss of deck space and a smaller loss of lab space compared to the present proposed arrangement on KNORR.**

The offset deck hangar appears to be most cost effective and also be most effective at retaining deck space. To preserve deck utility, at least some of the rails needed for DSV transport across the deck to the port mounted A-frame need to be removable. It is especially important that the rails closest to the stern be removable.

- **We recommend that the DYNACON winch be permanently installed below decks.**

Without the presence of this winch, KNORR is not truly equipped to handle ROV's, and hence compromises the role of KNORR as the "deep submergence support vessel". If the winch were not permanently mounted in the hold, it would consume a large amount of deck space and would also lead to increased maintenance problems and costs. There are other traction winches in the UNOLS fleet, thus retaining the fly-away capability of the ROV system.

- **Due to added weight from the A-frame, additional ballast, and other proposed work, the draft of KNORR will increase by 0.5-0.8 feet. As the available models suggest, this will reduce stern slamming by 50%. We do not recommend that the rapid ballast system be installed at the present time.**

If stern slamming remains a significant problem, the resulting ship shuddering may not only have a negative long term impact on KNORR, but also on the structural integrity of the DSV and ROV. If the proposed modifications do not sufficiently dampen stern slamming, the addition of the rapid ballast system may need to be considered at a future time.

- **KNORR will accommodate 21 science personnel once the DSV/ROV personnel are housed. As this is a real increase of 2 bunks over the ATLANTIS II, and the cost of the least expensive berthing addition is >$200K for 4 bunks, and this option will also result in the permanent loss of lab space, we do not recommend that more bunks be added at the present time.**

While in the ideal case KNORR would carry ~30 science personnel, the additional scientists will also require more lab space. If the lower lab is not converted to bunk space, KNORR retains almost twice the lab space of ATLANTIS II. The addition of 4 bunks would not obviate the need for a hotel ship for some science programs. An alternate plan provides for the addition of 12 bunks forward on the 01 level for ~$900K. Based on funding constraints it is not reasonable to propose this modification at the present time. If science program demands are shown to require significant use of hotel ships over the next few years, it may be cost effective to add those bunks at a future time.

- **At present KNORR is operating with two storage vans for science stowage. This is likely to continue after the conversion. As installation of the rapid ballast system is not recommended at present, there is not the associated negative impact on storage space. KNORR is presently housing full science parties for legs of 50 days with adequate dry stores, so this no longer appears to be an issue. Most submersible cruises at present are under 30 days in duration.**

- **A multi-beam system (SEABEAM 2100) has now been installed on KNORR, this previous recommendation has already been met.**

- **We recommend that the needed wet and dry ends of a combined short and long baseline navigation system be installed on KNORR as is necessary for submersible and ROV operations, and that it be integrated into a single navigation system that utilizes the high quality dynamic positioning system on KNORR. Without good navigation the utility of the deep submergence tools will be severely compromised.**

- **To enhance the "livability" of KNORR, we recommend a space be found to house exercise equipment. While other options should be explored first, a small amount of space in one of the upper labs may, if necessary, be used for this purpose.**

- **Small boat handling on KNORR is less than ideal. We recommend that any relatively costly resolution of this be deferred unless or until small boat handling becomes a significant limiting factor in DSV/ROV launch/recovery operations.**

- **Several ROV handling issues such as survey cable routing and slack tensioning need to be addressed during the Phase II design specifications.**

The net effects of the KNORR conversion are as follows:

- small net increase in science berthing for deep submergence operations compared to ATLANTIS II
- large (almost double) the available lab space on ATLANTIS II
- an effective, and integrated, vessel for deep submergence operations involving a DSV and/or a ROV
- retention of all current deck space for general oceanographic applications
- minimal negative impact on existing lab space
- minimal negative impact on existing storage space.

The net impact on the general oceanographic capabilities of KNORR as a result of this conversion are therefore minor, permitting KNORR to continue to serve in this capacity as required.

The deep submergence science community is firmly behind the retirement of ATLANTIS II and the conversion of KNORR to the support vessel. While ATLANTIS II has served the community well, its limited space for science, personnel, lab and hold space has been limiting. KNORR will be a significant enhancement over those capabilities. The conversion to KNORR will allow us to truly integrate submersible and ROV operations in ways that will certainly enhance opportunities for deep submergence science, both in terms of greater capabilities as well as reduced cost. The integration of the deep submergence operations of the National Facility aboard KNORR will open new investigative horizons for the deep submergence science community in the same way the move to ATLANTIS II from LULU proved to be a significant step function in the capability of our deep submergence operations. With KNORR serving as a platform for an integrated deep submergence science program, the user community will truly have a facility that can range globally to address the challenging problems of this planet's inner space. While the conversion of KNORR is not trivial, both structurally and financially, it will serve the community well throughout the next decade of deep submergence work.

ATTENDEES

Karen Von Damm, Sub Committee Chair
Jack Bash, UNOLS
Peter Betzer, FIC
Andy Bowen, WHOI
Bob Detrick, FIC
Bob Dinsmore, WHOI
Dan Fornari, WHOI
Dudley Foster, WHOI
Jeff Fox, DESSC Chair
Rich Lutz, Rutgers
Don Moller, WHOI
Theo Moniz, WHOI
Dick Pittenger, WHOI
Barrie Walden, WHOI

UNIVERSITY-NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

An association of institutions for the coordination and support of university oceanographic facilities.

Date: April 6, 1995

To: Deep Submergence Research Community

From: P.J. Fox, Chair
DEep Submergence Science Committee

Subject: Delay in Planned Conversion of R/V KNORR to Support
UNOLS Deep Submergence Vehicle Facilities
Request for Input on Areas of Interest for ALVIN diving in 1996

DESSC has been informed by NSF and ONR that the planned 1996 conversion of R/V KNORR to replace the R/V ATLANTIS-II as the UNOLS deep submergence support vessel has been delayed approximately six months. KNORR was to have returned from the Indian Ocean in the Spring of 1996 to begin the conversion, and now it will likely not return to Woods Hole until early Fall, 1996. It will carry out science programs in the South and North Atlantic on its way home. This delay has come about because of ongoing deliberations amongst the agencies regarding the best course of action for the long-term health and effectiveness of the entire UNOLS fleet. DESSC and the deep submergence operator, Woods Hole Oceanographic Institution, are working closely with the agencies to ensure that a capable and long-term support vessel is available to support deep submergence science into the 21st century, and to construct a plan that minimizes disruption to the deep submergence facilities and their operations.

The present A-II/ALVIN schedule has the facility returning to Woods Hole in January of 1996. Then A-II was to leave the UNOLS fleet, and ALVIN was to commence a major overhaul of approximately six months duration. It is still too early to define a workable utilization strategy given all the unknowns, but DESSC would like to get community input on what may or may not be possible in terms of science operations. For example, although there is presently no ALVIN-related science proposed or scheduled for the first half of 1996, the A-II/ALVIN schedule could be extended into the first half of 1996 (e.g. work in the Eastern Pacific, Gulf of Mexico, MAR south of 29!N), and then return to Woods Hole. DESSC and the federal agencies realize that because of prior plans for the timing of KNORR conversion, many scientists did not request to use ALVIN in 1996. DESSC is soliciting input from the research community in the form of short letters of intent (1-2 pages maximum) stating the science programs that could be proposed and carried out in the 1996 time frame.

P.O. Box 392
Saunderstown, RI 02874

Phone: (401) 792-6825
FAX: (401)792-6486

The lead time for preparing proposals to ONR, NOAA, and NSF is very short for new 1996 field work. Additional discussion with the agencies will be required to develop a schedule and process for consideration of potential projects. Prior to these discussions, we need to establish the scientific interests, geographical areas, potential sponsors and timeliness of requests.

In order to help us in the planning effort to respond to this change, investigators are requested to send brief letters of intent to the UNOLS office by April 21st, outlining their thoughts for ALVIN work in 1996 and proposed funding source. The issues of 1996 deep submergence field work and possible ALVIN/A-II programs past Jan. 1996 will be important agenda items for the UNOLS Council Meeting that will meet at the end of April. E-mail correspondence is encouraged for the letters of intent and the address is given below.

Any questions regarding this matter should be addressed to Mr. Jack Bash or Ms. Annette DeSilva at the UNOLS Office-URI.

I thank you in advance for your collective efforts to assist us in ensuring that 1996 remains a viable year for conduct of deep submergence science with ALVIN.

Contact Address for UNOLS Office:

E-mail: unols@gsosun1.gso.uri.edu

Telephone: 401-792-6825
Fax: 401-792-6486

Address: UNOLS Office
PO Box 392
Saunderstown, RI 02874

DESSC Memorandum to the Funding Agencies

To: Dr. R. Corell, NSF
Dr. F. Saalfeld, ONR
Dr. N. Ostenso NOAA

CC: Dr. D. Heinrichs, NSF
Dr. M. Reeves, NSF
Dr. E. Deiter, NSF
Dr. S. Ramberg, ONR
Dr. J. Andrews, ONR
Dr. H. Frey, NOAA

From: The DEep Submergence Science Committee

Date: June 2, 1995

Subject: Deep Submergence Support Ship Conversion

Gentlemen:

Based on the deliberations at our meeting this week, the committee feels strongly that the unique qualities and effectiveness of the National Deep Submergence Facility, which includes ALVIN and the ROV/towed vehicles, at Woods Hole Oceanographic Institution (WHOI) must be preserved and nurtured so that the U.S. research community continues to have access to the abyss in a safe and efficient manner into the 21st century. The continued need for deep submergence facilities is underscored by the array of fundamental scientific questions that can only be addressed by deep ocean observation, monitoring and measurement, and the advent of a variety of sea floor observatories that will monitor critical geological, chemical and biological processes on and above the deep sea floor. The DESSC believes that conversion of the new Atlantis (AGOR-25) represents the greatest potential benefits to the long-term support of US deep submergence science. The positive aspects of following that conversion path include greater science berthing, laboratory space, deck area, operational range, and longer projected life-span. There are some minor potential negative technical considerations which include the dynamic positioning system, and greater size and hence motion differences between the ship and submersible/ROV vehicles during launch and recovery operations. These issues are, however, being considered by several interested parties and the outlook for resolution is positive.

DESSC has reviewed the information provided by the Deep Submergence Facilities Operator (WHOI), and the reports of the Federal agencies that support deep submergence, in terms of the options that are available for providing the community with a first-class support ship that could provide service into the 21st century. The

committee notes that there are two principal conversion paths. One option is that the R/V Knorr be converted. At the DESSC meeting WHOI presented a revised Knorr Conversion plan that meets the specifications of the original AGOR-25 proposal, and provides for a capable deep submergence support vessel at no cost to the Federal agencies. This proposal is well-constrained logistically and fiscally, and will result in a converted deep submergence support vessel that is ready for science operations by mid-1997.

The other conversion option includes the new Atlantis as indicated above. The committee favors that path, however we also note that there are important and potentially deleterious consequences to following this path depending on the schedule followed during the conversion (see Attachment Options). These consequences must be adequately addressed or the plan to use the Atlantis as the new support platform is unacceptable because the long-term health of the facility could be jeopardized. The most critical concsequences that must be addressed with regards to converting the Atlantis are:

1] the uncertainties relating to the scheduling of the conversion and the impact that has on potential stand-downs of deep submergence operations and the consequent loss of technical/operational expertise,
2] interruption of ongoing time-series deep submergence science if the conversion process extends past mid-1997,
3] integrating and contracting for the conversion effort to support deep submergence with the ongoing construction of the new Atlantis,
4] the costs involved in the conversion,
5] the programmatics and delivery of any WHOI supplied items that are critical to the conversion (e.g. the A-frame), and
6] certification of launch systems by NAVSEA (SEA92Q).

One result of the recent changes in plans for providing a new support ship is that the community and funding agency program managers were caught short in terms of filling-out a 1996 science schedule. In order to ensure that 1996 provides a reasonable amount of deep submergence science and facility support the committee strongly recommends that PIs who submitted deep submergence based proposals for the NSF Feb. 15, 1995 target that were declined be allowed to resubmit for the NSF Aug. 15, 1995 target. If some of those proposals are funded it would be important to permit the programs to be fielded in late 1996 and early 1997. A response to this issue is requested as soon as possible as it will clearly impact how the science community responds in the near-term to writing ALVIN/A-II and ROV proposals that could potentially be funded and scheduled for the latter part of 1996.

The committee also notes that for both conversion options a window of opportunity exists for utilization of ROV and towed vehicles through 1996 and 1997. We would encourage the agencies to look critically at science proposals that seek to use

those vehicles inorder to continue the process of integrating the usage of those deep submergence vehicles by the full spectrum of the deep ocean scientific community.

In order to facilitate planning with the least negative impact to the research community and the deep submergence facilities operator we request that the agencies consider the recommendations of DESSC on the matter of the new support ship as detailed above, and arrive at a timely decision on which path is to be followed so that the community and WHOI can react accordingly and continue to be productive.

If you have any questions concerning this matter please do not hesitate to contact Mike Perfit, the new DESSC Chair, and Dick Pittenger at WHOI if there are technical questions on the facilities.

Thank you for your attention and consideration of this matter and continued support for deep submergence science and facilities.

Best Regards,

P. J. Fox (outgoing DESSC Chair)

M. Perfit (new DESSC Chair

APPENDIX I

AGENDA

DEep Submergence Science Committee
May 31, June 1-2, 1995
Carriage House, Woods Hole Oceanographic Institution
Woods Hole, MA
8:30 a.m. - Wednesday May 31, 1995

I. Welcome, Introductions, and Meetings Goals

II. Accept Minutes of December, 1994 DESSC Meeting.

STATUS REPORTS

III. Report on WHOI/DESSC Meetings with NOAA/NSF/ONR
(R. Pittenger, J. Fox, M. Perfit)

IV. National Deep Submergence Facility Operations at WHOI:

A. 1995 Deep Submergence Field Program: Completed & Scheduled

1. AII/ALVIN
2. Tethered Systems

B. Equipment/Instrumentation Upgrades and Improvements
(B. Walden, D. Foster, A. Bowen)

1. Navigation Proposal Status
2. Video System: Pan and Tilt Camera; New 3-chip Video
3. Electronic Still Camera for JASON, ARGO-II and ALVIN
4. ARGO-II and 120 KHz Systems Status
5. ROV - JASON Manipulator Program

C. Plans/Options/Issues for 1996-1997 Operations (R. Pittenger)

1. ALVIN Overhaul: Scope and Timing
2. Support Ship: WHOI Perspective
3. Timing Options for Deep Submergence Operations

V. UNOLS Report (Jack Bash, UNOLS for Ken Johnson)

VI. Agency Reports on Program Funding for 1996 and Beyond:

A. NSF
B. ONR (J. Andrews)
C. NOAA

VII. NOAA and US Navy Deep Submergence Operations

A. NOAA/HURL Program (A. Malahoff)
B. US Navy/NOAA Programs (Cmdr. John Green)

DESSC ISSUES

VIII. Recommendations on 1996 Operations at the National Facility

A. Assessment of Letters of Intent and Tally of Funded Programs (see Enclosure)
B. Recommendation for a 1996 Schedule of Operations: ALVIN and Tethered Systems
C. Implications for 1997 and Beyond
D. Guidelines for the Community

IX. 3rd Party Tool Review

A. Finalize Announcement for 3rd Party Tool Policy
B. Status Stakes/Holloway Drill
C. Other Systems: New NOAA Manifold Sampler, New Temperature Probes and Water Bottles, Fiber Optic Data Link
D. DUMAND Request for ROV Assets

X. DESSC Discussion and Recommendations on Developmental Upgrades

A. ALVIN Power
B. Other

XI. DESSC Discussion and Recommendations on Calibration of Science Sensors

XII. Review of User Community Assessments of the National Facility

XIII. Other DESSC Issues
A. DESSC and the Millennium

XIV. Recommendations for DESSC Membership

XV. Meeting Plans - Dec. 1995 Meeting

Adjourn

APPENDIX II

NAME	INSTITUTION/ORGANIZATION	PHONE/FAX/E-MAIL
Jim Andrews	ONR	(703) 696-8699/(703) 696-2007/andrewj@onrhq.onr.navy.mil
Jack Bash	UNOLS	(401) 792-6825/(401) 792-6486/unols@gsosun1.gso.uri.edu
Jim Bellingham	MIT Sea Grant	(617) 253-7136/(617) 258-5730/belling@mit.edu
Andy Bowen	WHOI/DSOG	(508) 289-2643/(508) 457-2191/abowen@whoi.edu
Rick Chandler	WHOI	(508) 289-2272/(508) 457-2107/rchandler@whoi.edu
Annette DeSilva	UNOLS	(401) 792-6827/(401) 792-6486/desliva@gsosun1.gso.uri.edu
Dolly Dieter	NSF	(703) 306-1577/(703) 306-0290/edieter@nsf.gov
Dan Fornari	WHOI	(508) 289-2857/(508) 457-2187/fornari@tone.whoi.edu
Dudley Foster	WHOI/DSOG	(508) 289-2273/(508) 457-2107/dudley@whoi.edu
Jeff Fox	URI/GSO	(401) 792-6229/(401) 792-6811/jfox@gsosun1.gso.uri.edu
Hank Frey	NOAA/NURP	(301) 713-2427/(301) 713-0799/hfrey@rdc.noaa.gov
CDR John Green	COMSUBDEVGRUONE	(619) 553-0360/(619) 553-7131/jwgreen@tecnet1.jcte.jcs.mil
Hugh Milburn	NOAA/PMEL	(206) 526-6169/(206) 526-6744/milburn@pmel.noaa.gov
Don Moller	WHOI	(508) 289-2277/(508) 457-2185/dmoller@whoi.edu
Dan Orange	MBARI	(408) 633-7012/(408) 633-4581/dano@mbari.org
Mike Perfit	U of Florida	(904) 392-2128/(904) 392-9294/perf@nevm.nerdc.ufl.edu
Dick Pittenger	WHOI	(508) 289-2597/(508) 457-2185/rpittenger@whoi.edu
Lisa Rom	NSF	(703) 306-1578/(703) 306-0390/erom@nsf.gov
Gary Taghon	Rutgers U	(908) 932-6555x547/(908) 932-8578/taghon@ahab.rutgers.edu
Karen Von Damm	U of New Hampshire	(603) 862-0142/(603) 862-2649/kvd@christa.unh.edu
Barrie Walden	WHOI	(508) 289-2407/(508) 457-2195/bwalden@cliff.whoi.edu
Carl Wirsen	WHOI	(508) 289-2307/(508) 457-2169/cwirsen@whoi.edu

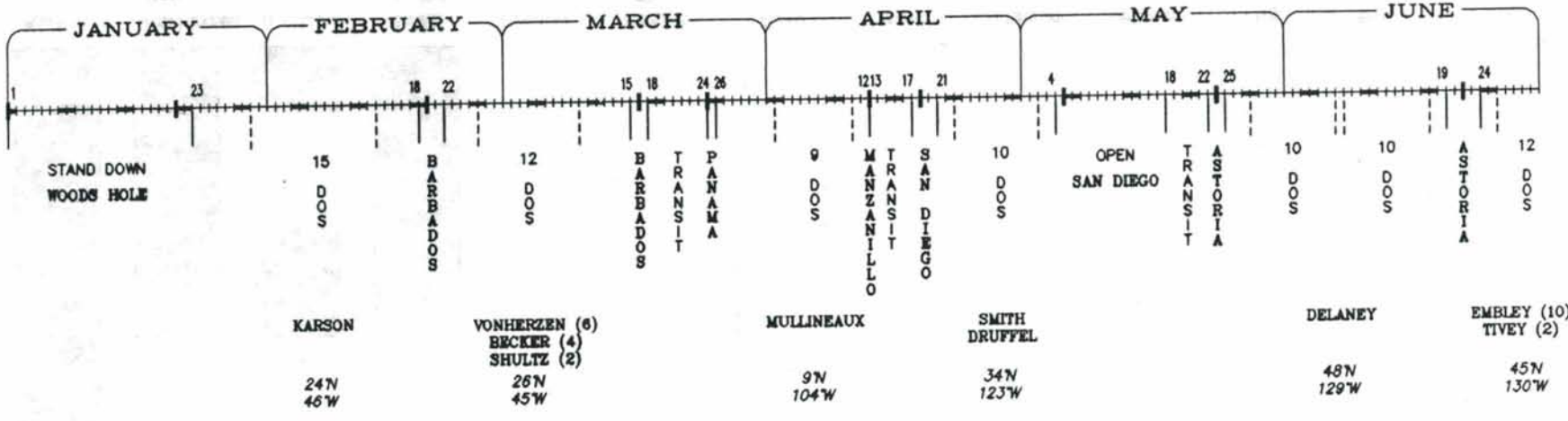
APPENDIX III

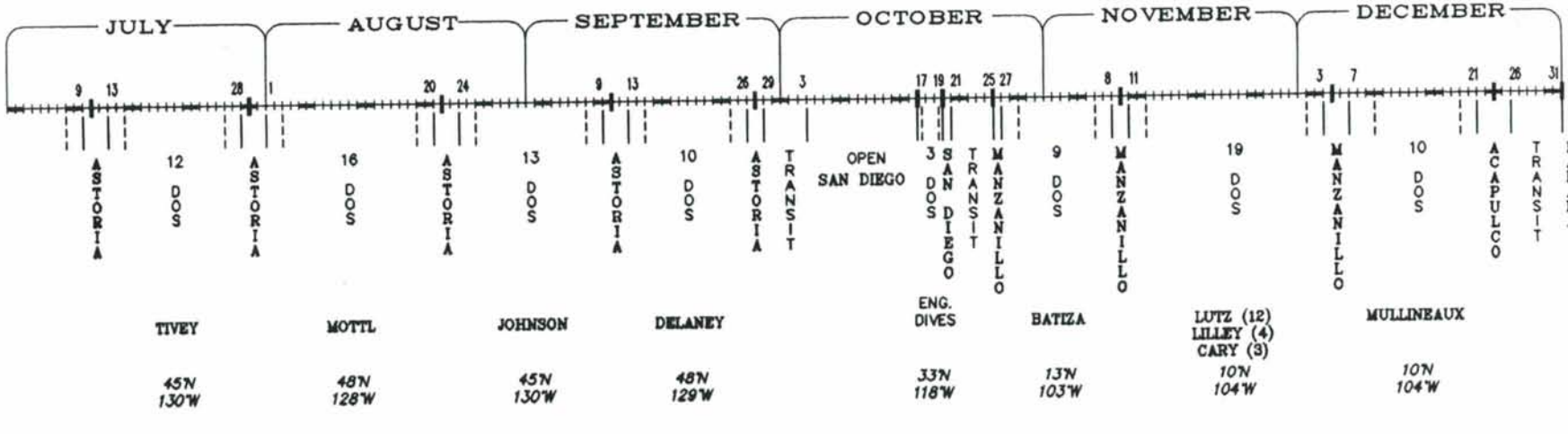
R/V ATLANTIS II & ALVIN OPERATIONS

1995

OPERATIONAL SCIENTIFIC SERVICES
WOODS HOLE OCEANOGRAPHIC INSTITUTION

12 APR 95
~~29 MAR 95~~
~~23 FEB 95~~
~~29 DEC 94~~
~~06 DEC 94~~
~~02 DEC 94~~
~~28 NOV 94~~
~~07 NOV 94~~
~~13 OCT 94~~



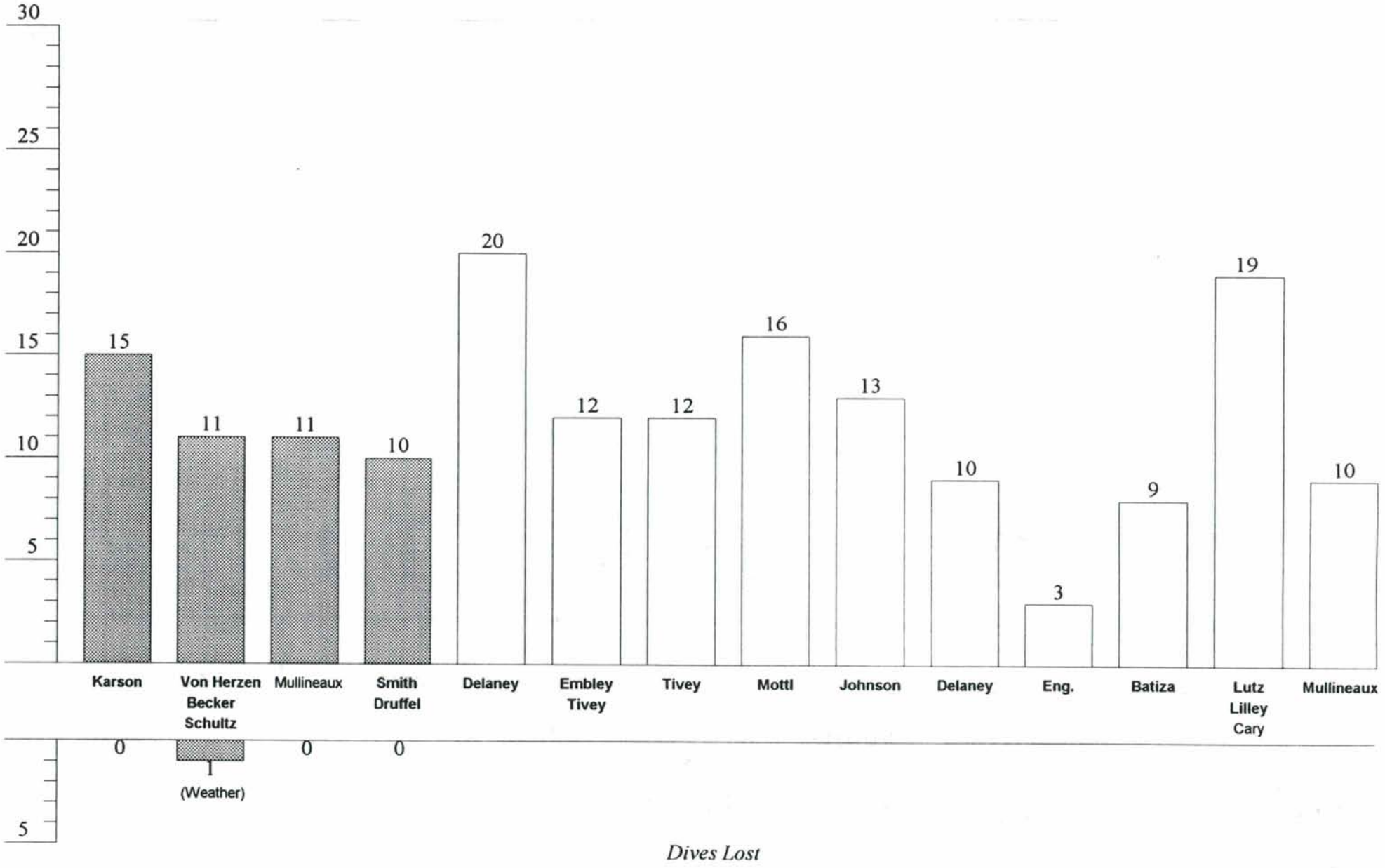


ALVIN Dives	
Science	167
Cert./Eng.	3
Total	170

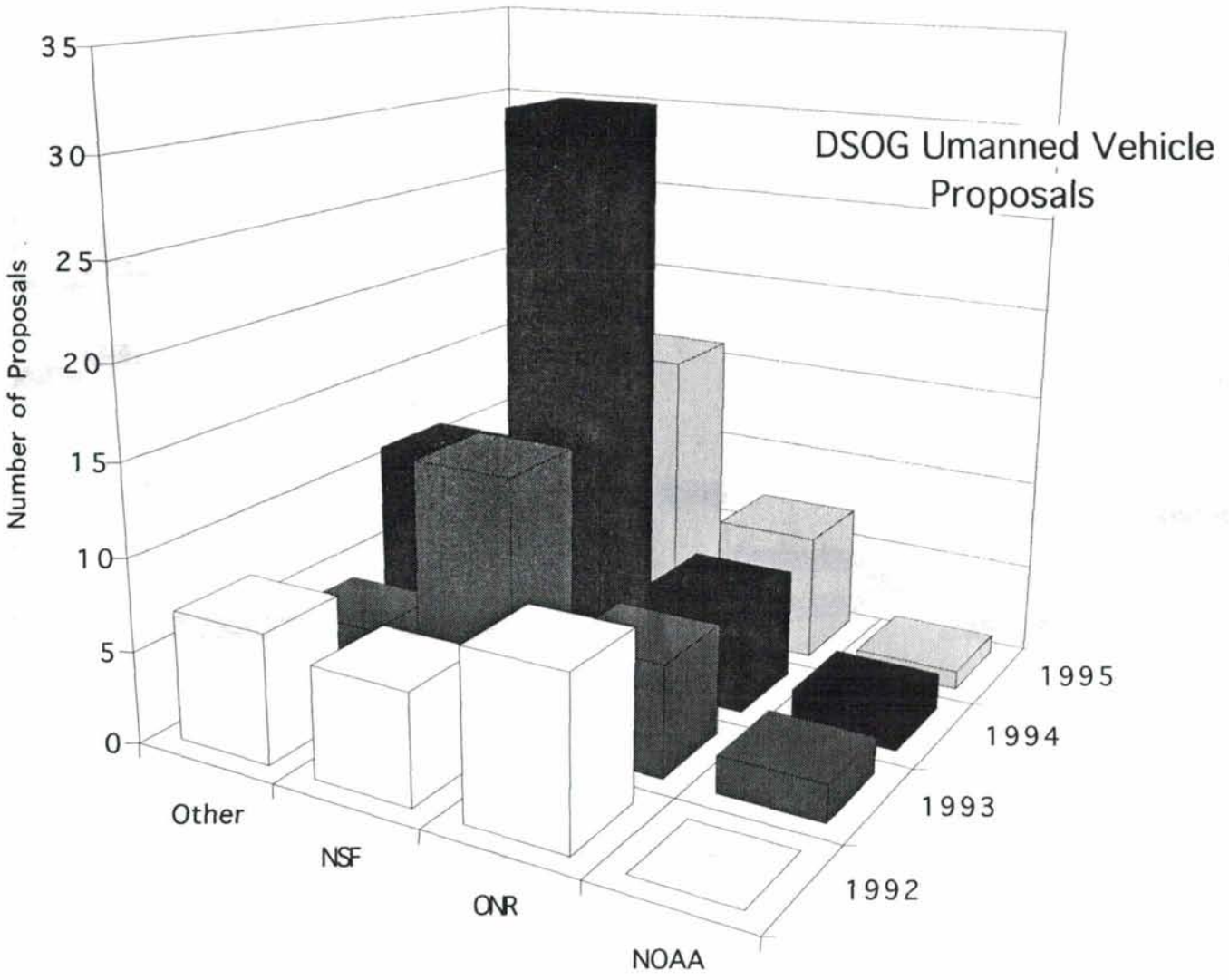
DOS = Dives On Station

1995 ALVIN Dives

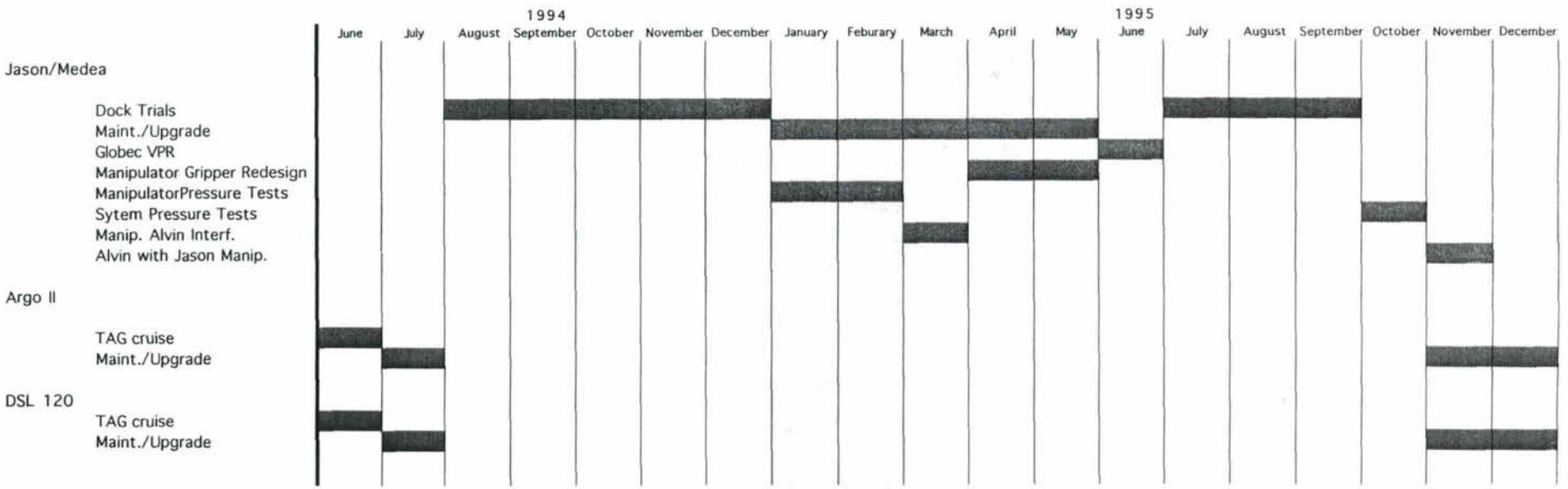
170 Planned
47 Completed (as of 5/25)



APPENDIX IV


DSOG Umanned Vehicle Proposals
Number of Proposals
35
30
25
20
15
10
5
0
Other
NSF
ONR
NOAA
1992
1993
1994
1995

DSOG UNMANNED VEHICLES 1995/9



DSOG Unmanned Vehicle Status

Jason/Medea

- Control Van Rewire
- Medea Replacement
- Debug Telemetry Lockups
- Documentation
- Manipulator Testing

Argo II

- Improved Obstacle Avoidance Forward Looking Sonar
- Determine Source of Video Camera Focus Problems
- Thrusters for Heading Control
- Resolve Noise on LBL Transducer
- Single Van Operations
- Documentation

DSL 120

- Replace Depressor
- Refine Low Speed Tow Dynamics
- Design and Install Weight Dropper
- Determine suitable Upgrade Path for Surface Processing
- Documentation

****for annette de silva - UNOLS Office****

annette - here are the words from Andy's OH, great to see you, thanks for all the help, cheers, Dan

New 3-Chip DSOG Video Camera and Pan and Tilt

3-Chip

- Studied Present Market and Technology
- Studied Present 3-chip Performance and Specifications
- Studied MBARI 3-chip Development Effort
- Developed Specs and RFQ for Camera Compatible with Both Alvin and Jason
- New Camera will be Installed During 1996 Overhaul Period

Pan and Tilt

- Surveyed Commercial Vendors
- Identified Remote Ocean Systems as Preferred Vendor
- Discussed Performance History of ROS units with Users
- Acquired Quote
- To Be Installed During 1996 Overhaul

Jason Manipulator Test Program

Completed as of 6/95:

- Demonstration of Fiber Optic Connector Mating/Unmating
- Operational Pressure Tests to 10,000 psi
- Redesign of Gripper for More Gripping Force
- Identification of Hydrothermal Fluid Sampler Trigger Mechanism
- Development of Mechanical and Electrical Documentation
- Identification of Dock Test Program

    1. Gas Tight Sampler
    2. Major Sampler Bottle
    3. High and Low Temperature Probes
    4. Rock/Glass Sampler
    5. Rock Sampling
    6. Transfer of Samplers/Samples to/from Elevators
    7. Biology Samples

To Be Accomplished Before 1/96:

- Installation and Testing of New Gripper
- Implementation of Polar Coordinate Control
- Dock Trials
- Vehicle/Manipulator Pressure Tests to 6,000 Meters
- Installation on Alvin for a Portion of November Science Program

Electronic Still Camera Characteristics

Vital:

- Analog Display of Acquired Digital Data
- Time Stamp at Acquisition
- Simple Real-Time Control
- Real Time Enhancement
- Adaptable to Both Alvin and ROV Power and Telemetry
- "High" Dynamic Range and Resolution
- Minimize Custom Software and Hardware
- Standard Data Format

Desirable:

- Real-Time Control of Focus
- Real-Time Zoom
- Real-Time Viewfinding

Image Processing and Mosaicking

APPENDIX V

J. Bellingham
6/1/95

Navigation Upgrade

- Pelagos navigation software (modular, integrated)
- Mission replay capability provided for users...
- Custom software
- In-hull navigation
  - computer (Pentium)
  - flat panel displays
  - ALVIN data logging transferred to new CPU?
  - (installation, timing of upgrade?)
- Nautronix 916 USBL/LBL system
  - provided on new vessels
  - Honeywell 906 acquired from Navy, then upgraded
- Installation of surface system w data logging
- Intelligent transponders
- DVL for ALVIN

Constraints

1 upgrade should not disable present system until new system is functioning
-> *yes, except in-hull interface upgrade*

2 operator must have source code for all navigation software
-> *yes, both code and development environment*

3 upgrade should not increase work-load of operator
-> *yes...*

4 volume and power should stay within present system envelop in-hull
-> *only if requirement 1) relaxed*

5 use off-the-shelf hardware (and software)
-> *yes*

Concerns

- large position jumps observed when switching between transponders
  -> calibration issue...

- navigation software difficult to use
  -> integrated, documented package to be supplied

- in-hull displays not as versatile as desired
  -> solved, but requires remove of existing system

- array deployment responsibilities not well defined
  -> documentation issue ...needs to be addressed

- post-processing requirements of scientists not well supported
  -> solved...demo package

LBL Upgrade

- Common hardware/software across Alvin surface and in-hull navigation & Argo/Jason/Medea/AUV navigation (modular hardware/software components)
  -> *Nautronix 916 surface hardware , Pentium based computers*
- Software upgrade -> commercial vendor/WHOI cooperative effort (acquisition, logging, display, computation, outlier rejection, etc.)
  -> *Pelagos software package*
- Improved array calibration
- Provide post-processing tool set for scientists in well supported environment
  -> *free*
- DOCUMENTATION

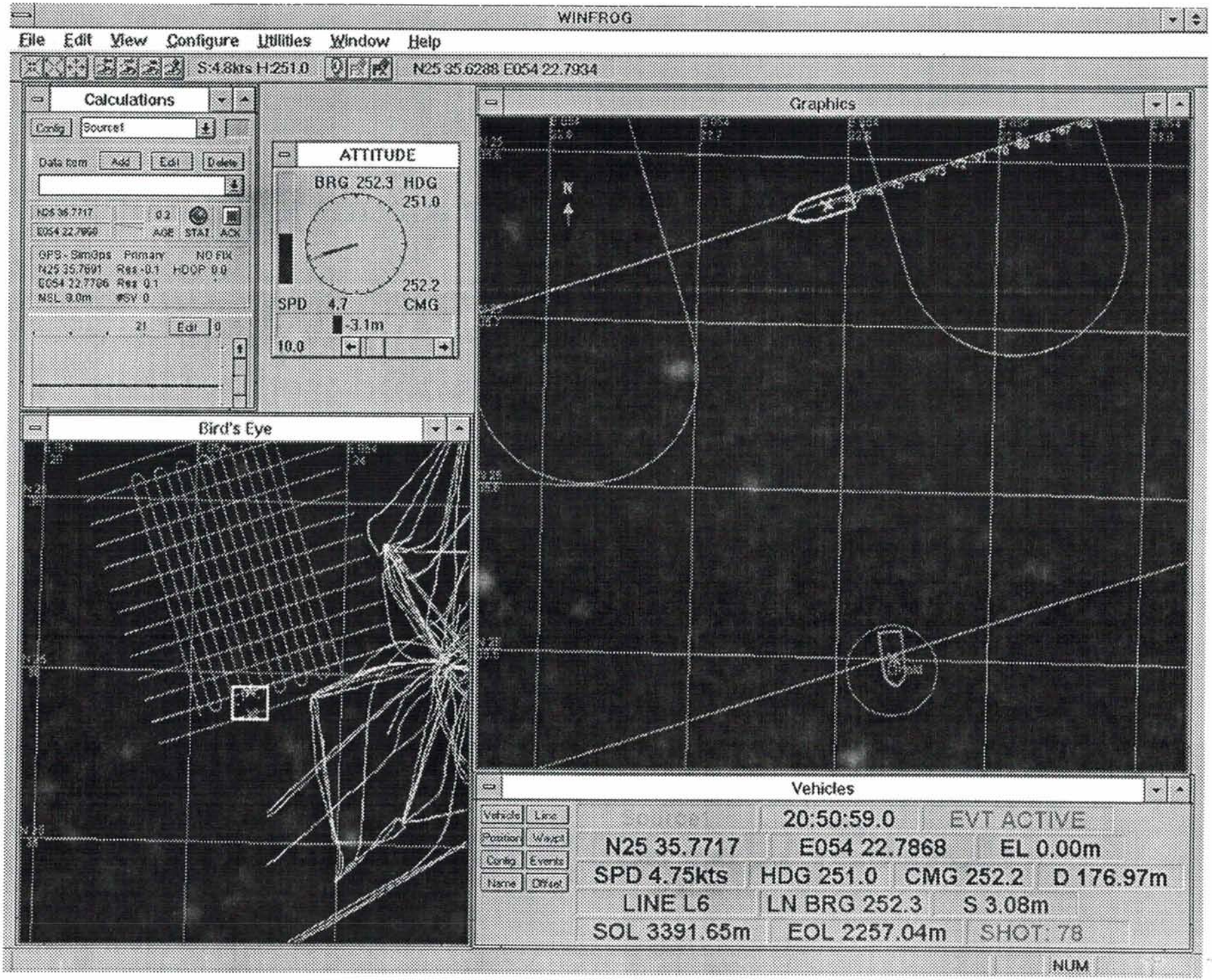
Transponderless Navigation

- Ensure navigation software supports integration of new systems (DVL, etc.)
  -> *modular software, support for multiple devices*

- Provide well documented data files with raw values
  -> *provided*

- Provide post-processing tool set for scientists in well supported environment
  -> *free demo package provides processing capability*

- Merging of surface and in-hull data files
  -> *not addressed*


WINFROG
File Edit View Configure Utilities Window Help
S:4.8kts H:251.0
N25 35.6288 E054 22.7934
Calculations
ATTITUDE
BRG 252.3 HDG
251.0
252.2
SPD 4.7 CMG
3.1m
Graphics
Bird's Eye
Vehicles
20:50:59.0
EVT ACTIVE
N25 35.7717
E054 22.7868
EL 0.00m
SPD 4.75kts
HDG 251.0
CMG 252.2
D 176.97m
LINE L6
LN BRG 252.3
S 3.08m
SOL 3391.65m
EOL 2257.04m
SHOT: 78
NUM

APPENDIX VI

ALVIN Overhauls & Inspections

Navy Requirements:
- *Annual sustaining certification audit*
- *Overhaul at least every five years*
- *Hull inspection every five years (currently under review)*

1989	February - Hull inspection August - Overhaul completed August - Sustaining certification audit
1990	March - Sustaining certification audit
1991	June - Sustaining certification audit
1992	August - Overhaul started
1993	February - Hull inspection (delayed until 1996) March - Overhaul completed March - Sustaining certification audit
1994	May - Sustaining certification audit
1995	May - Sustaining certification audit
1996	(Hull inspection) (May - Sustaining certification audit)
1997	(May - Sustaining certification audit)
1998	(Overhaul) (Sustaining certification audit)

Major Overhaul Work Tasks:

- *Hull inspection*
- *Frame inspection and repair*
- *Non-destructive testing of VB/HP air spheres*
- *Syntactic foam repair*
- *Fiberglass skin repair and painting*
- *Implodables pressure testing*
- *Cable inspection/replacement*
- *Battery replacement*
- *Control center refurbishment*
- *Primary systems inspections and refurbishment:*

  Hydraulic system
  Variable ballast
  Main ballast
  Propulsion
  Mercury trim
  Compensation
  Manipulators

- *Electronic equipment refurbishment, alignment, repair*

APPENDIX VII

Deep Submergence Science Committee

31 May - 2 June 1995

Woods Hole Oceanographic Institution

@ Carriage House/Quissett Campus

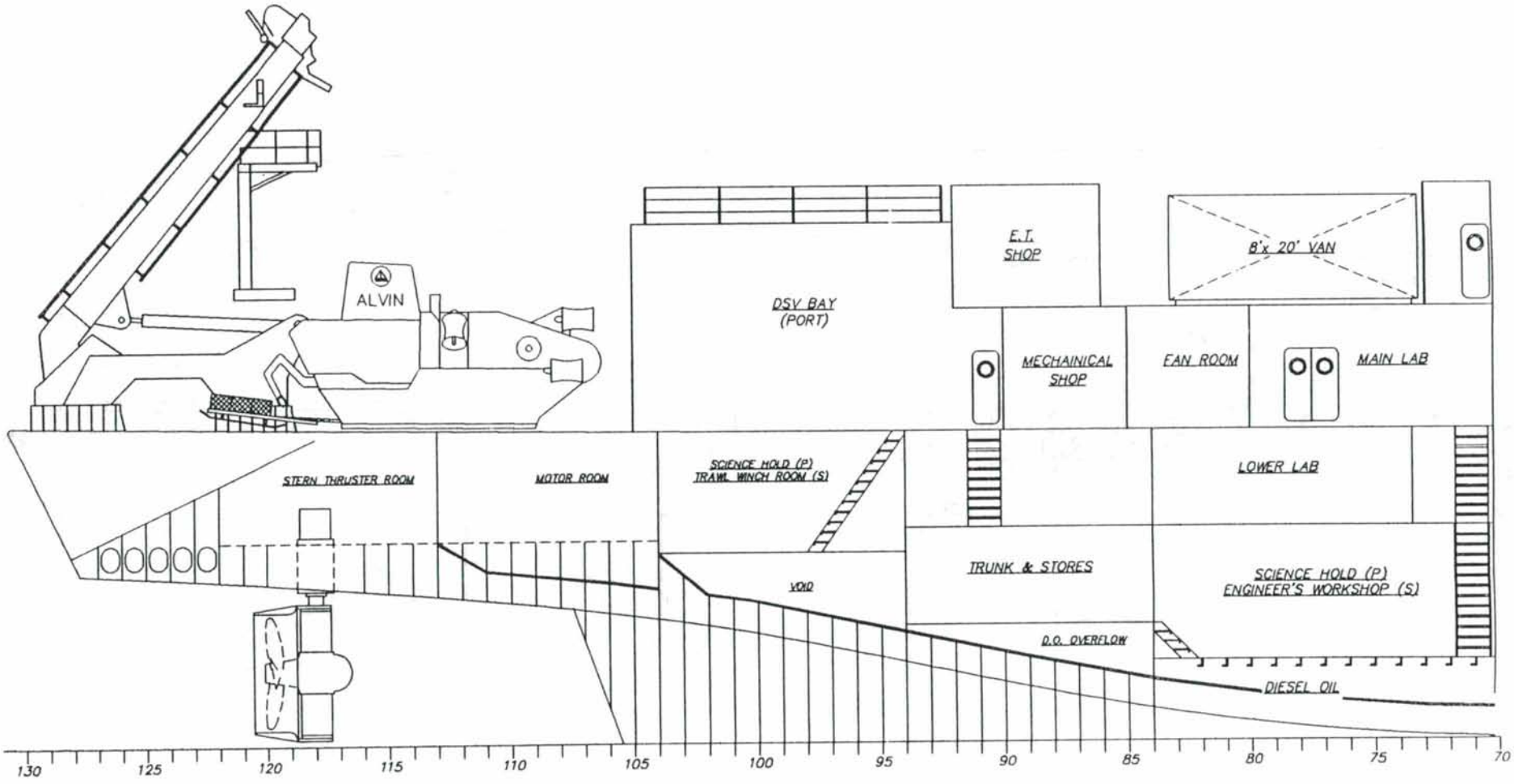
Overview

- **WHOI prepared to go ahead with *Knorr* conversion as proposed in April 1991 (AGOR-25 proposal).**

- **Features of Conversion**
  - ◊ **A-frame center-line versus offset to port.**
    - **Less expensive, fewer structural changes**
    - **Uses more deck space**
    - **Uses less main lab space**
  - ◊ **Traction winch on deck vice below decks (not in original proposal).**
  - ◊ **Crane to be moved off main deck.**

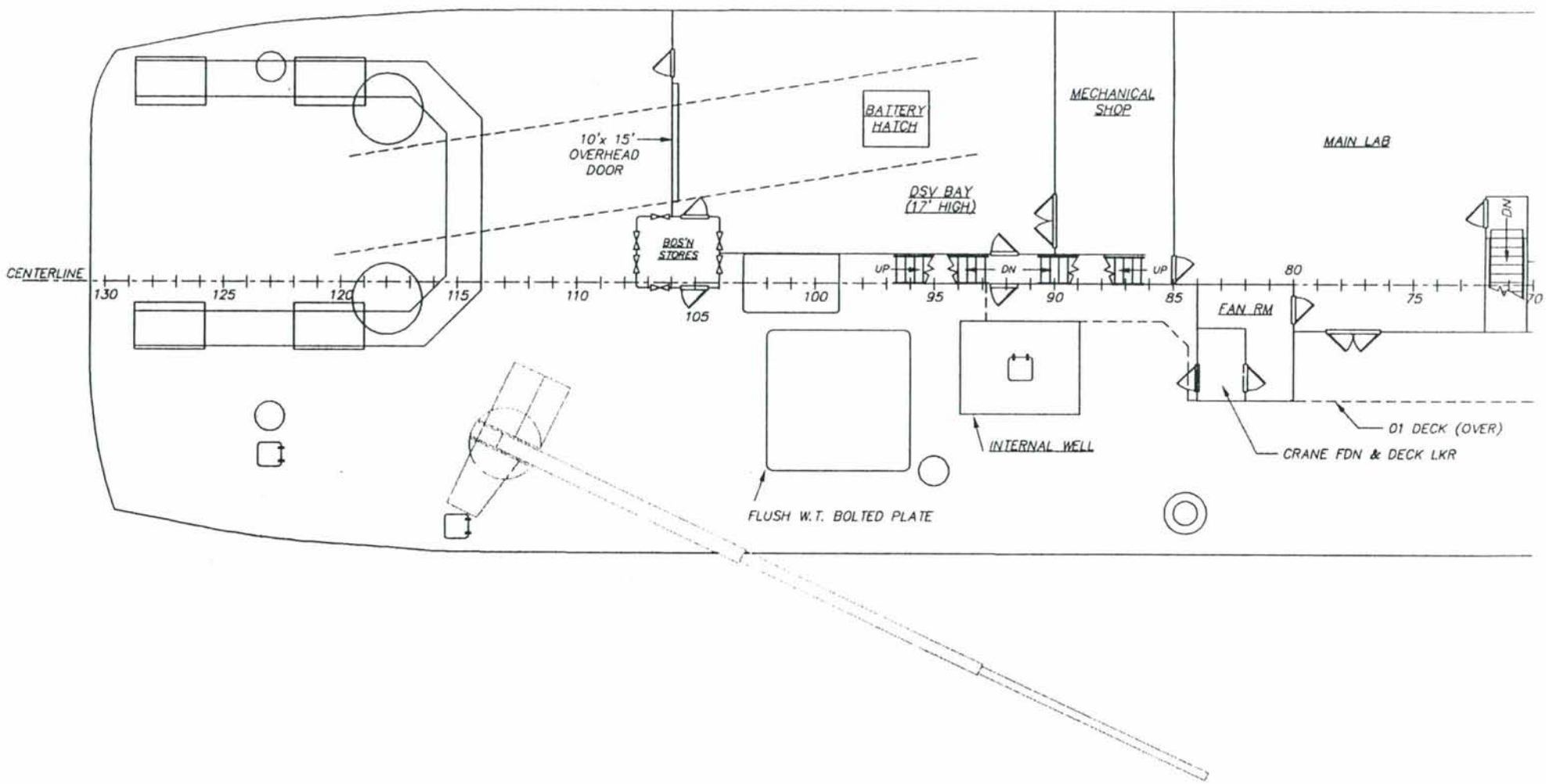
- **Weight storage, handling as on *Atlantis II***

- **Navigation - separate proposal per Bellingham's DESSC subcommittee**



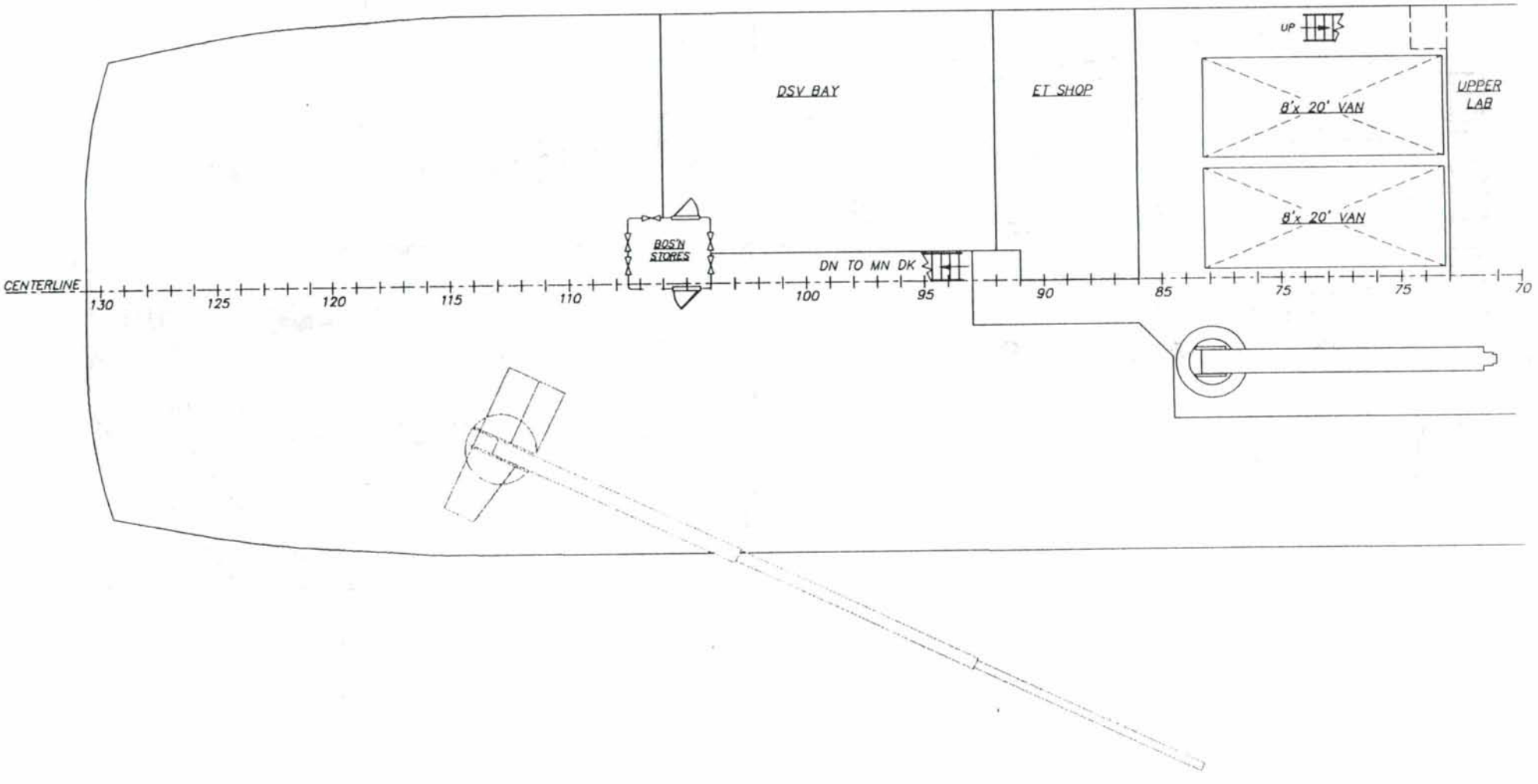
INBOARD PROFILE

JUNE '94 CONCEPT



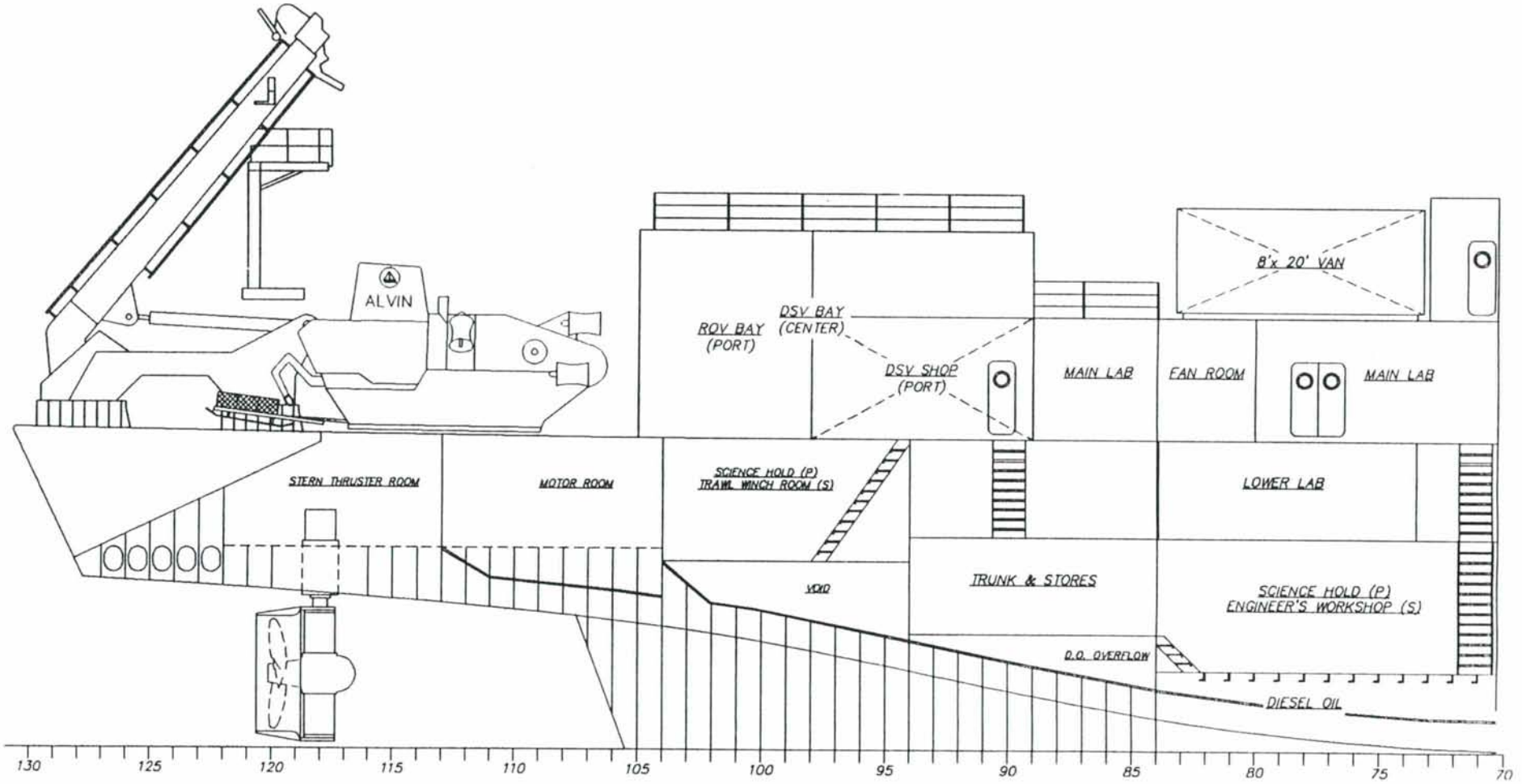
MAIN DECK

JUNE '94 CONCEPT



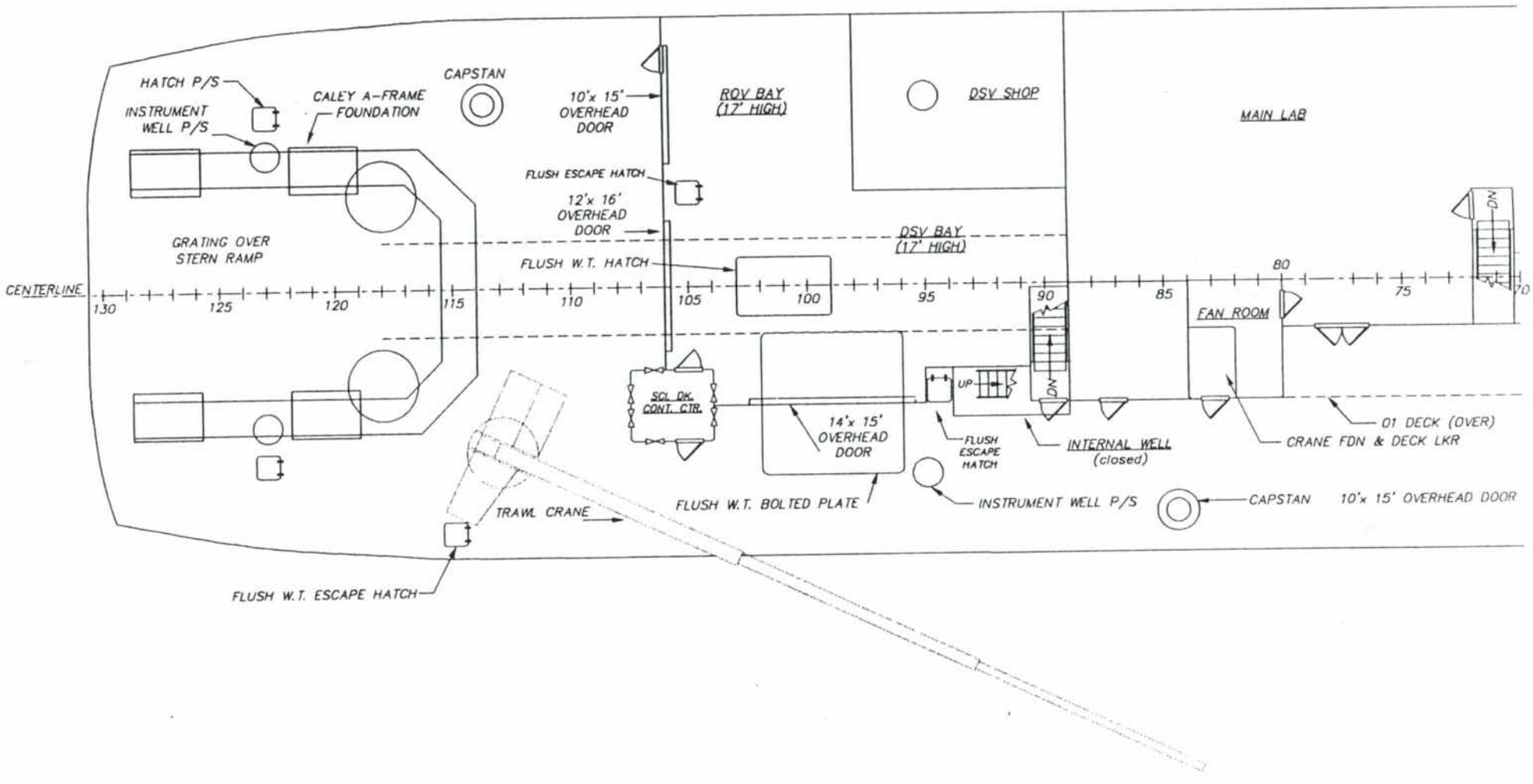
01 DECK

JUNE '94 CONCEPT



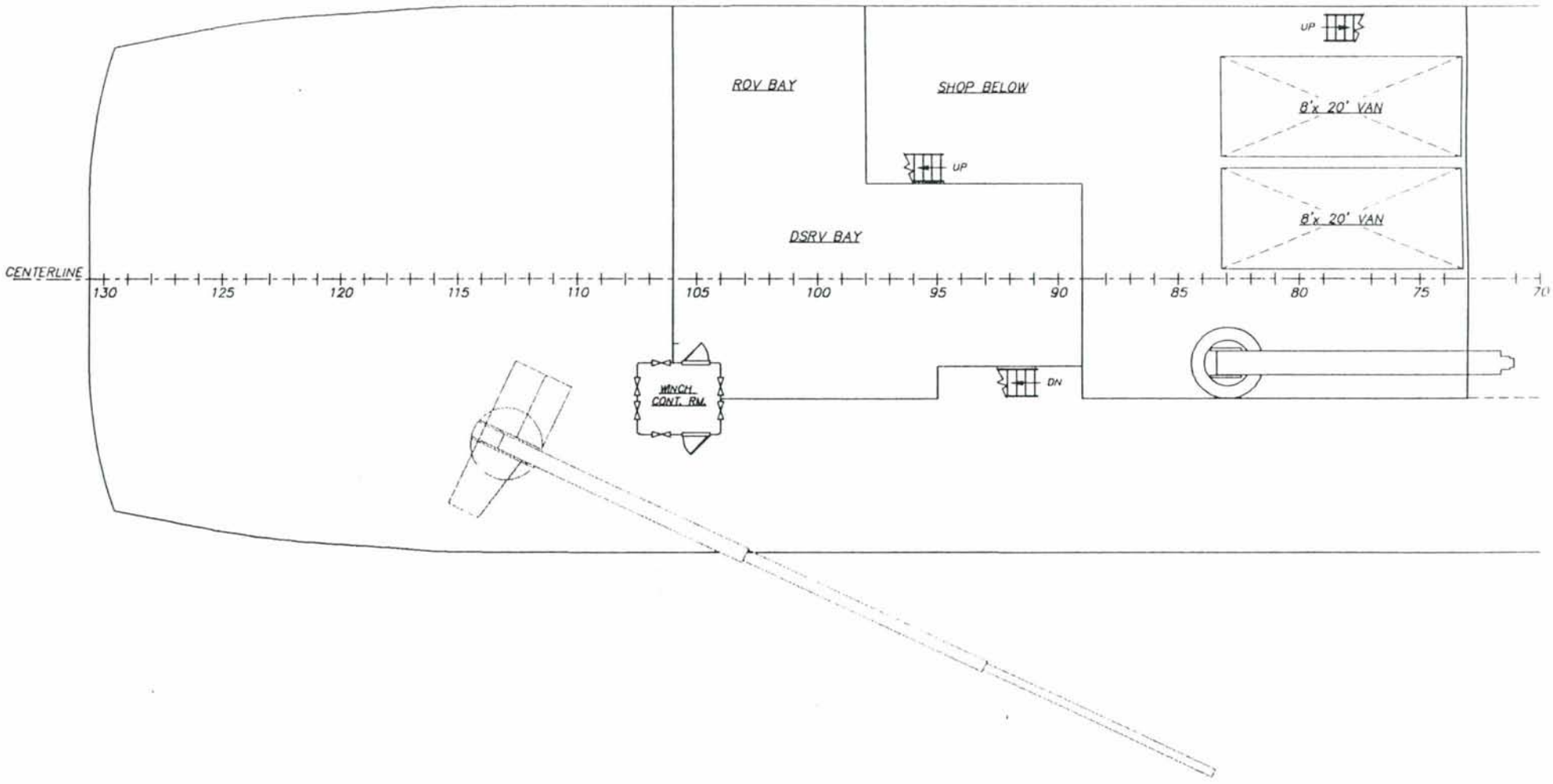
INBOARD PROFILE

ORIGINAL AGOR 25 PROPOSAL



MAIN DECK

ORIGINAL AGOR 25 PROPOSAL



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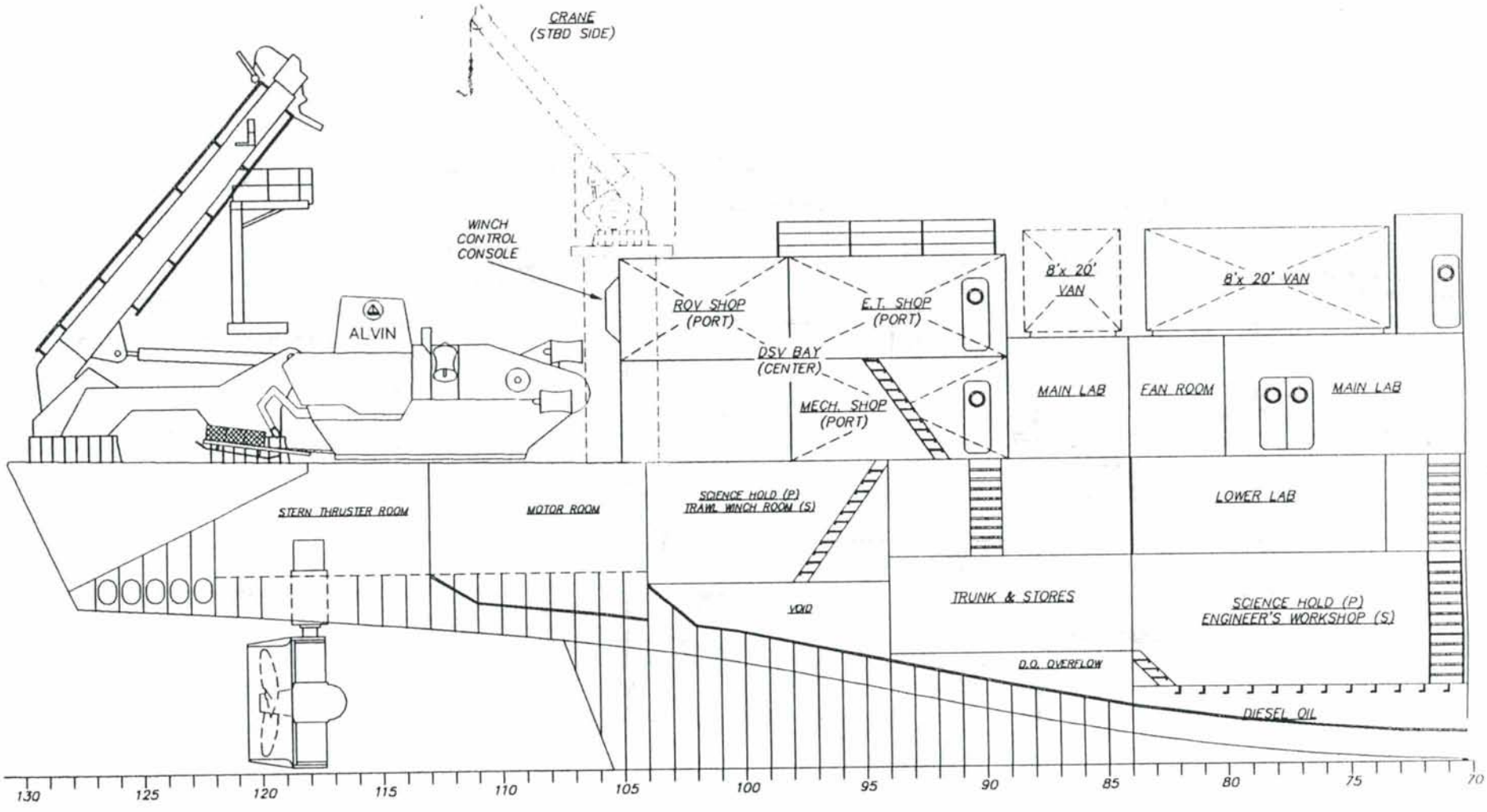
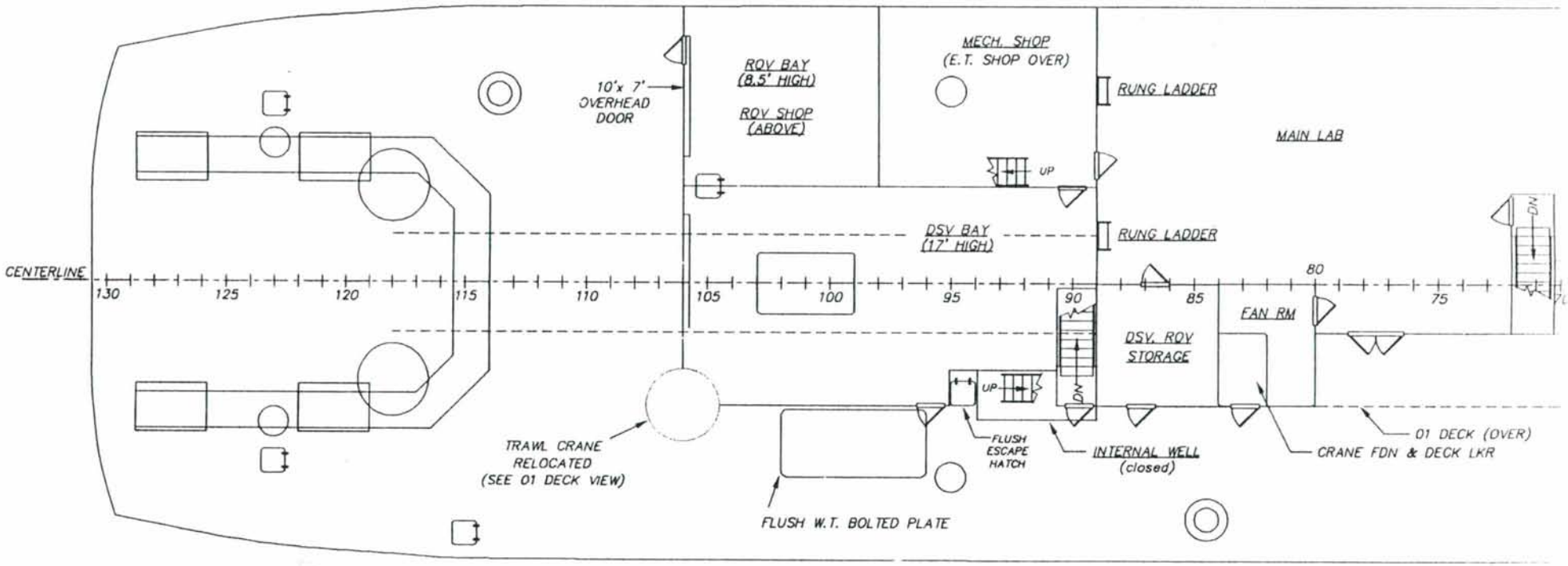
ORIGINAL AGOR 25 PROPOSAL



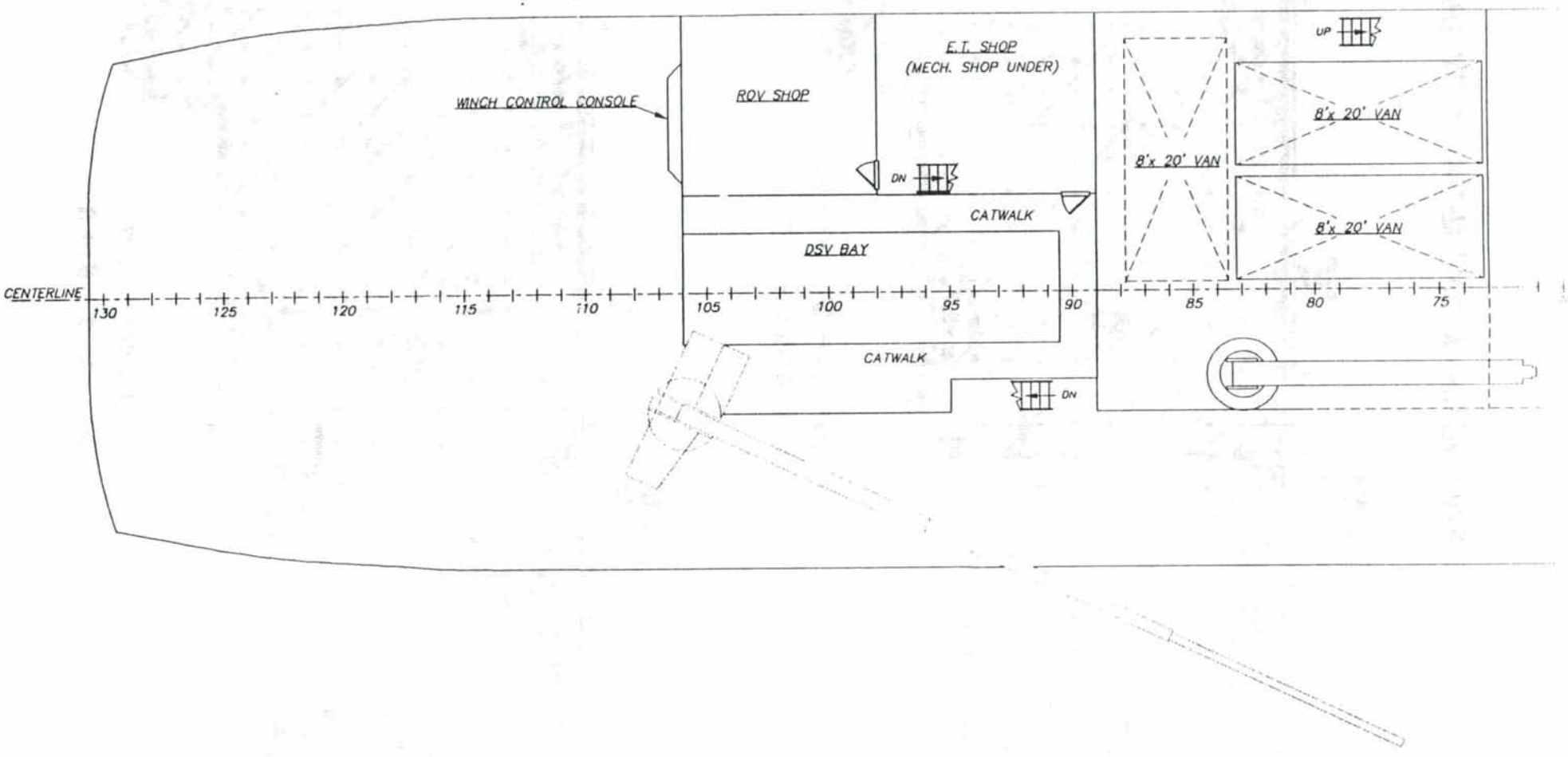
INBOARD PROFILE

MODIFIED AGOR 25 PROPOSAL



MAIN DECK

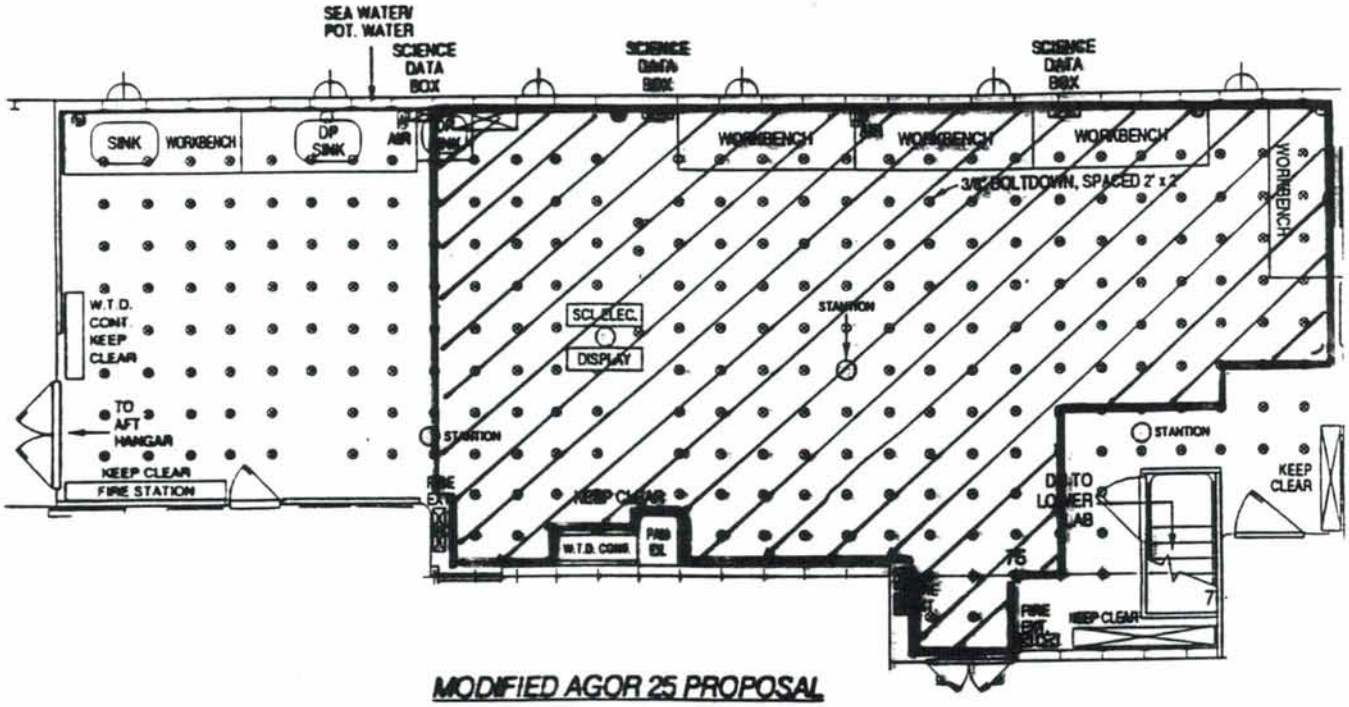
MODIFIED AGOR 25 PROPOSAL



01 DECK

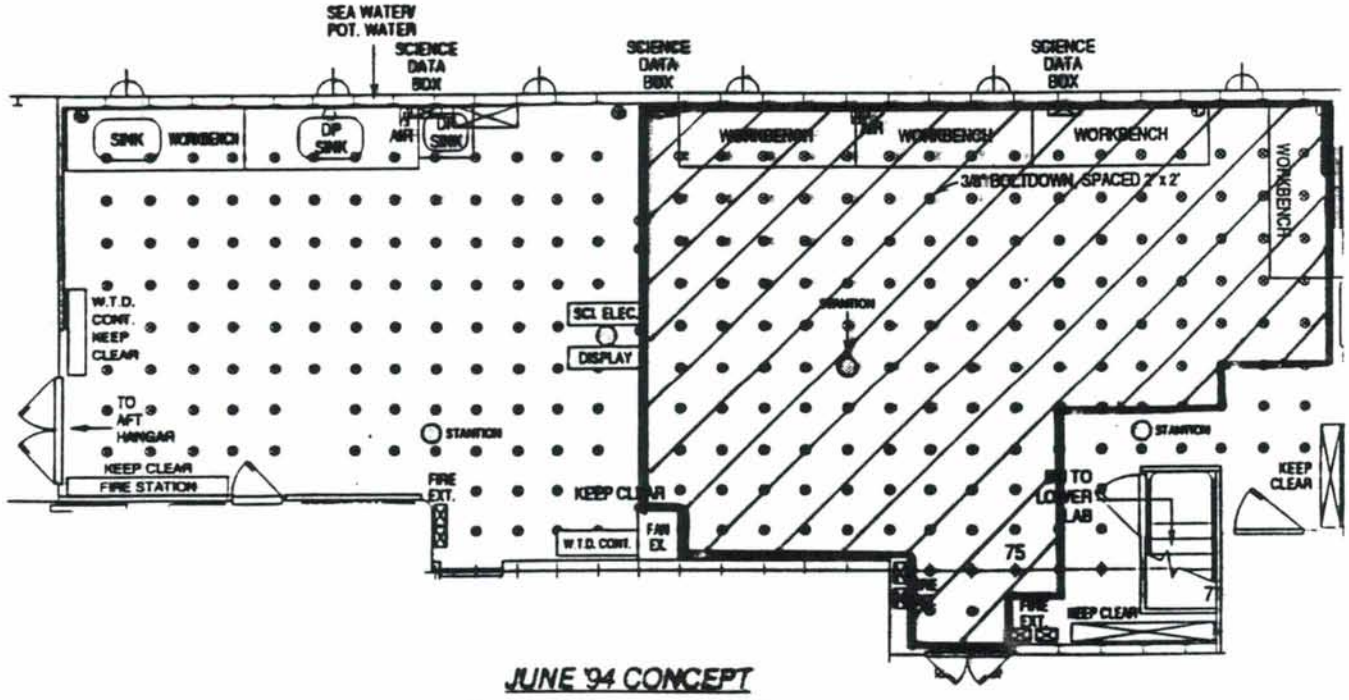
MODIFIED AGOR 25 PROPOSAL

R/V KNORR - MAIN LABORATORY SPACE



MODIFIED AGOR 25 PROPOSAL

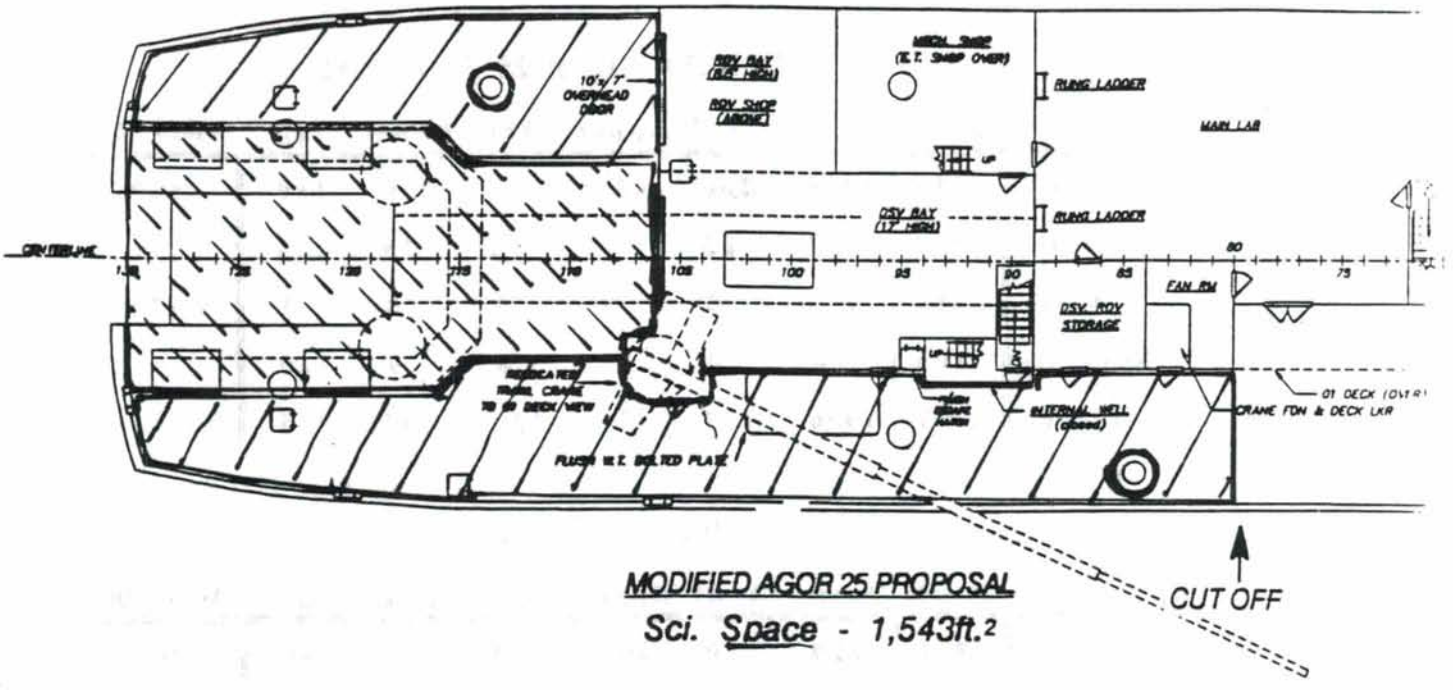
Sci. Space - 1,086 ft.²



JUNE '94 CONCEPT

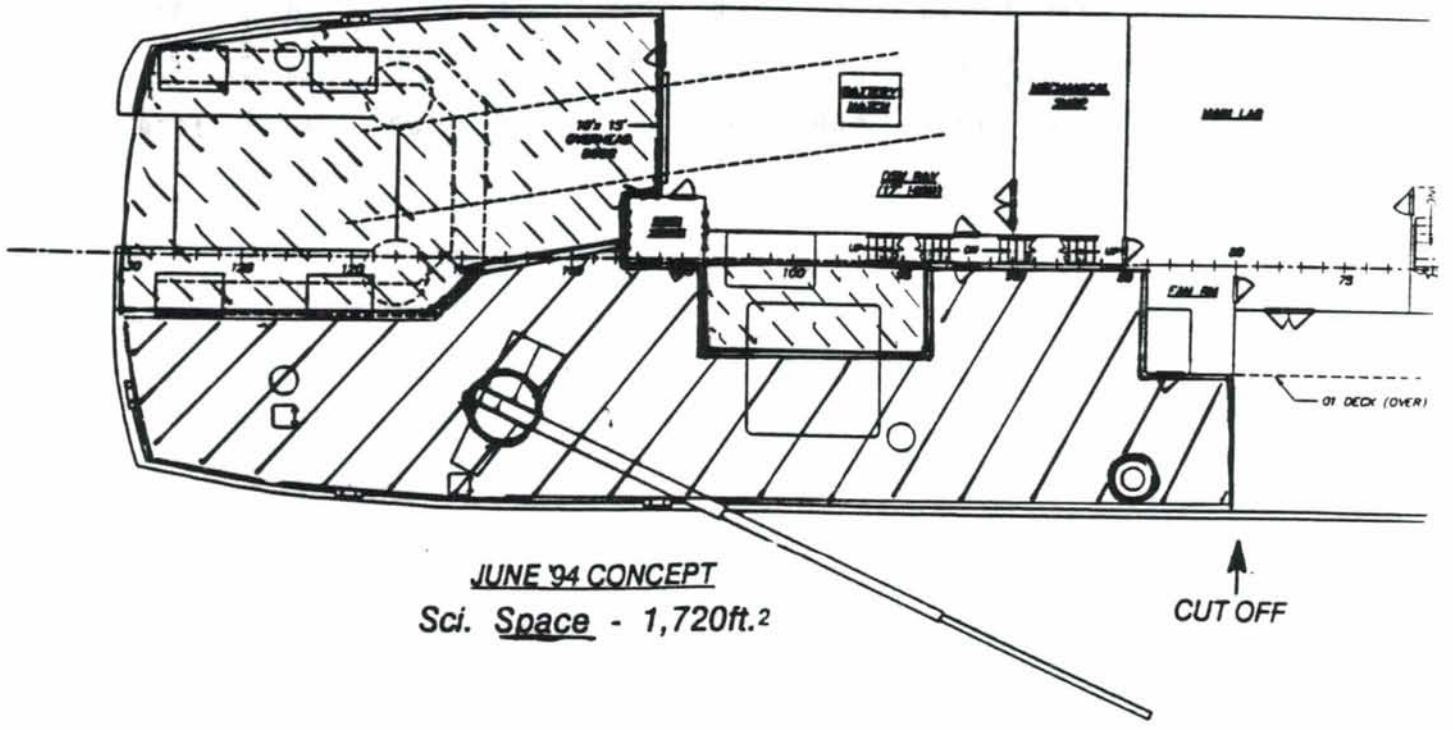
Sci. Space - 840 ft.²

R/V KNORR - MAIN DECK SPACE



MODIFIED AGOR 25 PROPOSAL

Sci. Space - 1,543ft.²



JUNE '94 CONCEPT

Sci. Space - 1,720ft.²

R/V KNORR
COMPARISION OF LAB & DECK SPACES
(Area in ft.^{2})

MODIFIED AGOR 25 PROPOSAL

	Total	Main	Anal.	Upper Wet	Lower	Top	Main Dk.
Total Area	2851	1320	260	483 148	260	380	2619
Unusable	479	192	23	77 18	55	114	-
Alvin	288	288	0	0 0	0	0	1076
Seabeam	103	0	0	83 0	0	20	-
Science	2227	1086	237	323 130	205	246	1543

JUNE '94 CONCEPT

	Total	Main	Anal.	Upper Wet	Lower	Top	Main Dk.
Total Area	2851	1320	260	483 148	260	380	3061
Unusable	479	192	23	77 18	55	114	-
Alvin	288	288	0	0 0	0	0	1341
Seabeam	103	0	0	83 0	0	20	-
Science	1981	840	237	323 130	205	246	1720

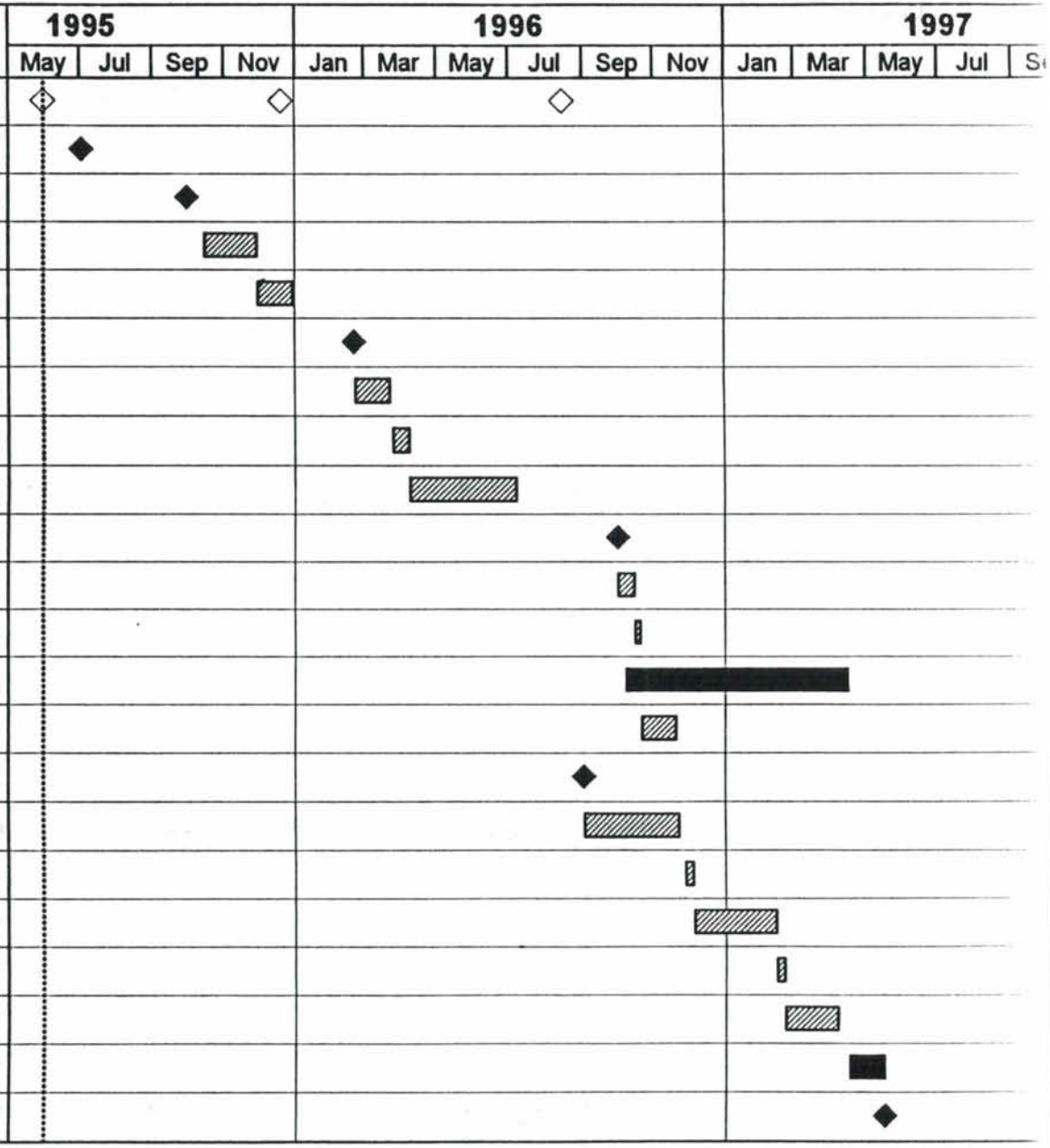
	Lulu	*Atlantis II*	*Knorr*
LOA	**105 ft.**	**210 ft.**	**279 ft.**
Beam	**48 ft.**	**44 ft.**	**46 ft.**
Displacement	**480 Ltons**	**2,300 Ltons**	**2,685 LTons**
Crew	**9**	**22**	**22**
Science:			
DSV/Tech	**9**	**9**	**13**
Party	**8**	**19**	**21**
Generators	**150 kw**	**600 kw**	**1,780 kw**
Cruising Speed	**6.5 kts**	**10.5 kts**	**12 kts**
Endurance	**20 days**	**30 days**	**60 days**
Range	**2,000 mi.**	**9,000 mi.**	**12,000 mi.**
Labs	**One Van**	**4 labs**	**6 labs**
		1,031 sq. ft.	**1,981 sq. ft.**

2227 ft²
↑
Modified Knorr

KNORR MODS FOR DEEP SUBMERGENCE FACILITY PLAN

revised 5/30/95

Name	Scheduled St
DESSC/FIC Oversight Comm	**5/31/95**
Submit Proposal	**7/2/95**
Decision to Proceed	**10/1/95**
Ph 2 contract Design	10/16/95
Prepare Specs & Contr	11/30/95
Issue RFP	**2/21/96**
Shipyard Bid Period	2/22/96
Evaluate Bids	3/25/96
Long Lead Time Delivery	4/8/96
Atlantis II Returns	**10/1/96**
Strip Atlantis II, Woods Hole	10/1/96
Atlantis transit to SY	10/16/96
Overhaul Alvin	**10/8/96**
Strip Atlantis II, SY	10/21/96
Knorr Returns	**9/1/96**
Knorr in Lay-up status	9/2/96
Deliver to Shipyard	11/28/96
Shipyard Work	12/5/96
Return to Woods Hole	2/13/97
Outfit in Woods Hole	2/20/97
Shakedown, w/limited science	**4/15/97**
Ready for Science	**5/15/97**



Key Objectives for WHOI 1996-1998

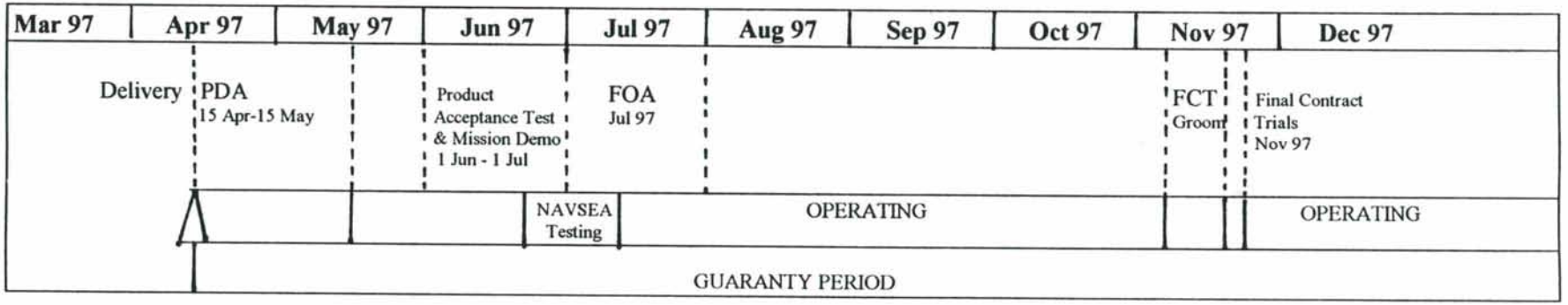
Short-Term (during transition period)

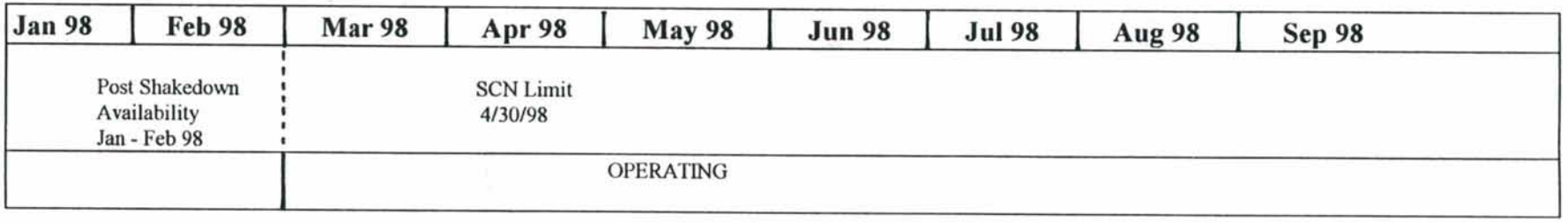
- **Science Support Continuity and Excellence**
- **Keep *Alvin* and ROV's Viable (personnel, team skills perishable)**
  - **Overhaul *Alvin***
- **Minimize Impact on Marine Crews**
  - **Minimum overlap of *Atlantis II, Knorr* out of service**
- **Minimize Cost to Feds**

Long-Term

Build to First Class National Facility

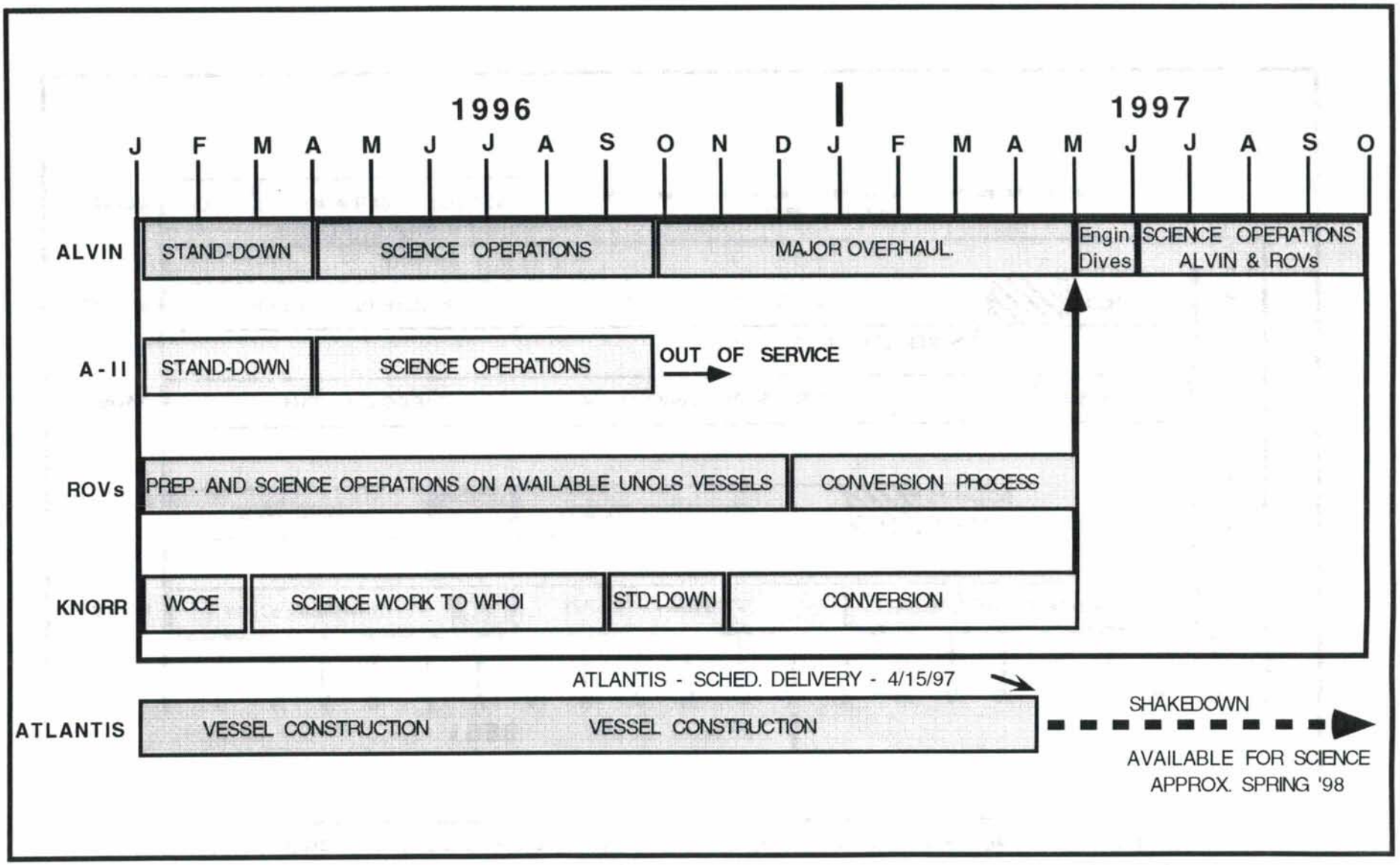
AGOR-25
Atlantis
POST DELIVERY SCHEDULE





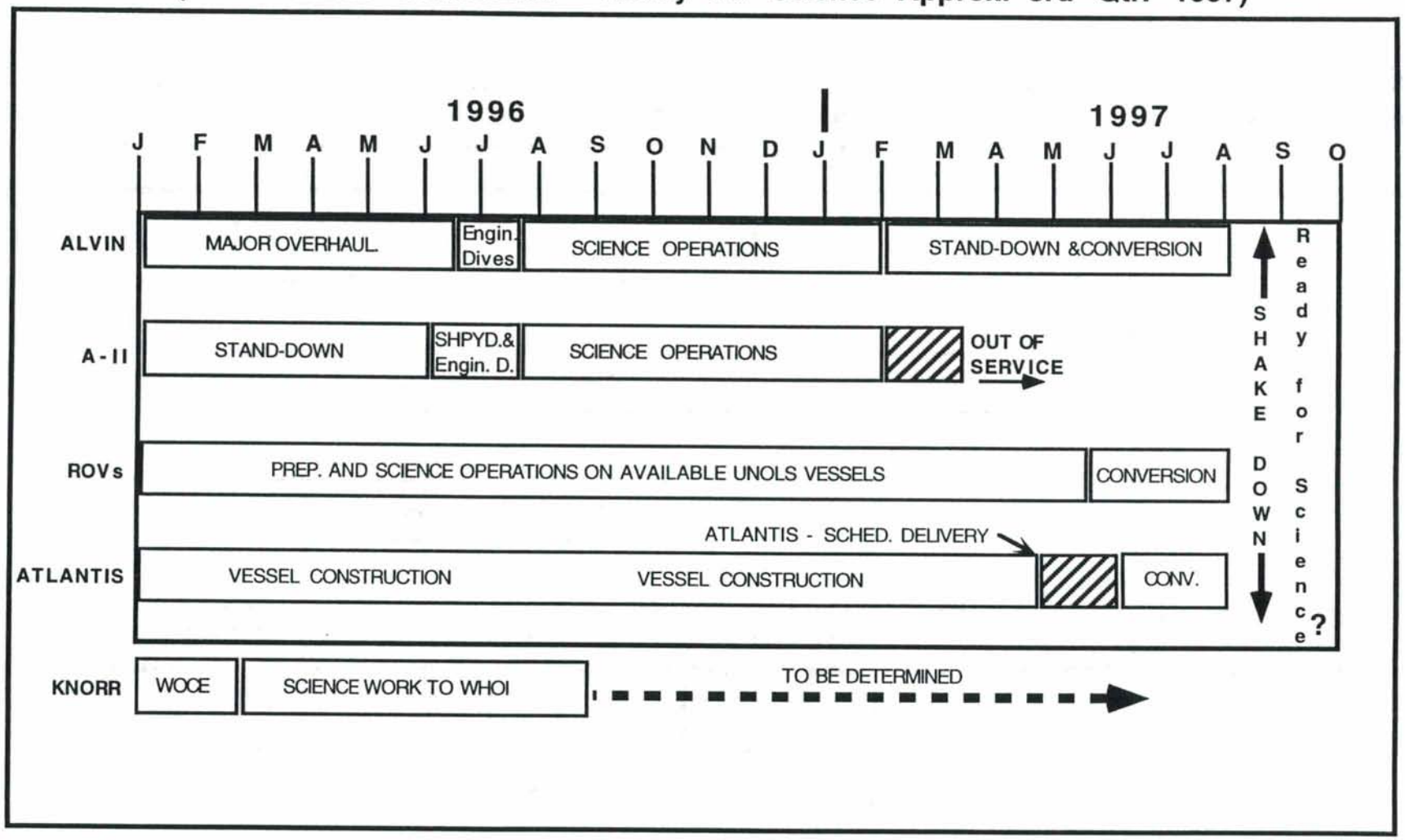
Revised 5/26/95

WHOI-Proposed Deep Submergence Operations Plan for 1996 & 1997
(Knorr Conversion in late-1996)



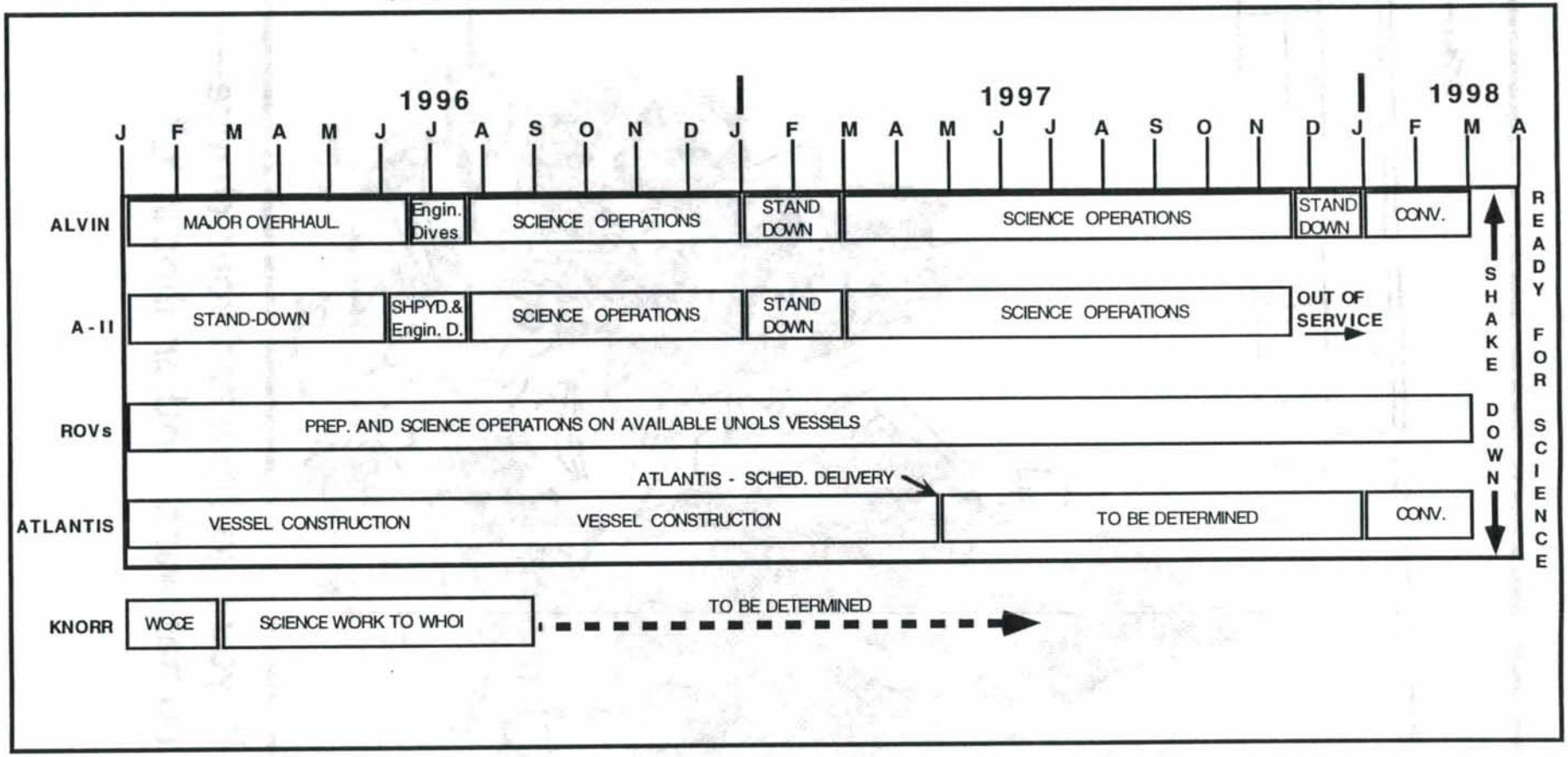
Revised 5/30/95

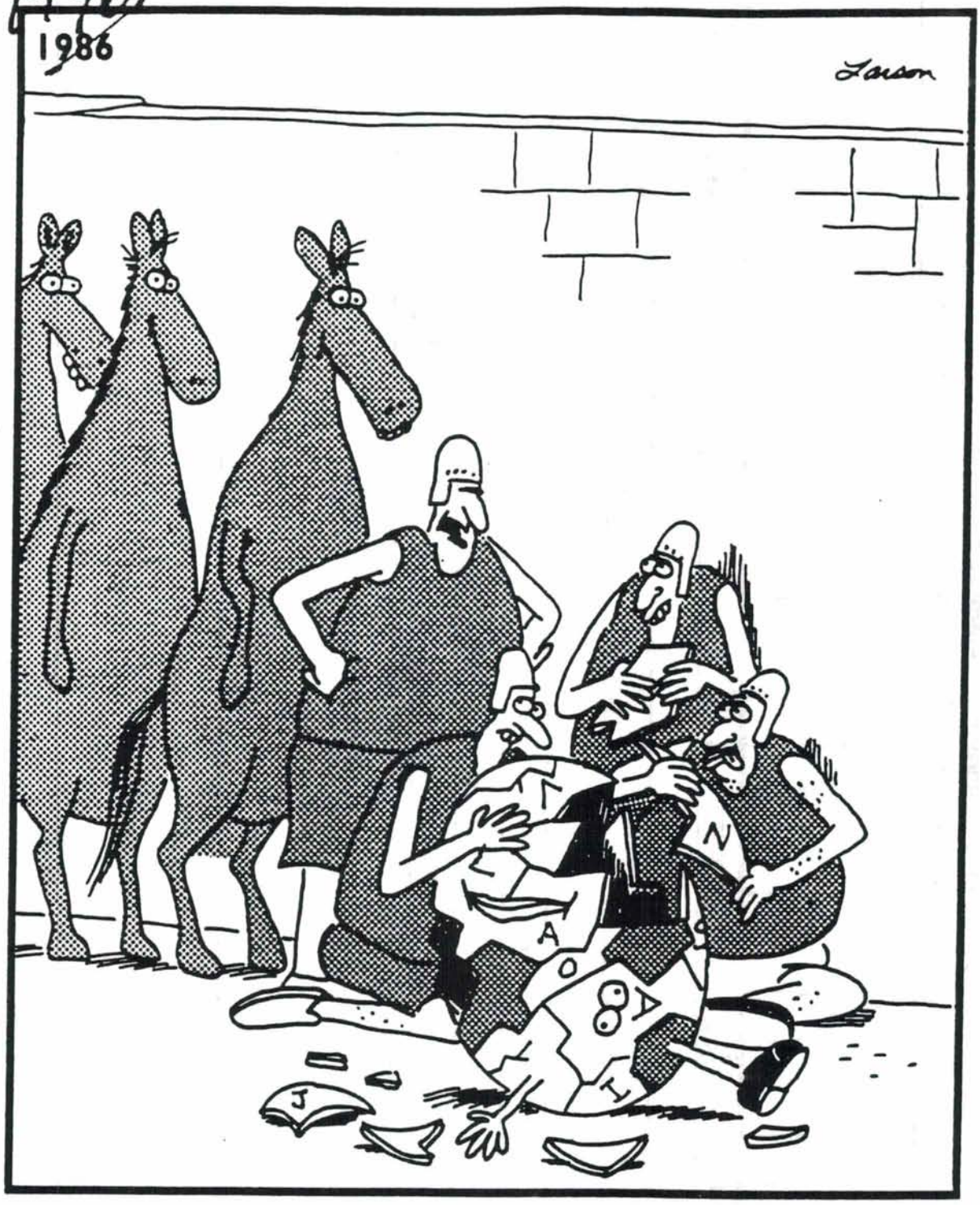
WHOI-Proposed Deep Submergence Operations Plan for 1996 & 1997
(New Atlantis Conversion - Ready for Science Approx. 3rd Qtr. 1997)



Revised 5/26/95

WHOI-Proposed Deep Submergence Operations Plan for 1996 & 1997
(New Atlantis Conversion - Ready for Science in Early 1998)





"OK, OK, you guys have had your chance—
the horses want another shot at it."

APPENDIX VIII

OCEAN SCIENCES DIVISION

	FY 1993	FY 1994	Estimated FY 1995
Ocean Sciences Division	$177.7 M	$ 188.9 M	$ 193.4 M
Ocean Sciences Research	92.5 M	100.0 M	102.9 M
Ocean Drilling Program	36.0 M	38.7 M	39.9 M
Oceanographic Facilities	49.2 M	50.2 M	50.6 M

OCEANOGRAPHIC FACILITIES DETAIL

Operations			
Ship Operations	29.4 M*	32.7 M*	35.2 M*
ALVIN, Aircraft, etc.	1.4 M	2.2 M	2.4 M
Marine Techs	4.2 M	4.2 M	4.2 M
	$ 35.0 M	$ 39.1 M	$ 41.8 M
Infrastructure			
Science Instruments	1.3 M	2.5 M	2.3 M
Shipboard Equipment	2.1 M	2.1 M	1.4 M
Ships, Upgrades	7.2 M	2.6 M	0.4 M
UNOLS, Misc.	0.5 M	0.5 M	0.6 M
	$ 11.1 M	$ 7.7 M	$ 4.7 M
Centers and Reserves	-	-	-
AMS	1.0 M	1.2 M	1.4 M
Cross Directorate/Reserves	2.1 M	2.2 M	2.7 M
	$ 3.1 M	$ 3.4 M	$ 4.2 M

*Plus $1.6 M from ODP (1993 and 1994), $1.8 M (1995)

(Apr. 1995)

NSF FY 1996 BUDGET REQUEST

OCEAN SCIENCES

- Request is $205.6 Million
- Increase of $12.2 Million or 6.3%

	FY 1994	FY 1995	FY 1996
OCEAN SCIENCES RESEARCH	$ 100.0M	$102.9M	$110.3M
OCEANOGRAPHIC CENTERS & FACILITIES	50.3M	50.6M	54.2M
OCEAN DRILLING PROGRAM	38.7M	39.9M	41.1M
	$ 189.0M	$193.4M	$205.6M

- Major Research Initiatives

GLOBAL CHANGE PROGRAMS	$53.7M	$57.7M	$59.8M
BIOTECHNOLOGY	4.0M	3.6M	3.8M
HIGH PERFORMANCE COMPUTING	0.4M	0.8M	1.0M
ENVIRONMENTAL RESEARCH	7.3M	7.7M	8.3M
SMETE (EHR)	2.1M	2.1M	2.2M
	$ 67.5M	$71.9M	$75.1M

- OTHER RESEARCH ACTIVITIES — $121.5M | $121.4M | $130.5M

(April 1995)

REQUIRED UNOLS FLEET CHANGES
1997 - 2002
" A MODEST PROPOSAL"

- **RETIRE**
  - ISELIN (1996)
  - GYRE
  - MOANA WAVE
  - ALPHA HELIX
  - ATLANTIS II (1996)
- **MOVE**
  - OCEANUS
  - MELVILLE
- **FLEET PROFILE**
  - **ATLANTIC/GULF**
    - 3 LARGE SHIPS
    - 3 INTERMEDIATES
    - 3 REGIONAL
    - 5 LOCAL
  - **PACIFIC**
    - 3 LARGE SHIPS
    - 3 INTERMEDIATES
    - 2 REGIONAL
    - 1 LOCAL
- **MAJOR PLAYERS**
  - **NSF**
    - OCEANUS, ALPHA HELIX, ATLANTIS II, ISELIN
  - **ONR**
    - KNORR, ATLANTIS, MELVILLE, MOANA WAVE
  - **INSTITUTIONS**
    - WHOI, SCRIPPS, HAWAII, ALASKA, MIAMI, TEXAS A&M
- **FLEET COSTS - 1997**
  - ESTIMATED AT $50.5 MILLION
  - UNCHANGED UNOLS FLEET - $60.0 MILLION
  - 1995 ESTIMATED FUNDING - $48.3 MILLION

(April 1995)

POSSIBLE UNOLS FLEET ALIGNMENT
1997 - 2002

ATLANTIC/GULF COAST REGION

NORTHEAST			
• KNORR	GENERAL PURPOSE	GLOBAL	WOODS HOLE
• ENDEAVOR	GENERAL PURPOSE	NORTH ATLANTIC	RHODE ISLAND
• EWING	MCS/MGG/GP	GLOBAL	LAMONT
• ATLANTIS	SUBMERSIBLE	GLOBAL	WOODS HOLE
MID - ATLANTIC			
• CAPE HATTERAS	GENERAL PURPOSE	NORTH ATLANTIC	DUKE ETAL
• CAPE HENLOPEN	GENERAL PURPOSE	CHESAPEAKE BAY	DELAWARE
BERMUDA			
• WEATHERBIRD II	GENERAL PURPOSE	BERMUDA	BERMUDA
SOUTHEAST/GULF			
• SEWARD JOHNSON	GP/SUBMERSIBLE	N. ATLANTIC, CARIBBEAN	HBOI/MIAMI
• EDWIN LINK HBOI	SUBMERSIBLE	GULF (BOTH SHIPS)	
LOCAL SHIPS			
• BLUE FIN	GP	S.E. LOCAL WATERS	GEORGIA
• SEA DIVER	SUBMERSIBLE	FLORIDA WATERS	HBOI
• CALANUS	GP	FLORIDA LOCAL	MIAMI
• PELICAN	GP	LOUISIANA, GULF	LUMCON
• LONGHORN	GP	TEXAS, GULF	U. TEXAS

(April 1995)

POSSIBLE UNOLS FLEET ALIGNMENT
1997 - 2002

PACIFIC REGION

ALASKA			
• OCEANUS	GENERAL PURPOSE	N.E. PACIFIC, BERING	ALASKA
NORTHWEST			
• THOMPSON	GENERAL PURPOSE	GLOBAL	U. WASH.
• WECOMA	GENERAL PURPOSE	NORTH PACIFIC	OREGON
CENTRAL CALIF.			
• PT SUR	GENERAL PURPOSE	N.E. PACIFIC	MOSS LANDING
HAWAII			
• MELVILLE	GENERAL PURPOSE	GLOBAL, WEST PAC.	HAWAII
SOUTHERN CALIF			
• REVELLE	GENERAL PURPOSE	GLOBAL	SCRIPPS
• NEW HORIZON	GENERAL PURPOSE	NORTH PACIFIC	SCRIPPS
• SPROUL	GENERAL PURPOSE	N.E. PACIFIC	SCRIPPS
LOCAL SHIPS			
• BARNES	GENERAL PURPOSE	PUGET SOUND	U. WASH.

(April 1995)

APPENDIX IX

A 5-year plan for undersea research in the region of the Central Pacific is being prepared.

Hawaii Undersea Research Laboratory - Project Unity Narrative

Following the recertification review of June 1994, the Hawaii Undersea Research Laboratory changed its basic direction to concentrate on the completion and full integrated operation of its ship, submersible and ROV. This has been labelled as project Unity. This change in focus was one of the central recommendations of the recertification committee.

Project Unity began in full swing in the fall of 1994. The goal of Project Unity is to effectively integrate the *Ka'imikai-o-Kanaloa*, ROV and *Pisces V* submersible into a smoothly operational 2000m diving system. Initial work began on the ship. This involved overhaul of the ship's motors and installation of an inertial navigation system. This was followed by a drydock period. During the drydock the rudders were overhauled and repacked, the below hull Seabeam array was installed, the hull was cleaned and painted and zinc anodes were replaced. Following drydocking a CTD winch and boom were installed as well as a ship wide video monitoring and clear com system.

The second part of project unity is the submersible. Work on the submersible began by totally dismantling the present vehicle. This was followed by new calculations on sub stability to make adjustments for the new hook which arrived from Scotland. A series of strengthening measures were taken on the strongback to allow for lift by the telearm. The hook has been installed. All submersible components have been overhauled. ABS has certified the frame and spheres. Reassembly is now taking place. The submersible with the new anti-pendulation tele-arm and A-frame lift system will be ready for ocean testing in the summer of 1995.

Following overhaul, the ship conducted three short test cruises. The Seabeam took accurate swath bathymetric data over

rough terrain at 11 knots. The CTD system and rosette water sampling system deployed by the innovative CTD boom worked flawlessly. All of the other ship systems also functioned well making the ship the first completed part of project unity.

A detailed study of our ROV system came to the conclusion that the purchase of a new ROV rather than an upgrade of the current ROV is most cost effective. Specifications have been completed and a new ROV will be ordered. Specifications have also been completed for a motion compensating crane to launch the ROV.

Project unity plans for tests of the integrated system in the spring of 1996 followed by a full science program in the summer of 1996. Project Unity is well on the way to providing the nation an effective deep ocean research diving capability .

APPENDIX X

ALVIN Letters of Interest
Summary 1995 - 1997

		1996 Prop.	1996 Funded	1997 Prop.	1997 Funded
ATLANTIC					
1	Calder	2			
2	Duncan	12			
4	Martin		12		
5	Ravizza	2			
6	Schmitt/Williams	7			
7	MacDonald	15			
8	Rona	10			
9	Klinkhammer	20			
11	Grassle/Petrecca	12			
42	Casey	22			
47	NERC	3			
	Total	**105**	**12**		
GUAYMAS BASIN					
12	Jannasch *	**10**		**10**	
OFF CALIFORNIA					
14	Smith/DeMaster	**10**			
EQUATORIAL PACIFIC					
13	Karson	20			
43	Schneider	12			
	Total	**32**			
JUAN DE FUCA					
15	Goldfinger/Kulm	16			
16	Johnson **	12			
17	Johnson	15			
18	Tivey			5	
19	Kelly et. al.	15			
20	Embley	15			
22	Zierenberg et. al.	33			
23	Becker	6			
24	Kadko	7			
25	Mottl **	22		22	
26	Kadko	3			
	Total	**144**		**27**	

		1996 Prop.	1996 Funded	1997 Prop.	1997 Funded
NORTHERN EAST PACIFIC RISE					
28	Chave/VonDover		4		
29	Langmuir	?			
30	Cary	5			
31	VanDover/Jonnasch			17	
32	Haymon/MacDona	18			
	Total	**23**	**4**	**17**	
SOUTHERN EAST PACIFIC RISE					
34	Naar	28			
35	Mullineaux/France	8			
36	Edmond	30			
37	Lilley	27			
38	Lupton***			25	
39	Lutz/Vrijenhoek		15		
45	Kent			20	
	Total	**93**	**15**	**45**	
WESTERN PACIFIC					
41	McMurtry	8			
46	Perfit			20	
	Total	**8**		**20**	

LUTZ

SUMMARY	1996 Prop.	1996 Funded	1997 Prop.	1997 Funded
	425	31	119	0

NOTES:

* ALVIN or JASON can be used

** Proposal requests JASON, But ALVIN preferred

*** Work can be moved to 1996 if ALVIN is in area

ROV Letters of Interest
Summary 1995 - 1997

		1996 Prop.	1996 Funded	1997 Prop.	1997 Funded
ATLANTIC					
3	Fornari	30			
9	Klinkhammer	20			
10	Sempere	35			
	Total	**85**	**0**		

		1996 Prop.	1996 Funded	1997 Prop.	1997 Funded
GUAYMAS BASIN					
12	Jannasch *	**10**			

		1996 Prop.	1996 Funded	1997 Prop.	1997 Funded
EQUATORIAL PACIFIC					
44	Stephen	**16**			

		1996 Prop.	1996 Funded	1997 Prop.	1997 Funded
JUAN DE FUCA					
16	Johnson **	12			
21	Humphris	25			
25	Mottl **	22		22	
	Total	**59**		**22**	

		1996 Prop.	1996 Funded	1997 Prop.	1997 Funded
SOUTHERN EAST PACIFIC RISE					
33	Fornari	30			
48	Haymon				21
	Total	**30**			**21**

		1996 Prop.	1996 Funded	1997 Prop.	1997 Funded
HAWAII					
40	Chave			8	
	Total			**8**	

SUMMARY	1996 Prop.	1996 Funded	1997 Prop.	1997 Funded
	200	0	30	21

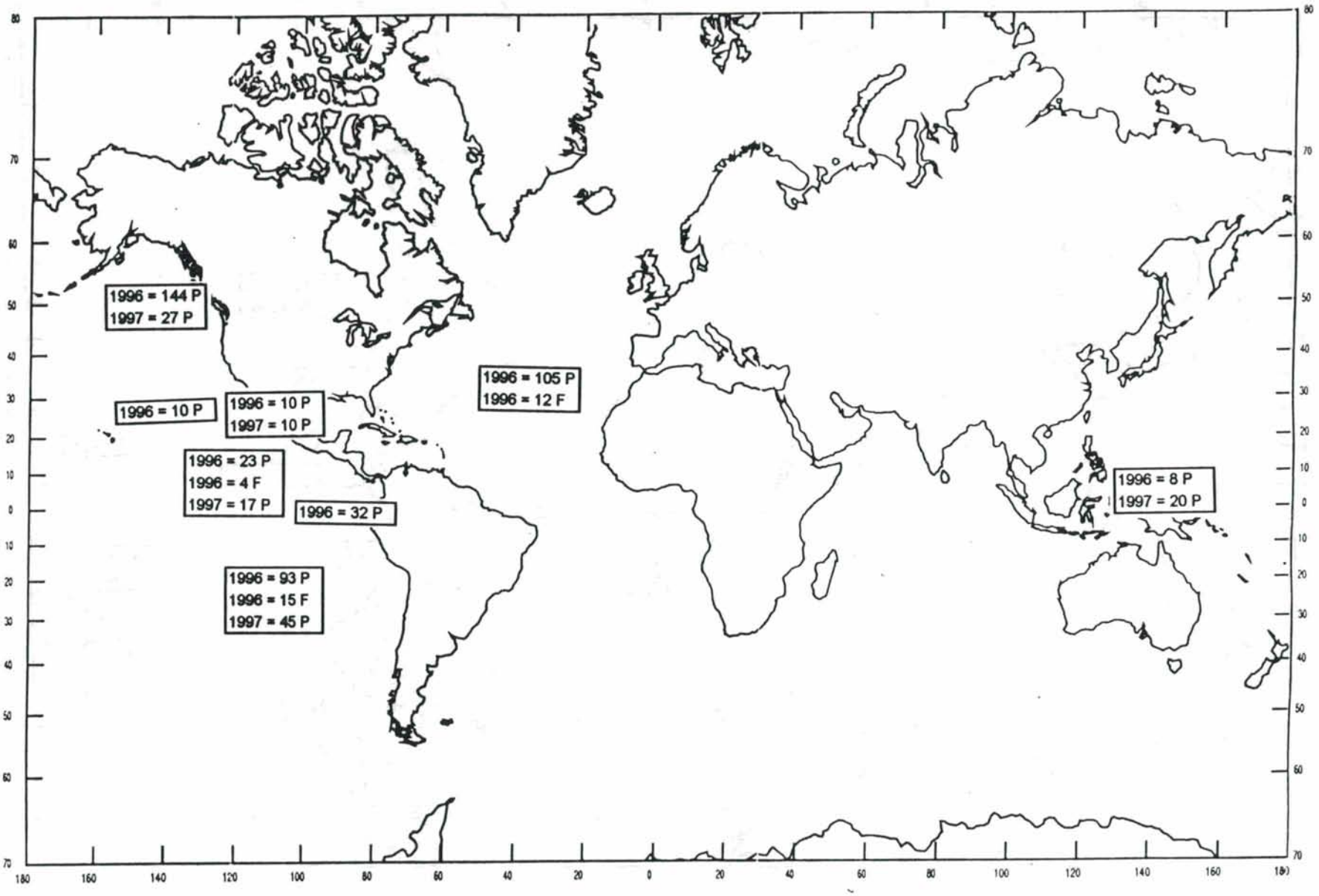
NOTES:

* ALVIN or JASON can be used

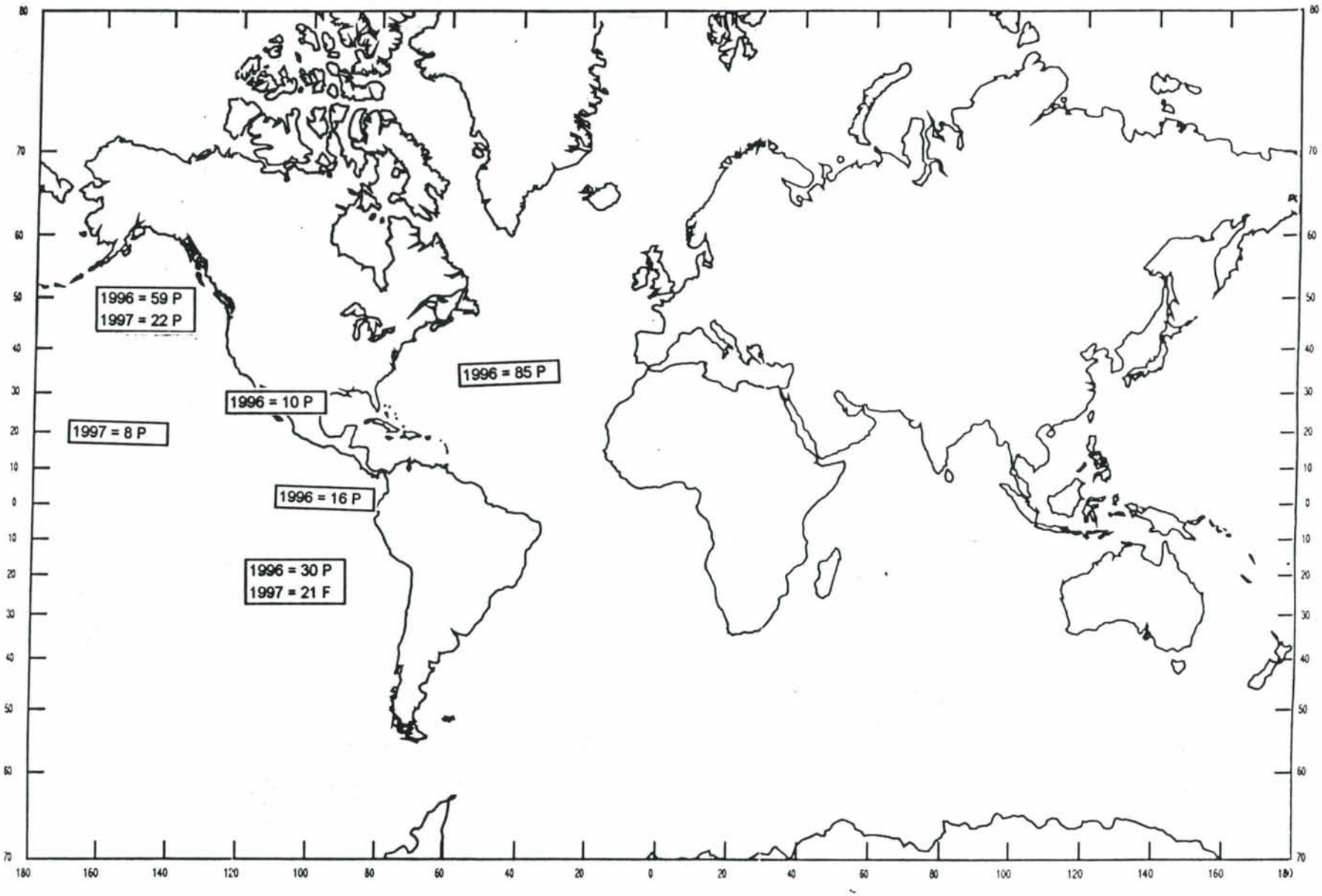
** Proposal requests JASON, But ALVIN preferred

*** Work can be moved to 1996 if ALVIN is in area

ALVIN REQUESTED DIVES BY REGION



ROV REQUESTS - 1996 - 1997



5/30/95

ALVIN Letters of Interest - Summary 1995 - 1997

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
LOI = Letter of Interest										
ATLANTIC:										
1.	D. Calder, Royal Ontario Museum		off Bermuda	Assess the diversity and zonation of epibenthos along a depth gradient, ranging from surface waters to the abyss, down the Bermuda Pedestal,	Canada Royal Museum LOI	1996 Jan to early May		2		Biol.
2.	R. Duncan, OSU	C. Sinton N. Donelly J. Diebold L. Abrams	Central Caribbean basin	Map and sample the western escarpment of the Beata Ridge to learn about the internal structure and composition of the mid-Cretaceous Plateau.	NSF LOI	1996		12	This proposal has been submitted for use of NAUTILE. If it is declined it will be submitted to NSF	G&G
3. ROV	Fornari, WHOI	Langmuir Colodner	MAR- 37 N Lucky Strike	Investigation of the Relations Between Volcanic, Tectonic and Hydrothermal Activity Within a segment of the Mid-Atlantic Ridge Influenced by the Azores Hotspot	NSF 831 11/16/94	Aug-Sep 1996	Jul-Oct 1996	30	ARGO II, JASON	G&G
4.	W.R. Martin, WHOI	F.L. Sayles, WHOI	Cont. Slope of NW Atlantic	Benthic Fluxes and Sediment Irrigation on the Continent Margin, N.W. Atlantc - Benthic Flux, pore water and sediment sampling, tracer experiments.	NSF 9503562 FUNDED	Jul-96	Jun-Aug 1996	12		Chem
5.	G. Ravizza, WHOI		high temp vent MAR or EPR	Collection of high temperature hydrothermal vent fluids for Os isotope analysis.	NSF proposal submitted 11/1/94	1996		2	dives of opportunity at a high temperature vent	G&G
6.	R. W. Schmitt, WHOI A. Williams, WHOI		Western Tropical Atlantic, east of Barbados	Double Diffusion in Oceanography - observations and measurements of the unusual layered structure found in temperature and salinity profiles in the main thermocline.	NSF LOI	1996		7	It was anticipated that ALVIN would be in the the area in the later half of 1996	Phys
7.	K. MacDonald,		MAR near 26 N	Investigate the origin of abyssal hills on the slow-spreading Mid-Atlantic Ridge near 26 N	LOI	1996		15		G&G
8	P. Rona, Rutgers	M. Kleinrock, Maurice Tivey	MAR Tag site 25 N, 45 W	Mapping, heat flow geochemistry/mineralogy and radiochronology of the MIR and the ALVIN relict hydrothermal zones.	NSF 8/15/95 submittal planned	1996		10		Geoche

ALVIN Letters of Interest - Summary 1995 - 1997

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
9. ROV & ALVIN	Klinkhammer	J.-C. Sempere R.Lutz	MAR 36 15.1'N 33 53.3"W	Detailed Deep Submergence Studies of Rainbow Hydrothermal Area, Amar Segment, Mid-Atlantic Ridge	NSF Submitted for May G&G Panel	Summer 1996		20	Project calls for ALVIN, JASON & AGOR II	G&G
10. ROV	J.-C. Sempere, UW		MAR, 29 N	Fine-scale segmentation and structural variability within a slow-spreading segment	NSF RIDGE 831-2/20/95	Any 96-97	1997	35	DSL-120 AGOR II	G&G
11.	F. Grassle, Rutgers R. Petrecca, Rutgers		Mid-Atl Bight 106-mile Sludge Sit 39 N, 70 W to 38N, 73 W	Continue interdisciplinary study of the 106-mile Deep Water Municipal Sludge Site (LEO-2500). Determine changes in the environmental parameters approximately 4 years after cessation of dumping	LOI NOAA/NURP & NSF	1996		10 to 14		Biol
42.	J.F. Casey, U. Houston	P. Rona, H. Dick, P. Kelemen, H. Elderfield, J.L. Charlou, J. Edmond, D. Colodner, C. Van Dover, P. Saccocia	MAR 15 40'N - 14 40'N, 44 50'W - 46 50'W	FARA ALVIN 15N: Mantle Crust Processes	NSF ODP submitted 2/15/95	1996 March	1996 Apr-Dec	22		G&G
47.	NERC, Brtish		MAR		Bitish	1996 1997	1997 1998	3		
GUAYMAS BASIN										
12. ALVIN or ROV	H. Jannasch, WHOI	N. Pace G. Muyzer	Guaymas Basin Gulf of CA	Microbial Transformations at Deep-Sea Hydrothermal Vents	NSF 831-12/12/94	1) Dec 95 to Apr-96 2) Dec 96 to Apr-97		1) 10 2) 10	ALVIN or JASON ALVIN	Biol
OFF CALIFORNIA										
14.	C.R.Smith, U.H D.J. DeMaster, NCSU		Santa Catalina Basin 33 12"N 118030"W	Age dependent bioturbationof deep-sea sediments tests of mechanisms at three bathyal sites	NSF submitted 2/15/95 pending	1996 1) early Jan 2) March		7 3		Chem

ALVIN Letters of Interest - Summary 1995 - 1997

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
EQUATORIAL PACIFIC										
13.	J. Karson, Duke	S. D. Hurst S. Agar C. McLeod Gillis	N. Wall of Hess Deep Rift 0 N, 102 W	Internal Structure of the Uppermost Oceanic Crust Exposed at the Hess Deep Rift: Manifestations of Waxing and Waning Magmatism Along the EPR.	NSF MG&G & ODP will resubmit	Sum 96		20	Proposal was submitted declined, encouraged to resubmit.	G&G
43.	D. A. Schneider, WHOI	M.A. Tivey	N. Galapagos 3N, 93W	Geomagnetic Paleointensity and 14C Production: the Record from Sediments Acquired by Submersible	NSF MG&G Form 831 4/15/94	1996		12		G&G
44. ROV	R. A. Stephen, WHOI	S. Swift R. Detrick	Site 504 1deg 13.6'N, 83 deg 43.8' W	High Resolution Imaging of Recent Faulting in Six Million Year Old Crust at DSDP Site 540: Implications for Hydrothermal Flow and Stress Regime	NSF ODP submitted 2/15/95	Fall 1996	Winter 97	16		G&G
JUAN DE FUCA										
15.	C. Goldfinger, OSU V. Kulm, OSU		N.E. Pacific Oregon & Wash. continental slope	Investigate the nature and origin of oblique strike-slip faults identified in existing SeaMARC-IA sidescan sonar images of the Oregon and Washington convergent plate boundary.	LOI NSF	1996 late May to Sept.		12 to 16		G&G
16.	H.P. Johnson, UW	M.A. Tivey M.C. Holes	Juan de Fuca 46 30 N 129 30 W	Time dependent changes in very young ocean crust	NSF RIDGE FUNDED	Sum 96	Jun-Oct 1996	12	The proposal presently recommends use of JASON, but Paul would prefer ALVIN	G&G
17.	H.P. Johnson, UW	M.A. Tivey M.C. Holes T. Juteau	Southern JDF & Northern Gorda Ridges Blanco Fracture Zone	An experimental determination of the density of upper oceanic crust as a function of depth.	NSF RIDGE submitted 2/15/95	1996	Jul, AUG 1997	15	The proposal presently recommends use of ALVIN in 1997, but could be performed in 96	G&G
18.	M.A. Tivey, WHOI	A. M. Bradley	Juan de Fuca: 48N, 129W	Development of Flow Sensors for Active High and Low Temperature Seafloor Vents	NSF RIDGE 831-2/14/95	Jun-Sep 1997		5		G&G
19.	D. S. Kelley, U.W. R. Koski, USGS R. Embley, NOAA J. Delaney, UW		JDF Blanco Transform Fault Zone	Accretionary and Hydrothermal Processes in the Lower Oceanic Crust: An ALVIN Study of the Blanco Transform Fault Zone	LOI	1996		15	ALVIN plus deep towed camera survey at night	Geo Chem

ALVIN Letters of Interest - Summary 1995 - 1997

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
20.	R. W. Embley	VENTS program scientists	JDF: North Cleft & Cobb segment	(1) Continue the time series at the 1993 CoAxial and the North Cleft eruption sites, and (2) sample some newly discovered vents on the Cobb segment on the northern Juan de Fuca Ridge to complete baseline survey	NOAA LOI	Summer 1996		12 to 15		Geo Chem
21. ROV	S. Humphris, WHOI	R. Zierenberg R. Koski K. Juniper	JDF Escanaba Trough, Gorda Ridge 41N, 127 W	Relations between Volcanic, Tectonic and Hydrothermal Activity in the Escanaba Trough, Gorda Ridge.	NSF-ODP 9521434 Submitted 2/15/95	May, Jun, Jul 1996	none	25	JASON & 120 kHz	G&G
22.	R. Zierenberg R. Koski K. VonDamm		JDF Escanaba Trough, Gorda Ridge Middle Valley	Pre- and post- ODP drilling experiments using ALVIN. Escanaba: Photo mosaic of the drill site area to establish the extent of hydrothermal discharge, the distribution of vent-specific fauna, and to facilitate placement of drill holes. Hydrothermal fluid sampling. Middle Valley: vent fluid sampling, biol mapping and sampling. heat flow measurements.	USGS and NSF LOI	1996 prior to ODP drilling		Escanaba: 16 dives Mid-Valley: 17 dives	ALVIN dives would take place prior to ODP Leg 169, Sept-Oct, 1996. This could be collaborated with work ROV proposed programs	G&G
23.	K. Becker, U. Miami		JDF Ridge -ODP srill sites	Revisit six ODP CORKs (sealed instrumented holes) shortly after August drilling in 1996.	NSF new proposal to be submitted 8/15/95	last half Sep, 95	mid-Aug 96	6	Work to be supported under an existing grant plus new proposal to be submitted for 8/15/95	G&G
24.	D. Kadko, U. Miami	D. Butterfield G. Massoth A. Schultz K. Becker	JDF N. Cleft Segment Monolith Vent	Measurement of short term variations of heat and chemical flux from the N. Cleft Segment of the Juan de Fuca.	LOI	1996		7		G&G
25.	M. Mottl	C.G. Wheat M.D. Lilley A.T. Fisher	1) JDF, 48 N Middle Valley 2) Escanaba Troug Gorda Ridge, 41 N	Temporal variations in sedimented-ridge hydrothermal systems at Middle Valley and Escanaba Trough: an ROV study	NSF - MGG proposal submitted for 2/15/95	late spring early sum '96 and Summer 97		1996 1) 14 2) 7 1997 1) 14 2) 7	This proposal was submitted requesting use of JASON in 1996, it was thought that ALVIN would not be available. ALVIN is the preferred vehicle.	G&G
26.	D. Kadko, U. Miami	A. Schultz K. Becker	JDF Middle Valley	Long-term instrumentation of Middle Valley Deplow instrumentation before ODP drilling to observe changes to the hydrologic system during and after the drilling operations.	LOI	1996 prior to ODP drilling		3	This cruise can piggy-back on Mottle cruise	G&G

ALVIN Letters of Interest - Summary 1995 - 1997

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
NORTHERN EAST PACIFIC RISE										
28.	A. Chave C. L. Van Dover		9 N EPR or other vent >350 C	ALISS: Ambient Light Imaging and Spectural System Design/checkout/test ambient light imaging system to characterize properties of vent light.	NSF 9407774 FUNDED	prior to May-96		4	Add on to other cruise 4 bunks needed	G&G
29.	C.H. Langmuir	J. R. Reynolds J. F. Bender W. B. F. Ryan K. Kastens	12 N EPR	Understand the meaning and significance of the spatial distribution of petrological types on the EPR. Fine scale sampling and observations using ALVIN.	LOI	1996				G&G
30.	C. Cary, U. Delaware	J. Stein,	EPR 13 N site: 12 48' N x 103 56' W	A molecular dissection of an epibiotic symbiosis in a highly thermotolerant metazoan - To determine the functional role of epibiotic bacterial microflora associated with the pompeii worm, Alvinella pompejana.	NSF renewal proposal 9314595 submitted	after Apr-96	Open	5	Ship time request submitted to UNOLS Office	Biol.
31.	C.L. Van Dover, U.Alaska H.Jannasch, WHOI		EPR - 9N	Recruitment of Chemoautotrophic Microorganisms and Hydrothermal Vent Invertebrates of Diffusional Sources of Sulfide at a Mid-Ocean Ridge characteristics vs. distance	NSF submitted 2/15/95	1) Fall 1997) 3 mo. later		13 4	Two dive series seperated by 3 months	Biol
32.	R. Haymon, UCSB K. MacDonald, UCSB		EPR - 9N	Conduct ALVIN dive series to (1) maintain continuity of the time series observations at the EPR 9.5-10 N site, and (2) provide post-eruption maps of the ASC, vents, biota and other fine-scale features that can be directly overlain on pre-eruption Argo data maps for an unprecedented comparison of the distribution of hydrothermal, volcanic and tectonic reatures before and after eruption of the MOR.	LOI	1996		18		G&G GeoChe
SOUTHERN EAST PACIFIC RISE:										
33. ROV	D. Fornari, WHOI	Humprhis Cavanaugh Reysenbach Van Dover Collier Lilley Von Damm	19-24 S EPR	Detailed Biological, Chemical and Geological Investigation of Hydrothermal Vents on the Central Indian Ridge in the 19-24 S Region	NSF 831 11/14/94	Jan-Mar 1996		30	JASON, 120 kHz, ARGO I	G&G

ALVIN Letters of Interest - Summary 1995 - 1997

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
34.	D.F. Naar, USF		Near Easter Is.	Detailed geochemical, geological, and geophysical sampling and mapping of critical areas of the Easter Seamount Chain defined by several swath mapping and dredging cruises.	NSF-MG&G LOI	Austral Summer 1996/97	Austral Summer 1997/98	28	This is an old request, but I think from David's brief e-mail he is still interested in this work.	G&G
35.	L. Mullineaux, WHOI S.C. France, UNH		Easter Is. & Sala y Gomez Ridge 27S, 100W or Fieberling Gouyot 33N, 130W	Genetic Diversity and Gene Flow Among Populations of Deep-Seamount Invertibrates.	partially ONR funded, have requested add. support from NSF	1996		8		Ecol.
36.	J.M. Edmond, MIT	J.G. Schilling, URI R. Poreda, Perdue M. Lilley, UW H. Elderfield, UK	Southern EPR Easter Island and vicinity	Hydrothermal Studies on the Easter Microplate.	NSF 9312950	Austral Summer 1996/7		30	LOI indicates that Edmond is still very interested in work S. Pac	Chem
37.	M.D. Lilley, UW	J.L. Von Damm J.E. Lupton	Southern East Pacific Rise 17 - 21 S	Chemical and geological characterization of hydrothermal vent fields, at this very fast spreading ridge.	NSF 831 5/10/94	late 96/ early 97		27		Chem Geol
48. ROV	R. Haymon, UCSB	K. MacDonald	S. EPR 17-18 S	Hydrothermal Vent distribution along the axial zone of the ultrfast-spreading EPR at 17-18 S	NSF FUNDED Old LOI	1997		21		G&G
38.	J. Lupton, NOAA	R. Embly, NOAA E. Baker, NOAA G. Massoth, NOAA R. Feely, NOAA D. Butterfield, UW T. Urabe, Japan Trefry, FIT	S. EPR 13.5 -20 S, 112-11	Investigation of hydrothermal systems This is in collaboration with the Japanese Ridge Flux Project.	NOAA NURP preparing proposal	Austral Summer 1997-1998	1996	25	If it appears that ALVIN will operate in the Southern Oceans in 1996, they would need to know aASAP to get their proposal submitted in time for funding.	G&G
39.	R.A. Lutz, R.C. Vrijenhoek, Rutgers		17-22s	Gene flow, dispersal, and systematics of deep-sea hydrothermal vent organisms	NSF 93-02205 FUNDED	1996		15		Biol.
45.	G. M. Kent, WHOI	R. Evans, M. Tivey, J. Collins, D. Fornari	17 deg 25' S, 113 deg 13' W	The GEMS Dive Program: A high resolution, Geophysical Investigation of Upper Crustal Emplacement & Evolution Along the Ultrafast Spreading EPR at 17 deg 25"S.	NSF RIDGE Form 831 2/9/95	1997 Austral Sum.		20		G&G

5/30/95

ALVIN Letters of Interest - Summary 1995 - 1997

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
HAWAII										
40. ROV	A. Chave, WHOI	R. Butler, IRIS F. Duennebier, U.H D. Yoerger, WHOI J. Catipovic	Hawaii 2 Observato 30 N, 140 W	Hawaii 2 Observatory - install a junction box and sensor on a submarine cable between Hawaii and California	?	Sep-97	Aug-97	8		EGR
WESTERN PACIFIC										
41.	McMurtry		Western Pacific	Hydrothermal deposits & fluids at arc volcanoes.	LOI NOAA	1996		8		G&G
46.	M. Perfit, U. Florida	K. Farley, D. Colodner B. McInnes V. Tunnicliffe	SW. Pacific Solomon Islands Papua New Guinea	ALVIN Investigation of Hydrothermally Active Submarine Volcanos in the New Ireland and Solomon Island Fore-arcs, Sothwest Pacific.	NSF MG&G Form 831 2/15/95	Sum 1997	Fall 1997	20		G&G

APPENDIX XI

1995 SOUTHERN CALIFORNIA SCIENCE OPERATIONS

ADVANCED TETHERED VEHICLE (ATV) AND DSV-3 TURTLE

29 APRIL - 14 MAY

WHALE-FALL COMMUNITIES

CATALINA BASIN: 29 ARRIL - 8 MAY

- Principal Investigator: Dr Craig Smith (University of Hawaii)
- Support of NURP's global change research initiative and man's influence on natural ecosystems and endangered species
- Investigated the significance of whale-fall communities as dispersal stepping stones for sulfide-dependent species
- Recovered 36 vertebrate segments, 41 core and scoop samples, 62 hours of video recordings, 550 still frames
  - ATV: 7 dives (69.3 hrs) TURTLE: 3 dives (24.7 hrs)

DEEP-SEA BRITTLESTAR FISH

SAN DIEGO TROUGH: 8 MAY - 14 MAY

- Principal Investigator: Dr Gordon Hendler (Natural History Museum of Los Angeles)
- Support of NURP ocean shelf and slope ecology initiative
- Provided first accurate interpretation of brittlestar behavior pattern; charactistic pattern of deep-sea animal life
- Recovered over 100 specimens, 65 hours of video recordings, 950 still frames
  - ATV: 5 dives (58.6 hrs) TURTLE: 4 dives (23.4 hrs)

RECENT MILITARY OPERATIONS

OCTOBER 1994 - MARCH 1995

- R & D Recovery in Southern California
- R & D Recovery on Pacific Missile Range
- Vil Vana Mishap Investigation
- F-14 and F-18 Air Mishap Boards

Over 200 hours of ROV bottom time
Over $50 million of recovered hardware

FUTURE OPERATIONS

ATV AND SEA CLIFF: AUGUST - SEPTEMBER 1995

- Dr Paul Dayton and Dr Eric Vetter investigating submarine canyons off the southern California coast
- Dr Cindy Lee Van Dover investigating hydrothermal vent invertebrates at the Main Endeavour Field
- Dr Martin Fisk investigating geology of the Mendocino Ridge

RECENT IMPROVEMENTS PROJECTS AND UPGRADES

- 3- Chip CCD Camers for both DSVs and UMVs (currently in use with great reviews)
- Lighting Upgrade for ATV and TUWVs (Dr Joules Jaffe of Scripps)
- Micro-laser scaling system (initial use for Dr Gordon Hendler)
- Navigation Upgrade (Winphrog and N-916)

IMPROVEMENTS, PROJECTS AND UPGRADES (CONT)

- Sea Beam post processing improvements
  - Sun Sparc 5 Stations w/ 17" real-time color monitor
  - HP 650C color-fill plotter
  - Archiving system
- Marsat E-mail
- SCORPIO depth upgrade

APPENDIX XII

1996 - ALVIN Dives/Cruises - 1996

(No Name Exercise)

Calender Days Associated with a Program

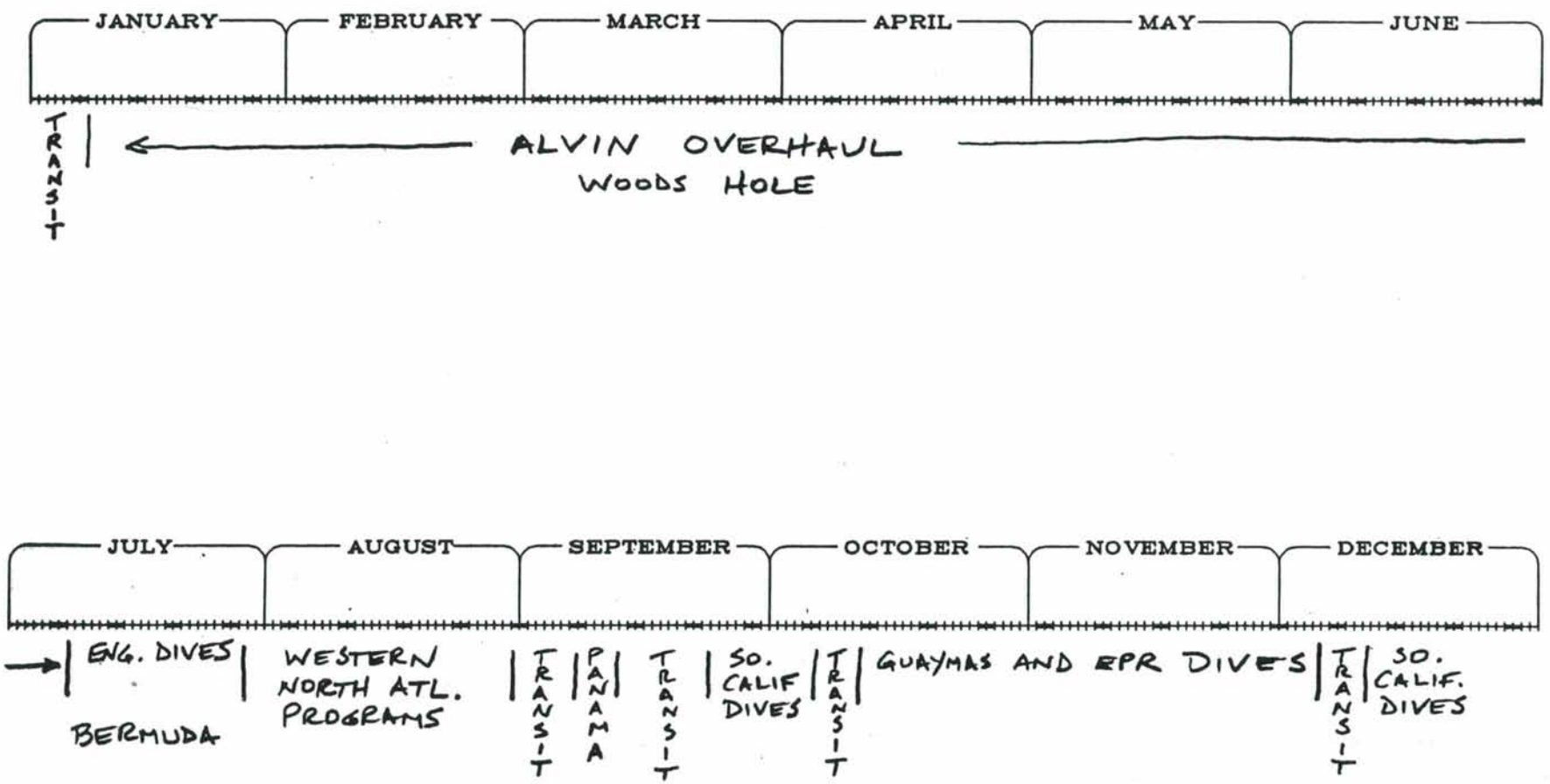
Area	# Dives	Transit	Port	Total
Transit to W.H.	-	9	-	9
WNA: Martin	12	2	-	14
WNA: No name	12	2	-	14
Transit Pan-WH	-	9	-	9
EPR: Chave etal.	4	9	2	-
No name vents	2	-	-	17
Guaymas Basin	10	9	3	22
California	10	2	3	15
Totals	50	42	8	100 days

TENTATIVE *

R/V ATLANTIS II & ALVIN OPERATIONS

1996

OPERATIONAL SCIENTIFIC SERVICES
WOODS HOLE OCEANOGRAPHIC INSTITUTION



Recommended ALVIN Day Assignments	
NSF	–
NOAA	–
OTHER	–
ONR	–
Total	–

Unassigned Operational Days

ALVIN Dives
Science
C&E/Eng.
Total

DOS = Dives On Station
RED Copies to: R.Chandler, J.Coburn, B.Doherty, D.Foster, B.Martineau, D.Moller, B.Walden

* Based upon requests for ALVIN time received by the UNOLS ALVIN Review Committee and therefore subject to revisions resulting from supporting agency funding decisions

APPENDIX XIII

April 19, 1995

Dr. Donald F. Heinrichs
Oceanographic Centers and Facilities
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Ms. Lisa Rom
Oceanographic Instrumentation and Shipboard Technology
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Don and Lisa

We have made progress on formulating policy and guidelines for third party tool development and use on ALVIN and the ROV/towed systems operated by the WHOI-DSOG in response to your letter of February 15, 1994. By this effort we hope to encourage innovation in the use of the assets of the National Facility, resulting in improved capabilities and enhancing the science that can be addressed. Additionally, this effort will establish guidelines to aid the reviewers and the agencies in the evaluation of the benefits and projected costs beyond the proposed work.

Third party tools are defined for this memo as devices developed outside of the National Facility with agency funds, and the emphasis is on those tools that may be useful for the larger deep submergence research community. New tools are required for the increasingly complex and multi-disciplinary nature of deep submergence research in mid-water, hard-rock and soft-sediment environments, as well as the advent of deep ocean seafloor observatories and time series studies. Advances in sensor technology, materials, and engineering must be incorporated in a manner to effectively support the science and enhance the US deep submergence capability. The Stakes/Holloway rock drill development is an example of a

tool that meets this criteria. It was designed for the work of the developers, it has been interfaced and tested on ALVIN, and has sparked the interest of other investigators. This type of asset should be developed with open communication with the DSF operator and the DESSC, and future operating, maintenance, and mobilization costs should be addressed in the original proposal where applicable.

We envision a procedure that involves scientific and technical review by the DESSC and operational assessment and recommendations by the WHOI-DSOG with respect to proposed 3rd party tool development. This must be done without unnecessarily burdening the investigator, but in a way that will enhance the review process and provide the agencies with information that is otherwise not available. The scientific merit of the proposed tool development, its operational viability, and its general applicability to a wide spectrum of deep submergence facility users, must be carefully reviewed to ensure that all disciplinary objectives and requirements are considered.

A straw-plan was presented to the DESSC at the December meeting and comments were gathered in the ensuing weeks to help in formulating the policy outlined in the Third Party Tool Policy draft that follows. Additionally, we propose a Technology Subcommittee be formed from the DESSC membership as necessary to address third party tool issues and to provide input to the Operator on technology issues.

Sincerely,

Barry Walden

Jeff Fox

THIRD PARTY TOOL POLICY

1. Investigators considering submitting a proposal for developing a tool with intended applicability beyond the initially proposed science program are encouraged to submit a "letter of intent to propose" to the DESSC - Technology Subcommittee for initial comment and review. The letter of intent should include preliminary estimates of those items mentioned in paragraph #2. The Subcommittee and the Operator would evaluate the information provided and respond with a letter to the investigator with comments and suggestions in a timely fashion. Based on the feedback, the proposer could submit a formal proposal to the funding agency. Tools that could be utilized on a variety of deep submergence assets available to U.S. investigators would obviously have greater potential of use. In addition, the interfacing of new tools with various types of vehicles should be encouraged. Attaching the letter will show reviewers the contact with the DESSC and Operator had been made. Omission of this step, or lack of endorsement by the DESSC, could jeopardize the chances of success for the proposal.

2. Proposals for third party tools should include operation and maintenance cost estimates. Investigators should be prepared to support the continued maintenance of the tool via the funding received for the tool development and implementation, or include a long-term maintenance plan in the proposal that addresses the user costs for support services, repair and logistics.

3. Proposals submitted to the funding agencies for development of scientific instruments or tools will be reviewed under the applicable agency peer review system. The agency is encouraged to incorporate a DESSC Sub-committee member as a reviewer, who in turn will contact the Operator for dialog relevant to the review. The agency panel could be assured that there has been coordination in the proposal/review process and an assessment of the priority of a specific proposal relative to other requested instrumentation will be provided.

4. The responsibilities of the vehicle operator should not go beyond providing detailed interface specifications, installing equipment, evaluating safety and operational requirements, and cooperating on

testing of new equipment. At sea repair, maintenance and spare parts for third party equipment shall be provided by the user or designated technician funded by the PI.

5. If, based on community demand, review by the DESSC Technology Subcommittee and with concurrence of the operator, equipment developed by a third party is to become a permanent addition to a vehicle system, the assets should be transferred to the vehicle operator for operation and maintenance. The appropriate support costs should be added to the annual operating budget of the vehicle operator.

6. The DESSC will report the status of third party tools to the community at the annual general meeting, including a review of tools under development and scheduled testing. In addition, a summary of tools available to the community, including the primary contact, will be maintained by DESSC and available with DSOG vehicle information.

We noted comments in your letter relating to the importance of the DSOG participation in the planning and implementation process for science tools that fall into the third party category. DESSC and WHOI-DSOG agree that this is a critical component of the process and it will play an important role in the eventual success of any tool development and utilization program. The 1995 DSOG Operations Proposal has included, within the scope of work for both ALVIN and the ROV/towed vehicles, the efforts that must be undertaken to provide and disseminate the vehicle systems criteria to interested parties in the deep submergence community, and the eventual work required to interface with those scientists and engineers.

APPENDIX XIV

From bluewtr!deb@orca.mbari.org Wed May 31 02:53:39 1995
Received: from orca.mbari.org (orca.mbari.org [134.89.3.101]) by tone.whoi.edu (8.6.12/8.6.9) with ESMTP id CAA18955 for <fornari@tone.whoi.edu>; Wed, 31 May 19 95 02:53:37 -0400
From: bluewtr!deb@orca.mbari.org
Message-Id: <199505310653.CAA18955@tone.whoi.edu>
Received: by orca.mbari.org
(1.37.109.16/16.2) id AA046923216; Wed, 31 May 1995 02:53:36 -0400
Received: from bluewtr with uucp; Tue, 30 May 95 22:50:45
To: fornari@tone.whoi.edu
Subject: stuff
Date: Tue May 30 22:50:44 1995
Status: R

Here is a brief status report of the continuing development of the multiple barrel drilling and plans for the October deployment onto the Alvin.

The dedicated valve pack is installed and has operated successfully on two deployments. Some initial problems have been solved by adding check valves. We also divided the valves between a high pressure side which powers the main drive motor and a low pressure side for everything else. This division isolates the seals for most of the small actuators from the full pressure of the hydraulic system. This modification should enable the system to be operated on a broad range of hydraulic pressures without the component failure we observed last year. An apparent added bonus is that the division into high and low pressures shunts more flow into the main motor to obtain higher rpms.

Sensors have been installed to monitor rpm, weight on bit, and torque (pressure drop). Only the rpm has been calibrated. The new systems delivers about 50% higher rpms. We also think that there is higher torque as we have sheared two driveshafts, but we have no previous value for comparison. We are building a new driveshaft and will be experimenting with a different coupling that can tolerate the higher torques. Otherwise things are progressing well with regard to the drill.

The only major change that would impact the ALVIN program is the multiple changes in components and component composition. Where possible we have moved from aluminum to titanium with a slight increase in weight. The result should be a more robust system. There was a major weight savings early in the year with the addition of a titanium custom hydraulic cylinder to replace the original steel cylinder. I have requested that Ops determine the air and water weight of the entire system once the design is stable. For the purpose of the Batiza cruise, the goal should be to maximize the allowable weight on the basket to provide the maximum weight on bit.

Extensive discussions have been held about mob and de mob for the Batiza cruise. Holloway will likely come to MBARI, assemble and test

the system, then drive it to San Diego. The drill will be installed on ALVIN and tested in port. Holloway will also accompany Batiza on the cruise. We have not resolved the safest strategy for the return of the drill to MBARI. Holloway has put together a spares list. We intend to have backups for every hydraulic component in addition to a generous supply of expendables. After the next round of dives at the end of June, I will notify you whether the ALVIN group should still provide their manifold as a back up. We are working on a daily check sheet for the system.

The one major concern that I have is the issue of insurance. Batiza was not successful in obtaining insurance coverage. The situation with a third party tool is that if it is lost, all you are guaranteed is an apology. Given the substantial investment we have made in improving this system, it would be appropriate for some additional assurance. Our insurance underwriter may provide coverage since I am a collaborator and will be physically on the ship. For some project that does not include me, WHOI should look into providing coverage at some fee. Failing this, perhaps NSF can self-insure unique tools to be used on ALVIN.

That's about it for now. Please ask questions if there is more information that you would like.

Debra

APPENDIX XV

DUMAND-Deep Underwater Muon and Neutrino Detection

Hawaii DUMAND Center
University of Hawaii
2505 Correa Rd.
Honolulu, HI 96822
808 - 956-7391

To: DESSC

From: John Learned
Department of Physics and Astronomy
For The DUMAND Collaboration

Date: May 24, 1995

Subject: Cooperative use of JASON for DUMAND installation and service

This memo contains a description of the DUMAND Neutrino Astronomy Project in brief terms, summarizes the status of already installed deep ocean facilities, and outlines our needs for deep submergence vehicles to install and maintain the laboratory which is located 25 km west of the Island of Hawaii at a depth of 4800 meters.

We repectfully request that DESSC consider the following:

1) DESSC endorsement of the cross disciplinary use of the JASON/MEDEA system for the DUMAND deep ocean operations is requested. The DUMAND system will need to be serviced by the ROV at a frequency of approximately once per year for order of one week, beyond a first year effort of several weeks for initial installation. We have already discussed minor modifications to JASON vehicle with the Deep Submergence Operations Group at Woods Hole Oceanographic (Mr. Andy Bowen – of the unmanned vehicles group has been the prime point of contact), in order to accomplish the tasks. These tasks are similar to those needed for almost any deep ocean terminal/laboratory. Funds required for any vehicle modifications or special components needed to carry out the DUMAND work would be provided by the DUMAND Project.

2) We ask the advice of DESSC on the best means for us to proceed to acquire needed facilities support, given that the DUMAND project is an approved and multiply reviewed project which is funded by the Dept. of Energy, which does not have deep submergence facilities like the Ocean Sciences Branch of NSF. The use of the JASON ROV for the DUMAND deployment and servicing is currently caught between agency and disciplinary forces, in a kind of a Catch-22 situation. One line of argument in favor of shared, interagency use of facilities such as the deep submergence vehicles supported by NSF/ONR and NOAA is that DOE provides 'free' accelerator beam time to NSF-Physics researchers, so that in all fairness the DUMAND group (the only high energy physics project conducting experiments in the oceans), should have similar access to consideration for ship time and ROV allocations from the NSF shared-use oceanographic facilities. To date, NSF-OCE facilities personnel have stated that DUMAND was not eligible for consideration for such ship time unless DOE paid the bill, or unless we had NSF funded collaborators (which we had in the past and did receive ship time for testing in previous years, but our NSF collaborator has retired). (In passing I might mention that I have been unable to obtain a written policy which defines the rules.)

Telefax: (808) 956-2930 • Telex: UHHEPG 7431844 • BITNET Node: UHHEPG

3) We have a deep ocean multiple use terminal already in place at depth, with high data rate capability, and it has capacity beyond our physics needs (due to built-in spare channels). We have considered the route of soliciting ocean researchers to co-propose other ocean science activities which might be cost-effectively carried out with this unique asset (25 km West of the Big Island of Hawaii, and at 4.76 km depth in a subsidence basin). We would welcome shared-use of this potential deep ocean monitoring system for other oceanographic research and stand ready to collaborate with marine scientists in providing access to the DUMAND facility for their work. However, because of the urgent need to deploy the system (we are ready to perform tests for which JASON is needed as soon as possible, in 1995) we do not feel that it is viable to wait for other oceanographic work to be attached to DUMAND so that it fits the mold of currently acceptable NSF-OCE facilities use.

4) We might also depend upon facilities potentially available from the USN in the Submarine Development Group One from San Diego. There are several problems with this however. First, it is a Navy facility and always at the command of flag officers who properly put the military concerns first, but who often care little about scientific missions (which do not contribute to their career advancement). Second, due to the decreasing funding of the military generally, the substantial amount of training time formerly available at little or no cost, must now be supported partially. For us in Hawaii this means paying unacceptably large transit costs (of order $250K), if we are the only user. Third, there is the systemic USN problem due to rotation of officers every two years, which means that long term experience is not accumulated (and historical documentation is not very good either). Fourth, we hear continuing rumors about the possible demise of the entire SubDevGrp1 operation. Thus, while we have had good relations with the SubDevGrp1 people, and there are some excellent people there now who have a really supportive attitude about science (particularly our liaison, Cmdr John Green), their use in the long run seems not a viable option.

We respectfully request that this memo be distributed to the DESSC membership and agency representatives at the meeting and that the issue be discussed. If you require further information please do not hesistate to contact me by email or telephone at the addresses listed below. Thank you in advance for your consideration of this matter.

Sincerely,

John G. Learned
DUMAND Project Spokesman and Director
email: jgl@uhhepg.phys.hawaii.edu
office: 808-956-2964 / fax: 808-956-2930 / home: 808-956-2930

The DUMAND Project – Scientific Overview and Planning

Since the discovery of neutrinos in the 1950's, people have dreamed of viewing the universe in the 'light' of these particles, which must stream to us in vast numbers from astrophysical objects. Neutrinos are produced in essentially any place of high activity, from such nearby objects as galactic black holes and neutron stars, to the distant centers of the most luminous objects in the universe, the quasars. The neutrinos do not interact much with ordinary matter, and thus can flow freely from even the most dense objects, and will travel in straight lines to us (unlike charged cosmic rays which wander about due to the magnetic fields in the galaxy). Photons, the stuff of all astronomy until now, whether radio, light, or x-rays and gamma rays, do not escape from densely shrouded sources. The higher energy gamma rays are absorbed just in traversing the distance to quasars. But, while neutrinos will allow insight into the enigmatic engines of the universe, these neutrinos are exceedingly hard to catch, mostly going right on through the earth without a trace.

Occassionally a neutrino (one in a million or so for the energies in question) will snatch a charge from a quark in the earth near a detector and become a charged particle. The electric charge then disturbs atoms along the path and radiates a wake of light (called Cherenkov Radiation) as it travels at greater than the local speed of light (which in water is 3/4 of the speed in vacuum). Large photomultipliers can then provide signals to trace the trajectory of such a particle, which travels kilometer distances and reveals the initial neutrino source direction to a degree or less. One can imagine a neutrino obervatory such as we are building as a rotating all-sky (fish-eye lens) camera observing a faint image which will take months or years to develop.

There are many spinoffs to the neutrino detection program, including searches for the missing dark matter of the universe, study of the interactions of these particles at energies not accessable at human made acclerators, and even a plan to do earth tomography with neutrinos. Acoustic detection of neutrino induced particle cascades, which may be possible at the highest energies, will also be pursued in DUMAND.

The idea of carrying out neutrino astronomy from the depths of the ocean was conceived many years ago, owing to the unique nature of the benthic region: phenomenal optical clarity, shielding, placidity, sparsity of biological activity (including human!), ready access from mid-ocean volcanic islands, and of course cost of material. Ocean is our shielding, target material, and detection medium. It took nearly a decade of activity, however, to: examine the environment (it was found to be better than anticipated optically); study the backgrounds (bioluminescence having been a worry); develop the technology needed (in optical detectors, fiber optics, electronics, and overcoming a frustrating series of connector difficulties); and for physicists to gain the requisite operating and engineering experience in the deep ocean to design the reliable high technology equipment needed for an ocean laboratory for long term deployment.

The array under construction was approved in 1990, and will consist of eight moorings 450 m tall, placed in a 106 m diameter octagonal pattern, with one further instrument string in the center. Each instrument string consists of 24 optical detectors, each encased in a standard 17 inch glass instrument housing, plus 2 laser calibration devices, 5 hydrophones, a programmable pinger, environmental sensors, and a central electronics unit. Power at 350 VDC is delivered to a 12 port junction box, along with 12 single-mode optical fibers, via a 30km armored cable to shore.

Near Future DUMAND Operations

This junction box has already been installed on a flat, barren bottom in the Kaho'olawe Deep (West of the Big Island of Hawaii), and successfully connected to a shore laboratory at Keahole Point, Hawaii. One instrument string was installed at the time of cable laying, but this string failed soon due to a leak, and was recovered via acoustic release. The umbilical cable remaining from this initial string is now shorted (it was designed for a guillotined release) and must be removed prior to activation of the junction box; at present we are hoping that the ATV will be able to carry out this task (requiring about one half day of dive time) on the newly organized expedition of the Laney Chouest to Hawaii during June 1995.

We have developed a plan in concert with WHOI personnel, to employ the JASON cable and winch for sea trials of the reliability of the three moorings, prior to commitment to the deployment operations. These tests can employ a locally available ship, not needing DP capability. The DUMAND Project would provide the funding to cover the expenses for the winch costs including mobilization/demobilization and personnel for this work.

The first three moorings are ready for installation, though of course under continuous testing and improvement in our laboratory at UH while awaiting a ship for deployment and an ROV or DSV for connection. Deployment involves the use of a DP ship for placement of the mooring with several meter precision (an acoustic network is also in place). In the second step, an electro-optic connector must be dragged from the string base some 50 m to the junction box and plugged in. The connection operation was demonstrated to be workable (about 12 times) at the DUMAND site in 10/92 using the US Navy ATV with a mockup junction box and connector. JASON has practised the connector removal operation in shallow water at WHOI in early 1995. JASON is the only available academic/civilian ROV in the US that is capable of carrying out these operations.

Summary of DUMAND's needs for joint operations with JASON:

1) Mooring tests from junction box as early as Summer/Fall, 1995.

2) Deployment and connection operations for three moorings during 1996.

3) Further activities for the deployment and connection of six more moorings in approximately 1997, plus ongoing maintenance at a frequency of order of once per year or less, for a period of less than five years.

Note that long range plans by a world consortium to build an array fifty times larger than DUMAND (a full cubic kilometer in size) are in formation at present for construction around the turn of the century. If carried out in Hawaii, this project would probably involve requiring an ROV and platform to be locally available for a significant fraction of time over some years, and certainly with direct funding of associated costs. Several options for that are under study, but we hope that the project can be carried out with oceanographic community involvement to our mutual benefit. Whatever we do would hopefully be carried out with significant involvement by WHOI and working within the scope of the DESSC.

APPENDIX XVI

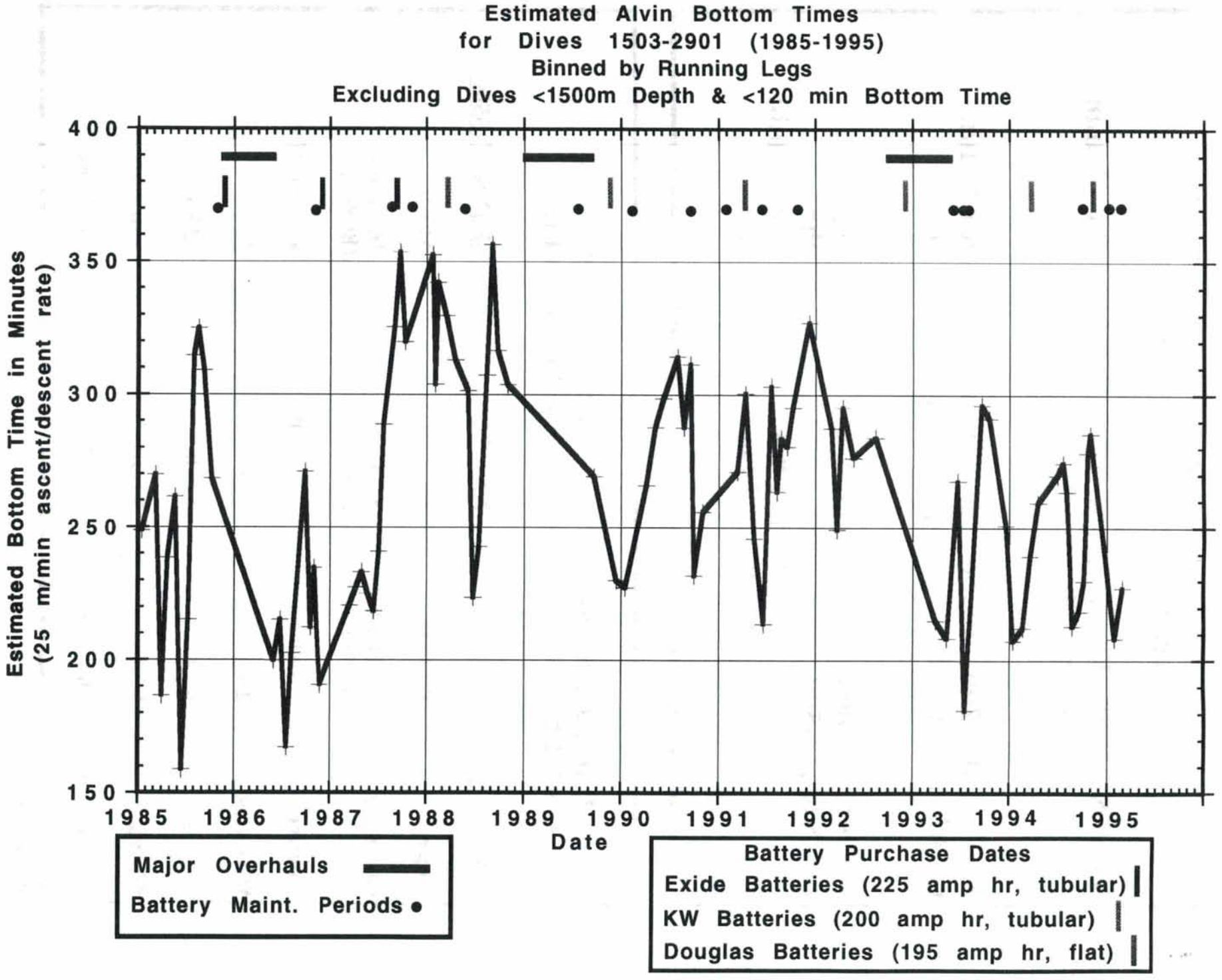
Comparison of On-Bottom Times for Different Deep Diving Submersibles

ALVIN (1500 dive average 1985-1995) (dives >1500 m, >2hr)	4hr 47 min
NAUTILE (200 dive average 1994)	4hr 8 min
CYANA (200 dive average 1994)	5hr
SHINKAI-2000 (at 2000m 1994)	4hr
SHINKAI-6500 (at 6000m 1994)	4hr
(at 6500m 1994)	3hr 30 min
(at 3000m 1994)	5hr

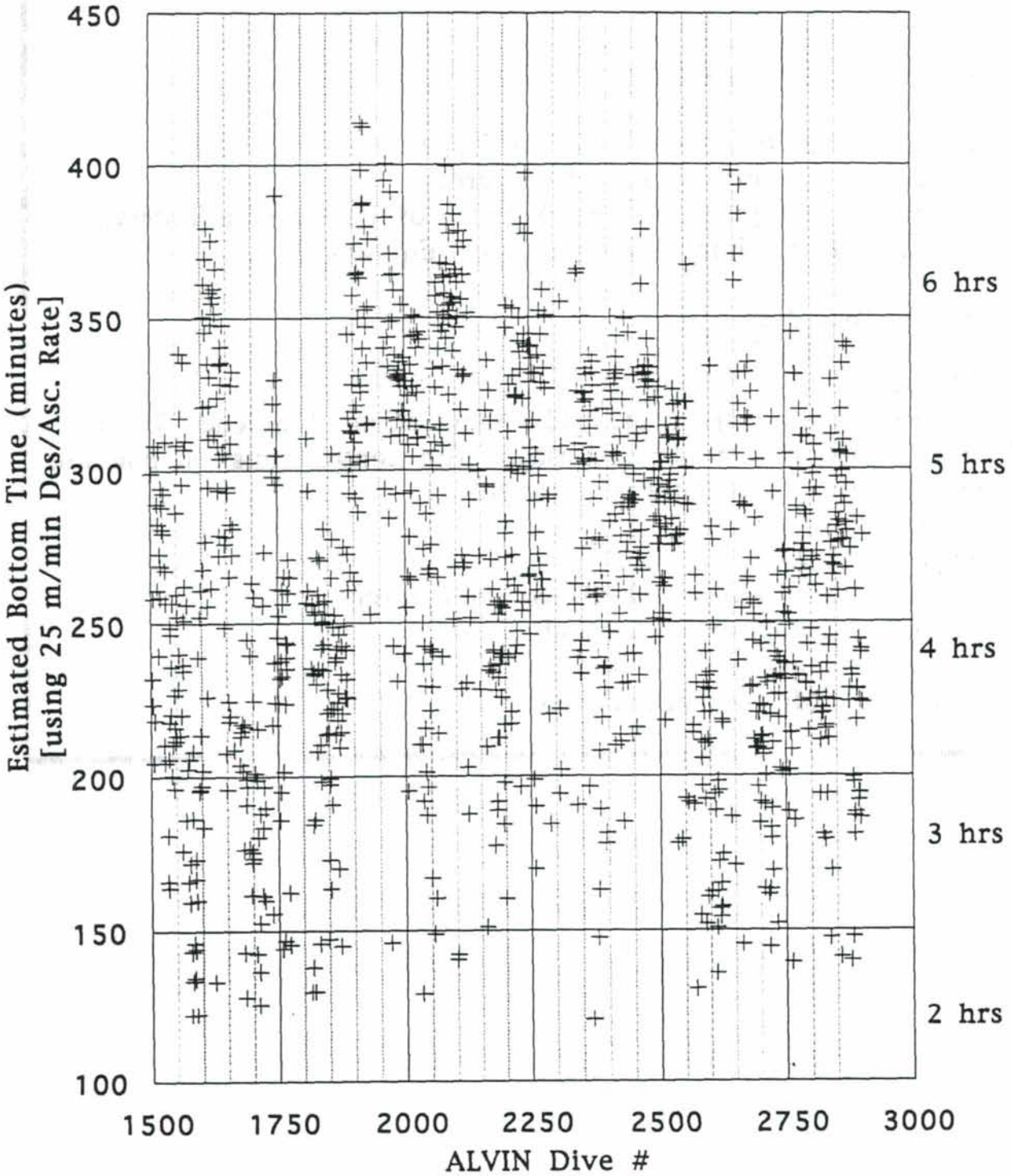
Comparison of Battery Characteristics & Cost Factors for Deep-Diving Submersibles

SPEC.	ALVIN	NAUTILE	SHINKAI 6500
Type	Pb acid	Pb acid	AgZn
Capacity	37.4kwh (80%)	38.4kwh (80%)	86.4kwh (80%?)
Cost/set	$7,800	$42,000	$2,630,000
Dives/set	200	200	75
$/dive	$39	$210	$35,000
$/kwh	$208	$1,141	$30,440
Maint. Int.	60 dives	50 dives	30 dives

5/26/95-D. Foster


Estimated Alvin Bottom Times
for Dives 1503-2901 (1985-1995)
Binned by Running Legs
Excluding Dives <1500m Depth & <120 min Bottom Time
Estimated Bottom Time in Minutes
(25 m/min ascent/descent rate)
400
350
300
250
200
150
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
Date
Major Overhauls
Battery Maint. Periods
Battery Purchase Dates
Exide Batteries (225 amp hr, tubular)
KW Batteries (200 amp hr, tubular)
Douglas Batteries (195 amp hr, flat)

Estimated ALVIN Bottom Time Data
(All Data for Dives 1503-2901 [~3/85 to ~3/95]
w/Depths>1500m and Est. Bottom Times >2 hrs.)



Variables Affecting *Alvin* Power and Bottom-Time

Long-Term Variables

1. Power Characteristics of Battery Type
2. Charging Equipment and Procedures
3. Changing Configuration and Number of Power Consumptive Operational Equipment and Science Equipment

Short-Term Variables

1. Science Mission Objectives
2. Lead-Observer Experience and Organization of Science Tasks
3. Piloting Style (e.g. throttle usage, trim control, mission planning, manipulator skill, fatigue, attitude)
4. Dive Depth
5. Type of Terrain
6. Lights (observation and video photography)
7. Sampling/Hydraulics Demand
8. Battery Condition
9. Service - Maintenance Procedures

APPENDIX XVII

Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Phone: (508) 548-1400
Telex: 951679

May 10, 1995

FAX TO: Prof. P. Jeff Fox, Chair
DEep Submergence Science Committee

FROM: Dudley Foster and Barrie Walden - WHOI

SUBJECT: ALVIN Batteries and Hydraulic system

Dear Jeff:

In response to questions raised at the December 1994 DESSC meeting concerning ALVIN batteries, charging cycles and bottom time we have provided the following information for evaluation by the committee. We feel that it is important to demonstrate to the committee and the community that we are tracking the submersible power issue. Realistically, however, there exists no panacea to this problem, and given the current fiscal climate it is extremely difficult for us to do more than what we have within the scope of our limited operational budget.

One question that was raised by the committee and various scientists at the meeting was how does the ALVIN group justify its battery voltage limits. The recommended low-voltage limits and capacity of Pb-acid batteries is available from most major manufacturers of this type of battery. We have tracked this issue carefully over the years and have stayed abreast of the most current recommendations as they relate to the batteries we purchase to build our battery packs. Several months of research on various Pb-acid cell types (flat and tubular plates), and their care and treatment, was re-done by our engineers about six years ago. This has been done several times in our 30 year history due to ALVIN battery configuration changes. The results of those studies have determined our present voltage cut-off limits.

There have been no significant developments in Pb-acidbattery manufacturing that have provided any type of technological breakthrough which would be worth spending the time and money to redo those studies in an effort to gain power for ALVIN. The information does not show that any appreciable power-gain, over what we currently have, is possible with today's Pb-acid technology. At such a time that either Pb-acid technology breakthroughs arrive, or should the current testing of Ag-Zn or Fe-Ni batteries by other submersible operators show that these battery technologies could provide a reliable, cost-effective, and sustainable increase in available operational and science power, we would be the first to argue for funding to investigate the applicability of those power sources for ALVIN. As mentioned above, given the present funding climate we do not feel that we can make a strong case at this time for requesting additional funding to further research the submersible power issue, despite its clear importance and implications for the conduct of science while on the bottom. The ALVIN group will continue to monitor the Pb-acid technology and dialog with the other submersible operators to learn about their experiences with other power sources, and we will keep DESSC abreast of our findings at upcoming meetings.

As further background to the voltage cut-off limit we have recently been doing some testing of Pb-acid cells here at WHOI and have concluded that the at-sea operations group is running the batteries to about 70% discharge when they leave the bottom. The general guidelines throughout the Pb-acid battery industry is to not discharge below 80% of capacity for regularly used batteries, such as fork trucks, which is less severe service than we use for ALVIN. The net result is that ALVIN leaves the bottom with only 10% of the "usable" battery left to get to the surface, maneuver if required, and get secured in the hanger until external power is connected. Our experience and data show a significant imbalance in cell capacity with usage, and running below 80% capacity risks permanent damage to the weakest cells.

The initial battery problem on the last Karson cruise (January - February 1995) is a good example of what can happen if a single cell in a battery is overly discharged. When the low-capacity ALVIN battery was removed in Barbados after that cruise, some of the individual cells showed "reverse polarity" damage on the initial test discharge, even though the overall battery voltage was satisfactory. These cells were likely the weakest ones in the battery pack. This type of problem can only be solved by throwing away the cell. Pressing the low voltage limit increases the risk of this kind of cell damage, resulting in permanent loss of the entire ALVIN battery capacity. The result is lost bottom time for future legs until the battery pack can be replaced.

In an effort to get the most power for the longest period of time from our batteries, we continually try to improve the way ALVIN battery packs are maintained, and we are currently testing electronic monitoring devices that will help us track battery performance. Part of this effort requires occasional changes to procedures, support hardware, and associated evaluation of results. The initial poor battery performance on the Karson cruise was due in part to changes in the battery charging hardware, internal component grounds, and a battery with some less-than-optimum cells. The time involved in recognition and evaluation of the results caused limited power on several dives. Because of the small incremental improvements we are trying to achieve, any changes realistically require 50 or more battery cycles (dives) to correctly evaluate the results. Because these "experiments" can only be evaluated in our operational environment the expected results will not be 100%. Unfortunately, a few users may, at times, be shorted on performance in the interest of long-term improvements for all ALVIN users.

We intend to present some historical data that we have compiled on bottom times for dives from 1985 to the present at the upcoming DESSC meeting and discuss the many variables involved with the issue of submersible power and bottom time with the committee.

Please let us know if you need further information on this topic or if there are questions on the issues we discuss above.

Sincerely,

Barrie B. Walden

Dudley B. Foster

/kifh

cc: R. Pittenger
WHOI - DSAC

APPENDIX XVIII

To: DESSC
From: J. G. Bellingham and D. L. Orange
Re: Increasing Bottom Time of ALVIN
Date: June 26, 1995

At the DeSSC meeting in Woods Hole June 1, 1995, we discussed the potential increases in ALVIN bottom time attainable through improved hydrodynamics or changes in available power. We felt that it would be instructive to assess these two approaches via the following analysis:

Start with the following equation for power consumption:

$$E_0 = 2\frac{P}{n}\frac{D}{r_0} + P\,t_0$$

P = power consumed on bottom
P/n = power consumed on descent/ascent (i.e. n is reduction in power used relative to power consumed on bottom)
E_0 = total energy available (present ALVIN configuration)
r_0 = rate of descent/ascent (present ALVIN configuration)
t_0 = bottom time (present ALVIN configuration)

Write the power consumption for a modified ALVIN as:

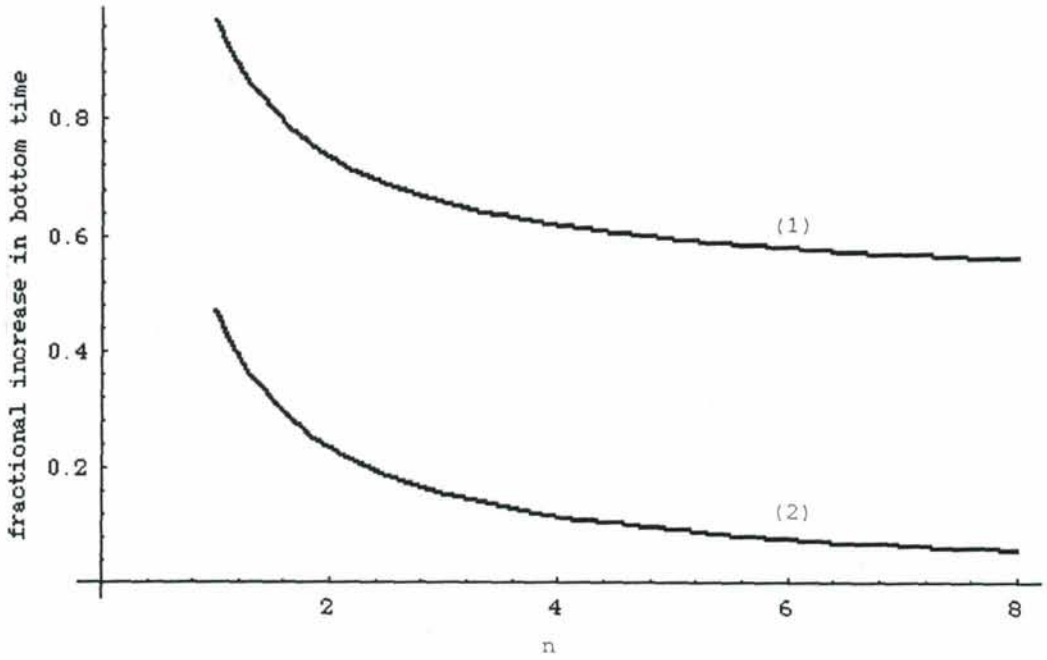
$$E_1 = 2\frac{P}{n}\frac{D}{r_1} + P\,t_1 = f\,E_0$$

f = increase in battery capacity
r_1 = modified rate of descent/ascent
t_1 = bottom time of changed ALVIN configuration

Solving for t1 we get:

$$t_1 = \frac{2\,D\,f}{n\,r_0} - \frac{2\,D}{n\,r_1} + f\,t_0$$

Consider two cases, both with D = 2800 m and t_0 = 240 minutes.
(1) $r_0 = r_1$ = 25 m/s, f = 1.5 (i.e. descent/ascent rate stays the same, battery capacity increased 50%).
(2) $r_1 = 2r_0$ = 50 m/s, f = 1.0 (i.e. descent/ascent rate doubled, no change in batteries).



Discussion:

If the power used on ascent and descent is minor compared to the power used on the bottom, n becomes a large number. In this case, any increase in ascent/descent rate has a negligible effect on bottom time. Thus a 50% increase in battery capacity increases the bottom time ~50% (in the limit). At the DeSSC meeting Dudley commented that the power consumed during ascent/descent was very low compared to power usage on the bottom. Therefore, any increase in battery power directly increases the bottom - science - time, whereas increasing the ascent/descent rate has less of an effect on bottom time. Increased hydrodynamics could benefit the deepest dives, which may be currently limited by the length of the operational day. We feel that the largest benefit to science, though, would come from increasing the available battery power.

We sympathise with the engineering challenge presented by increasing the available battery power, and with the up-front cost inherent to a change in battery technology. However, when viewed in light of the high day rate attached to deep submergence science, the significant increase in bottom time achievable with increase battery power is worth striving for.