UNIVERSITY - NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

UNOLS
DEep Submergence Science Committee

MEETING REPORT

June 13-15, 1994

Carriage House
Woods Hole Oceanographic Institution
Woods Hole, MA

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MEETING REPORT SUMMARY

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Monday, June 13:

I. WELCOME & INTRODUCTIONS: 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.**

II. ACCEPT MINUTES: The minutes of the December, 1993 DESSC meeting were accepted as written.

III. UNOLS REPORT: Garry Brass, UNOLS Chair, gave the report of recent UNOLS Activities. At the early part of June, UNOLS hosted a NOAA/NURP-convened panel to review proposals for use of the Navy's TURTLE/ATV. Up to 60 days of submersible/ROV/support ship time is available to U.S. investigators as part of a joint Navy/NOAA(NURP) cooperative agreement. The meeting was held in San Diego and the

panel was provided a tour of the facilities by the Navy. The tour was very informative and the meeting a success.

Garry reminded everyone that his term as Chair is expiring and that nominations for Chair and other Council positions should be made to the Nominating Committee, chaired by Dick Pittenger.

Garry also reported that he has been in contact with representatives from NUWC, who are preparing a proposal to designate a Navy nuclear submarine as a "White Submarine", dedicated to research operations. The White Sub would be able to cruise throughout the world's oceans. Presently, the NUWC representatives have been briefing various groups for feedback on this concept. The annual operating costs are estimated at $10 million per year, or approximately $30K/day. This is comparable to ODP operating costs. The overhaul of a Navy submarine to a research platform is estimated at approximately $50 million. It has been recommended that perhaps funding could be obtained through ARPA for the overhaul. The Navy has indicated that they will only support this project if new money is appropriated through Congress.

IV. DEEP SUBMERGENCE OPERATIONS AT WHOI:

A. Deep Submergence Facility (DSF) Program Management - Dick Pittenger reported on DSF management issues at WHOI. In June, ALVIN successfully completed its third INSURV inspection; also, ALVIN turned 30.

Dick presented a series of viewgraphs, the first showing the Deep Submergence functional relationships between the community, DESSC, WHOI and the funding agencies, see **Appendix III**. WHOI has formed a Deep Submergence Science Advisory Committee (DSAC) to assist the DSOG Operations group in responding to science needs on the vehicles and to interface between the DESSC and the National Facility. WHOI provided telling ALVIN statistics over the last ten years. A summary of ALVIN dives made versus total dives scheduled, shows that the dive completion percentage has been consistently above 95%. Operating costs over these same ten years has remained fairly constant, ranging between $1,500 K and $2,000 K per year.

Dick reported on the impact of budget constraints, as well as the challenges and dilemmas facing WHOI as a consequence, see **Appendix IV**. Funding limitations are putting a strain on operations. In 1994, there have been reductions in funding for both equipment and personnel. Manyears were reduced by 1.05 instead of increased as requested to address increasing science needs. Two of the eight requested engineering dives were eliminated. Total equipment funding requested was reduced by $82,379, or 62%.

WHOI is faced with the dilemma of losing core personnel and the technological edge. At the same time, the under subscription of ROVs jeopardizes their future. WHOI services and reputation are being degraded by budget shortfalls. As a challenge, community wide support must be strengthened for building and maintaining a national deep submergence facility.

WHOI's recommendations are to:

- Support KNORR's conversion plan
- Implement ALVIN's short-term imaging and mid term upgrades
- Put ROVs on a faster track
- Develop a strategy plan and build community support

Dick reviewed the 1995 to 1997 schedule options for WHOI Ships, see **Appendix V**. KNORR will return to WHOI this summer for installation of SeaBeam before sailing off to the Mediterranean for operations. Following the Mediterranean work, operations will continue through 1995 with WOCE work in the Indian Ocean.

WHOI is aware of a thruster problem being experienced on a number of the large vessels, and will monitor KNORR's performance. MELVILLE cracked a gear in 1993 in the South Pacific. Both thrusters on THOMPSON recently were discovered to have broken gears. Since the gears take five months to manufacture, the gears designated for AGOR 24 are being installed on THOMPSON to avoid a lengthy down period. After installation, THOMPSON's performance will be monitored. After 100 hours of use, THOMPSON will be drydocked and analyzed again before going to the Indian Ocean. KNORR has been experiencing some vibration problems and an expert will be consulted on the situation. However, present plans call for KNORR to proceed as scheduled.

ATLANTIS II has two operation plans. Plan A would bring the vessel back to Woods Hole in March/April 1996 after a field program in the Southern EPR. Plan B would bring the ship back to Woods Hole at the end of 1995 and there would be no program in the Southern EPR. ALVIN would begin overhaul when AII returns to Woods Hole. The overhaul is expected to take six months to complete. The earliest ALVIN could resume operations would be in July, 1996.

OCEANUS has been given the okay to resume operations while the USCG clarify the rules for admeasurement inspection. Congressional Relief will be sought if necessary.

AGOR 25 is under construction and is scheduled for delivery on April 14, 1997.

B. KNORR Reconversion Schedule - Dick Pittenger presented an overview of the KNORR reconversion plan, see **Appendix VI**. There are three main objectives of the conversion: 1) to support ALVIN as well or better than currently supported on AII, 2) support ROV's, and 3) in the context of 1 and 2, maximize the general oceanographic science capability. Dick identified a number of design issues associated with the conversion. Considerations to be addressed include deciding whether to replace the A-Frame or cross-deck the old one, increase science berths to replace those needed by the ALVIN/ROV crews, and analyzing the effects of stern slamming. Presently there are no buyers for AII. WHOI plans to retain the services of two ship sellers, one from the Gulf and one from London, to assist in advertising the vessel.

C. Equipment/Instrumentation Upgrades and Improvements - Before reporting on planned upgrades and improvements, Barrie summarized the status of the ALVIN/ROV support group at WHOI. Engineering support on shore is critical to the well-being of the operations, however, they are feeling the pressures of restricted budgets. The ALVIN and ROV programs continue to merge and with the conversion of KNORR, this will be completed. The same group of people will be working to support both manned and unmanned operations. This means that the community will have one or the other system available to them at any one time. Harsh financial realities are dictating this situation and it appears there is no choice but to accept them. It is conceivable that if demand is high for both systems the operator may be able to operate in a surge mode, bringing in additional, short term support as needed. KNORR will be an outstanding platform with Seabeam, ALVIN and ROV capabilities. WHOI and DESSC need to find ways to help the ROV program gain support.

Barrie presented major initiatives for the national Deep Submergence Facilities from 1994 through 1998, see **APPENDIX VII.** The initiatives are categorized by ships, ALVIN, ROV & Towed vehicles, and AUVs. A brief summary of the initiatives follows:

> **Ship** initiatives show the installation of the P-Code GPS in 1994 on ATLANTIS II and then the conversion of KNORR in 1996.
>
> **ALVIN** initiatives include imaging and navigation upgrades in 1994 and 1995, and a major overhaul in 1996.
>
> **ROVs and Towed Vehicles** include fiber optic cable testing and JASON manipulator testing in 1994. While ALVIN is in overhaul, JASON, ARGO-II and DSL 120 vehicles will be well placed to continue supporting field programs. MBARI's TIBURAN begins operations in 1995/96. It is hoped that by 1997 or sooner, the ROVs and towed vehicles will be widely accepted by the community.
>
> **AUV** activities in 1994 include the development and field trials of ABE and ODYSSEY. ODYSSEY will be operated on the Juan de Fuca Ridge in August 1994 in collaboration with NOAA/PMEL scientists, and on the East Pacific Rise at 9° 50' N in collaboration with WHOI and Rutgers University scientists. In 1995, it is planned that ABE will be deployed to Juan de Fuca.

Barrie continued his report with a summary of improvements planned for ALVIN. He provided a matrix of ALVIN improvements for the near term, mid term and long term, see **Appendix VIII.** Near term improvements are those to be implemented prior to ALVIN's next overhaul. The mid-term improvements will be carried out prior to the end of the next overhaul. Mid-term improvements generally will take more effort to carry out and in many cases funding will have to be identified for their support. Improvements planned are for ALVIN's imaging capabilities, navigation, data logger, sensors & samplers, dive duration and submersible systems.

Imaging - ALVIN's imaging proposal was to a large extent funded and will be carried out in the next several months.

Navigation - Installation of P-Code GPS for navigation is complete. The funds in the imaging proposal that were to go towards the support of navigation improvements were deferred because the reviews suggested a need for a more integrated solution to navigation improvements involving both manned and unmanned systems. Funding of $5K was made available to assist in developing a navigation plan. A broad-based subcommittee made up of scientists and engineers from WHOI, DESSC and the community was established and has met to develop a list of navigation short-term and long-term needs. They are seeking input from the user community.

Data Logger - Funding for near term improvements to the data logger system are in hand. The operating system will be upgraded to improve VP/ix capability and documentation in the User's Manual. Long term improvements would be a total replacement of the hardware and software.

Sensors and Samplers - Near term improvements for sensors and samplers include providing general use science computers. In the mid-term, a spare gyro will be obtained. Long term improvements are planned to provide Hydro-winch based 3/8-inch fiber optic ROV and AUV capability for night time operations.

Dive Duration - To increase dive duration, long term recommendations are suggested that would replace the main batteries and redesign the personnel sphere interior. It was recommended that the operator monitor power usage during different types of submarine operations to see if they can be made more efficient.

Submersible Systems - Near term improvements for submersible systems include replacing all explosive release devises and emergency breathing assemblies. WHOI is presently waiting for NAVSEA approval on both of these items. WHOI is also evaluating lower cost motor controllers. WHOI still has the ambient pressure motor controllers that failed during the Karson cruise in 1993. MBARI purchased the same pressure tolerant motor controllers as WHOI and experienced similar problems. MOOG, the manufacture, has been troubleshooting the problems and claims to have detected all problems. MBARI's repaired motor controllers will be tested soon. If successful, WHOI will consider repair and reinstallation of pressure controllers.

ROV Upgrades - Andy Bowen reported that improvements for the ROV/Towed Vehicles often parallel those identified for ALVIN. A short term goal is to refine the ROV manipulator functions and capabilities. Potential testing methods might include installing the JASON manipulator on ALVIN during selected engineering dives and performing operational pressure tests at WHOI. Other short term goals include completing vehicle operations manuals and documentation, standardizing phase bathymetry processing for 120 kHz system, and to study MBARI's toolsled concept for interchangeability.

Long term plans include ROV interfacing with Ocean Floor Observatory Sensors and Systems and reducing manpower requirements for operations. A long term goal is also to achieve steady-state utilization of ROV and Towed Systems for Science. A full list of short and long term goals for deep submergence facilities is included as **Appendix IX.**

D. Status of 1994 ALVIN/AII Operations, Preview of Factors for 1995 - Rick Chandler reviewed the 1994 ALVIN/AII schedule and highlights, see **Appendix X.** In February, ALVIN was certified to operate to 4500 meters. Three new pilots have been certified for operations, bringing the total number of pilots to six. This should help to reduce pilot burnout. ATLANTIS II is due to arrive in Juan de Fuca in early June and will end the year with operation on the East Pacific Rise before beginning a stand-down period. The full 1994 schedule is included in Appendix X. One dive was lost during Karen Von Damm's cruise due to mechanical problems.

Don Moller presented a summary of the ALVIN dives requested for 1995. He showed a map with the requested regions of operations. Time constraints or other logistical concerns were highlighted in red. Based on the requests, Don presented two cruise track options. Option A shows 304 total operating days, with 158 dives and approximately 14,000 miles of transit. Normally a schedule with 300 operating days would be able to accommodate approximately 200 dives; however because of the transits required in 1995 only 158 dives can be performed. Option B also has a total of 304 operating days with 147 dives and 17,700 miles in transit.

E. 1994 ROV/Towed Vehicles Operations, Preview of Factors for 1995 - Only one science program, an NSF-ODP funded ARGO-II and DSL-120kHz sonar field program to the TAG area, is planned for the towed vehicles in 1994. Five requests for use of the towed vehicles have been submitted for 1995. One JASON/MEDEA request is submitted for 1996.

V. AGENCY REPORTS ON PROGRAM FUNDING FOR 1995 AND BEYOND:

A. National Science Foundation (NSF) - Dolly Dieter provided the report for NSF. NSF budget slides are included as **Appendix XI.** Since 1992, NSF's support for ALVIN operations have gone up significantly from $0.9 M in 1992, $1.4 M in 1993 and an estimated $2.2 M in 1994. The total NSF share of the operation cost of the National Facility has increased because of decreased usage by ONR and also NOAA, but the total operational funding level has remained stable for many years. During that same period, ONR's support has been going down and NOAA's support has remained constant. NSF ship operations support in 1994 is projected at $31.6 M. The FY1995 budget request for Oceanographic Centers and Facilities is $53.9M, which is a $3.7M increase or 7.3%. Indications show, however, that funding will most likely be level to a 2% increase. Next year will be a very expensive year for NSF with three large ships in the Indian Ocean for the entire year. In other NSF matters, Lisa Rom is on maternity leave until September. Don Heinrichs, with the assistance of a Sea Grant Intern, will handle the technicians program.

B. Office of Naval Research (ONR) - Keith Kaulum reported that the ONR Ocean Sciences Directorate has been reorganized. Under the new organization, basic research is to vertically

integrate with applied research. It will take some time for program managers to adjust to this new culture. In 1995, we should begin to see the results of this reorganization. Two site visits have been conducted so far this year, one at Scripps and the other at the University of Miami. Research Facilities can expect funding to remain level. Last year the program took a major cut of $1.5M to support other Navy commitments. Navy labs with applied research funds are being encouraged to use UNOLS facilities. ONR will provide matching funds to the Navy Labs for their use of UNOLS vessels. Keith has requested $3M to support ship use by Navy labs having matching funds.

Keith reported that he will be leaving ONR by the end of August. June Keller is leaving at the end of June. The Research Facility Office will most likely be reduced to a one person office and, as a result, the scope of the program will need to be reduced. June spent approximately 25% of her time dedicated to ALVIN's certification. Annette DeSilva will most likely be filling in for six months while they advertise for the position to be filled. A temporary ONR person will also be assigned to the office during the interim period. Jim Andrews has taken over some of the responsibilities formerly held by Steve Ramberg. He will continue to oversee the facilities program. Pat Dennis is working at ONR one day a week. Dick Pittenger expressed his appreciation on behalf of the operators to June and Keith for their efforts over the years, and DESSC, on behalf of the user community, expressed appreciation as well.

C. National Oceanic and Atmospheric Administration (NOAA) - Mike Ledbetter gave the report for NOAA. For the last fifteen years, NURP has been left out of the budget. This year is no different. They don't know if, when, or how much they will be funded. The NURP Organic Act, authorizing legislation to make NURP an entity in the budget has been revised. It now includes only ALVIN and the NURP centers for inclusion in the budget. Additionally, the reauthorization calls for a NURP center in the Gulf of Mexico region (tied to Texas A&M). NOAA/NURP's search for a director was put on hold after the second round of interviews. They will have to begin the entire process over again.

Mike reported that every six years the NURP centers must recertify. The HURL center in Hawaii was recently reviewed. As a result of that review, it was recommended that HURL not extend the depth capability of PISCES, and that they not participate in a Western Pacific field program with PISCES. PISCES is scheduled to be on KAIMIKAI-O-KANOLA (KOK) by 1995. KOK should be able to support science operations before that time.

In personnel news, Cindy Lee Van Dover has been appointed the Science Director of the West Coast Center in Fairbanks, Alaska. Geoffrey Wheat will be the new Science Coordinator.

D. Navy Submarine Development Group - LCDR Billy began the report for the Navy. He said the recent increased interaction the Navy has had with the scientists through DESSC and the NOAA/NURP reviews has been beneficial to both the Navy and scientists. The scientists are becoming more familiar with the capabilities of the Navy assets. Over the last four years, the Submarine Development Group (SUBDEVGRP) has been cut 60%. They would like to be able to make 120 days a year available for science use in the future as part of the Navy/NOAA(NURP) cooperative agreement. The Navy would also like to see their assets be

used to fulfill time series work along the West Coast while ALVIN is in overhaul and in other global arenas.

This year, 40 days of science time was scheduled on NR-1. In the first week of June, a review of proposals to use TURTLE/ATV was performed in San Diego. Funded work will be performed on Juan de Fuca in the Fall. There will be no science operations this year on SEA CLIFF due to manipulator problems.

In 1995 and 1996, the Navy hopes to have science opportunities available for TURTLE/ATV in March through June. SEA CLIFF is expected to have an availability in the August to October time-frame during those same years.

George Billy will be leaving the Navy this summer. His replacement will be Lt. Ed Lancaster. DESSC wishes him the very best and thanks him for his considerable contributions to deep submergence operations.

John Green, Science Liaison Officer for the Navy's SUBDEVGRP, continued the Navy's report. He presented Dick Pittenger with certificates for the WHOI pilots who recently became certified for single pilot operations. John reviewed the Navy's technology initiatives to improve science operations on their submersibles, see **Appendix XII**. In FY94 and 95 seven projects are planned with WHOI and Scripps. These include upgrading SeaBeam post-processing capabilities on LANEY CHOUEST, increasing SCORPIO's depth capability from 5,000 to 10,000 feet, upgrading vehicle tracking systems, evaluating the ATV and SCORPIO cable designs, imaging and lighting upgrades, standardization of data recording systems, and development of environmental monitoring support packages. Upgrading for post-processing of SeaBeam is funded for the fourth quarter of 1994.

Miscellaneous projects include the production of in-house, mission specific tools, i.e., pre-approved tempmods (temporary modifications) for recurring use items. These include a 3-chip CCD camera, 7-function hydraulic actuator, laser scaling system, water sampler, suction pump, and a Mesotech sonar system. The Navy's SUBDEVGRP has two major goals: (1) to make science capability better and (2) to bring the reliability of Navy's assets up.

VI. Review Dive Requests and Develop 1995 Schedule:

A. Review ALVIN and ROV Dive Requests for 1995 - Before beginning the DESSC review of ALVIN requests, it was noted that mariners should be notified in advance of ALVIN's planned operating areas to avoid any conflicts. A summary of requests for ALVIN/ROV/Towed Vehicles for use 1995 and beyond are included as **Appendix XIII**. Thirty-three new proposals requesting ALVIN were received in addition to six requests from last year for a total of 442 dives in 1995. Of these dives, 201 are already indicated as funded. In an exercise to try to get a sense of the kind of utilization pressure the ROV could expect once the system was fully incorporated into deep submergence operations, the DESSC committee reviewed each submitted ALVIN proposal to determine if the science could be performed using an ROV. The proposals were given ratings of:

"A" = requires a manned submersible,
"B" = could possibly be performed using an ROV, or
"C" = could be performed equally or better using an ROV.

Requests falling into the "B" category, generally required sampling or other manipulative capabilities. Engineering dives would be required before moving the science to the ROV.

After reviewing the proposals, it was concluded that almost half of the requests could be conducted by ROVs. As a result of the proposal review, DESSC made the following recommendations:

(1) **DESSC will send a letter to NSF with copies to ONR and NOAA explaining how progress on many deep submergence questions could be accelerated if ROVs were supported and that a significant percentage of work now carried out by submersibles could be done by ROVs.**

(2) **DESSC will remind the community that this a period where ROVs offer additional capabilities and options for deep submergence science that can augment the existing capabilities of submersibles.** The community should consider the capability of the deep submergence platform needed for their research when preparing a proposal.

There was discussion on what would be needed to prove the ROV manipulator capabilities and how testing could be achieved. One recommendation was to mount the ROV manipulator on ALVIN's basket for testing during science operations. Another suggestion was to use the ROV manipulator in place of ALVIN's Schilling arm. Field programs could be selectively chosen for use with the ROV manipulators. Perhaps ONR would be interested in supporting this type of field testing. Also, George Billy suggested that the vessel CAROLYN CHOUEST might be available for support of JASON testing. Pressure testing of the manipulators could be performed in a tank. DESSC enthusiastically encourages the operator to proceed with a strategy for testing the ROV manipulators as soon as possible.

Review proposals for use of the unmanned vehicles - Five new proposals for use of the unmanned vehicles have been submitted in addition to one resubmittal from last year. All of the proposals, with the exception of one, requests the use of ARGO II and the 120 kHz systems. The proposal requesting JASON/MEDEA is for 1996. DESSC reviewed all of the proposals and determined that the vehicles requested were all well suited for the science proposed.

B. Letters of Intent for 1996 and Beyond - Interest for work in the Southern EPR is on going. Also, since the work planned for the Western Pacific with HURL will most likely not happen, there will be additional interest to bring ALVIN to this region. When ALVIN resumes operations after its overhaul in 1996, dive regions might include the Atlantic, Caribbean, East Pacific, Southern Pacific and the West Pacific. The only region that does not fit into the scenario is Juan de Fuca because it is expected at this time that the overhaul and conversion operations will not be completed until the Fall of 1996, after the weather window

in the JDF operating area. The Juan de Fuca community must find other platforms to perform their research in 1995. ROVs will be available throughout 1996. Additionally, it was suggested that a 60 day opportunity on SEA CLIFF could be made available for operations in Juan de Fuca. A joint cruise could even be coordinated with JASON/MEDEA. John Green will explore the SEA CLIFF option further. He indicated that if enough advance notice is given, temporary modifications (TEMPMODs) can be accommodated on the manned Navy submersibles to better serve science.

VII. AGOR 25/ATLANTIS II/KNORR STATUS:

A. Construction of AGOR 25 - Dick Pittenger gave the DESSC an update on the status of AGOR 25, ATLANTIS II and KNORR. AGOR 25 is presently under construction at Halter Marine. Keel laying is scheduled for August. The shipyard is looking for an earlier delivery date than the scheduled date of early 1997. Changes in design of the berthing and water piping have been instituted. The name ATLANTIS has been proposed for this ship.

B. Status of Sale of Atlantis II - ATLANTIS II remains up for sale. To date there have been no serious offers. WHOI continues to seek a buyer for the ship.

C. Status of KNORR's Reconversion - The date for KNORR conversion to a submersible handling ship remains dependent upon the operating schedule of KNORR and the operational schedule of AII/ALVIN in late 1995, early 1996. Presently the ship expects to return from the Indian Ocean in early 1996 and commence the conversion in April of that year. A three month conversion period is planned. The extent of the work will be dependent upon the funds available. Dick's sequence of slides are included as **Appendix VI.** The priorities include converting the ship to handle both ALVIN and ROVs. This will be done. The ship is presently being equipped with Seabeam which was also included as a priority. A multi-purpose capability e.g. maintaining the general purpose availability of the ship is also a high priority. Financial constraints suggest a cross-decking of the existing A-Frame. Engineering studies related to this are on-going. It appears the stern slamming problem can be corrected with ballasting which will require some alterations. Still under consideration are the additional berths, habitability upgrades and whether or not the Dynacon winch should be permanently installed in the hold. The design for the changes has been completed by Glosten & Associates and made available for review to WHOI, ONR and the KNORR Conversion Ad hoc committee.

Ken Johnson, Chair of the KNORR Conversion Ad hoc Committee, reviewed the comments of the committee and presented viewgraphs of the design layout, see **Appendix XIV**. This included the need for the converted KNORR to meet or exceed the submersible capability of ATLANTIS II. If possible, additional science berths should be considered. The current lab space should be maintained and an increase in dry stores space should be considered. The general purpose capability should not be degraded. This might include a flush deck rail system to facilitate handling of moorings. The Ad hoc committee stands ready to review the revised drawings of Glosten.

VIII. UPGRADE PLAN FOR DEEP SUBMERGENCE ASSETS - IMPLEMENTATION STRATEGY:

A. Navigation Proposal - Jim Bellingham provided the DESSC with an update on the ALVIN Navigation Proposal, see **Appendix XV.** A Navigation Subcommittee is chaired by Jim and Barrie Walden and includes Dana Yeager, Ken Stewart, Jim Newman, Russ McDuff and Dan Fornari. This subcommittee is working with Barrie to resubmit the navigation portion of the ALVIN equipment proposal. They are also working on a long range plan which would entail a more extensive navigation proposal to be submitted next year. They seek strong community support and feedback. The solution will need to be applicable across all assets including ALVIN, ROVs and AUVs. They have requested $5000 to proceed with the study. By the December DESSC meeting, the subcommittee will have plans for the short term solutions and for the long term strategy.

B. Status of National Research Council Findings - Jeff Fox has been in contact with members of the National Research Council's study on deep submergence. They are not yet ready with their report and plan to use the DESSC workshop report as a perspective. All agreed that the two reports should, if possible, give consistent messages.

C. Review Strategy Plan - Jeff reported that the relationship between the user community, DESSC and the Operator is good and has been improving. He sighted the imaging proposal success and the work in progress with the navigational proposal. Jeff said that Barrie's vision for improvements were well formulated and will be brought before the entire community at the December DESSC meeting to factor in user community interests and to develop a consensus. Jeff further suggested that it was timely that the community engage in a discussion of whether or not a new generation of submersible was essential for research in the 21st century. This will be discussed at the December meeting.

IX. REVIEW ALVIN/AII TENTATIVE 1995/96 SCHEDULE:

Don Moller and Rick Chandler used the information provided earlier in the meeting concerning dive requests for ALVIN and concluded that there were already enough funded ALVIN dives to create a robust schedule for 1995. These funded programs were used to frame an operating schedule for 1995.

X. IMPROVED UTILIZATION OF ROVS:

A. MEDEA/JASON Needs - Andy Bowen provided several slides in his presentation on the activities and improvements planned for the MEDEA/JASON -ARGO II/ DSL 120 systems. These are included as **Appendix XVI.** Andy began by presenting impressive results from last year's ROV cruise to the Mid Atlantic Ridge. ROVs have operated successfully around hydrothermal vent complexes at both Juan de Fuca and Guaymas.

Andy divided the unmanned vehicle improvement plan into two parts, near term and long term. Near term improvements included refinements to JASON's manipulator functions, a re-configuration of the DSL 120 vehicle, improve most of MEDEA/JASON vehicle attitude sensors, integration of real time phase bathymetric processing, define improved elevator for sample recovery and actively monitor planning and development for seabed observatories.

Long term plans are to promote continued coupling of fundamental engineering research and operations, improve navigation capabilities, streamline at-sea data processing, assimilate AUV technology, decrease manpower at sea and improve the imaging systems.

B. ROV Strawman Schedule Review - Six (6) towed vehicle and ROV proposals have been submitted to the NSF May 1, 1994 panel review. Robert Ballard has expressed a strong interest in using JASON for a National Geographic Society expedition in 1995 which would provide some operational time for the vehicle in 1995 as there are no presently supported science cruises funded for JASON in 1995. This lack of science activity is of concern to WHOI-DSOG and DESSC.

XI. ENGINEERING DIVES/THIRD PARTY TOOLS: Dick Pittenger led the discussion on third party tools by providing flow charts and models of recommended development plans. The funding agencies had requested that WHOI prepare a codified development procedure. These are included as **APPENDIX XVII**. Considerable discussion followed concerning the role of third party tools. DESSC has been asked to play a role by advising early in the process whether or not a tool is appropriate for a third party tool. The ODP model was offered as a model. New tools must be a part of science planning and if engineering dives are necessary to test or prove a tool, dives should be scheduled for this purpose. Barrie pointed out that there are a number of issues associated with third party tools; such as where the tool will be housed, responsibilities for maintenance, and what to do in case of a tool failure. It was concluded that it is difficult to set one plan for all tools because of the varying requirements, however, it is necessary to recognize that a process is needed and that DESSC can play an advisory role.

Rock Drill - The Stakes/Holloway drill is an example of a third party tool. Debra Stakes and Leon Holloway are adapting a Gatling configuration to the drill for use on ALVIN. This is being driven by Rodney Batiza's need for a rock drill on an upcoming ALVIN science cruise where they plan to drill hyaloclastite and basalt on seamounts in the eastern pacific. Testing of the drill is currently being done on the MBARI ROV Ventana. Further testing in preparation for the Batiza dive series is being conducted in early September on ALVIN during planned Engineering dives. One of Batiza's science dives has been allocated for the testing of the drill.. It is anticipated that the rock drill will be a widely used tool in the future and there is already one funded program that requires its use in 1995.

XII. DESSC REPORT: The committee spent several hours reviewing the draft workshop report titled *The Global Abyss: An Assessment of Deep Submergence Science in the United States*. This report will not only cover the results of the November 1992 DESSC Workshop but will include subsequent discussions and developments. This report is divided into three parts. The first chapter is a sampling of deep submergence research. The second chapter provides a summary of the assets and infrastructure available to access the abyss, and the final chapter presents the near and long term challenges to deep submergence science. After reviewing and critiquing the draft document follow up assignments were handed out with the goal of presenting a final draft to the UNOLS Council at their 11-12 July meeting in Maine.

XIII. ASSESSMENT OF ALVIN COMMENTS: Jeff Fox spoke with some of the science users of ALVIN over the past year and provided the committee with an assessment of their comments. Users were very pleased with the effort and professionalism of the ALVIN group at sea. The excellent science results and the minor down time was a reflection of their efforts. The reoccurring problem of operational personnel turnover and extended at sea periods, however remains at issue. With the recent certification of three additional pilots some operational pressure should be relieved. Jeff said the DESSC would push for more personnel support.

A second issue had to do with the changing depth measurement which was not thoroughly explained nor transmitted to the scientists in a timely manner. Barrie explained that the algorithm they had been using for calculating depth/pressure had been questioned by the Navy certification people. There are two new equations for depth measurement, one uses constant latitude and the other uses varying latitudes. As of June 1st, the new equations will be in effect. The user manual will include the new equations. All old data can be converted to be consistent with the new equations. The DESSC emphasizes the importance of timely science community notification when changes of this type are under consideration.

XIV. REVIEW ALVIN/AII TENTATIVE 1995/96 SCHEDULE: Don Moller and Rick Chandler developed a preliminary ALVIN/AII schedule of funded programs, see **Appendix XVII**. A very tentative schedule has AII/ALVIN starting the year in Woods Hole for a series of dives on the Mid Atlantic Ridge. It would transit the Panama Canal and conduct dives out of Mexico and San Diego before arriving in the Juan de Fuca area in mid May to early June. A full season of dives are planned with the ship heading south in late September for more work off San Diego and then to the northern EPR. The year would end with the ship in Panama. Depending on funding decisions, the facility will return to WHOI for the overhaul or head to the Southern EPR for a short program.

XV. DISCUSSION ON THE USE OF NAVY ASSETS UNDER THE NOAA/NURP MOA: Mike Ledbetter reported on plans for research aboard the Navy assets. Two panels hosted by UNOLS reviewed proposals for use of NR-1 and TURTLE/ATV this year. NURP funded four programs on NR-1 for approximately 25 operating days. Operations are planned in the Gulf of Mexico, Florida, Mid Atlantic Bight and George's Bank. Two TURTLE proposals will receive NURP funding for work on Juan de Fuca and one ATV proposal will receive funding.

NOAA/NURP plans to continue with the MOA and will work with the Navy on future science projects. George Billy followed by stating that the Navy would like to increase the annual research opportunity from 60 days to 120 days on their submersibles. He sees a closer relationship with the WHOI DSL and the DESSC.

XVI. UPDATE ON NATIONAL DEEP SUBMERGENCE SCIENCE PLAN: Several issues are in progress that could point to movement in a new approach to planning and funding deep submergence science. These include the passage by Congress of the "Organic Act" which will strengthen NOAA/NURP. As DESSC's "Global Abyss" report is distributed and the National

Research Council findings published, the need for a national agenda will be clear. Jeff indicated that Jim Baker has responded to Garry Brass's letter concerning a new paradigm for funding deep submergence science and he has suggested a meeting between UNOLS/DESSC, NOAA, NSF and ONR. Jeff hoped that a meeting could be scheduled in the early Fall.

XVII. RECOMMENDATIONS FOR DESSC MEMBERSHIP:

A. DESSC Member - Dan Fornari has changed from a DESSC member to an ex-officio member because of his position at WHOI. This opens up one position on DESSC with an MG&G background.

B. DESSC Chair - Jeff Fox will be stepping down as Chair of DESSC in June of next year (end of term). The Committee was asked to think about potential candidates and communicate these to Jeff. It would be desirable to bring this person onboard by the December DESSC meeting (in Dan's position) to allow for a transition period.

XVIII. MEETING PLANS:

A. 1994 DESSC Planning Meeting - The 1994 DESSC meeting will again be held on the Sunday before the fall AGU in San Francisco. The date for this meeting will be 4 December. Jeff expressed the importance of this meeting as a national forum on deep submergence and an opportunity for DESSC to receive community input on its programs.

B. 1995 Spring Meeting Plans - Because of budget cutbacks in UNOLS Administration, the third DESSC meeting, held this year in MBARI, will be cancelled in 1995. Jeff suggested that an additional day or two be added to the June meeting to address those issues of operational concern to DESSC and WHOI. Jeff hopes that in the future the third meeting could be put back into the schedule. This meeting provides an opportunity to focus on long range issues, to work on cross-cutting deep submergence science issues that concern everyone in the community, and to interact with operators of deep submergence assets.

APPENDIX I

June 10, 1994

AGENDA

DEep Submergence Science Committee

8:30 a.m. June 13-15, 1994

Carriage House, Woods Hole Oceanographic Institution

Woods Hole, MA

8:30 a.m.- Monday, June 13, 1994 - Carriage House

I. Welcome, Introductions, and Meeting Goals (Jeff Fox, DEep Submergence Science Committee Chair)

II. Accept Minutes of December, 1993 DESSC Planning Meeting and the May 1994 DESSC Meeting at MBARI.

III. UNOLS Report (Garry Brass, UNOLS Chair)

IV. Deep Submergence Operations at WHOI:

A. Deep Submergence Facility Program Management (D. Pittenger)
B. KNORR Reconversion Schedule (D. Pittenger)
C. Equipment/Instrumentation Upgrades and Improvements (B. Walden, D. Foster, A. Bowen)
D. Status of 1994 ALVIN/ATLANTIS II Operations, Preview of Factors for 1995 (R. Chandler)
E. 1994 ROV Operations, Preview of Factors for 1995 (A.Bowen)

12:00 noon to 13:00 - LUNCH

V. Agency Reports on Program Funding for 1995 and beyond:

A. NSF (D. Dieter)
B. ONR (Keith Kaulum)
C. NOAA (Michael Ledbetter)
D. Navy (LCDR Billy)

VI. Review Dive Requests and Develop 1995 Schedule:

A. Review ALVIN and ROV Dive Requests for 1995. NSF, ONR and NOAA representatives will provide best-available funding information for all dive requests. The DESSC will review all proposals for 1995 and beyond. The reviews will emphasize the appropriateness of the vehicle to perform the proposed science. Needs for engineering dives to test scientific tools will be identified. The review and final schedule recommendations will be balanced against NSF, ONR and NOAA program/budget structure to assure that each agency's critical needs are met.

B. Review Intents of Interest for 1996 and Beyond. DESSC will review letters of interest for research in 1996 and beyond (post ALVIN Overhaul). The Committee will discuss the maturity, level of interest, and timeliness of the proposed work.

C. Schedule Recommendations for 1995. DESSC will work with the agency representatives and WHOI staff to develop a tentative schedule that most effectively utilizes the deep submergence assets. WHOI staff will assemble a candidate schedule for DESSC review based on those recommendations.

5:00 - 7:00 p.m., June 13th
Deep Submergence Science Committee Social
Clark Building, 5th Floor

8:30 a.m. - Tuesday, June 14, 1994 - Carriage House

VII. AGOR 25/ATLANTIS II/KNORR Status:

A. Construction of AGOR 25 (D. Pittenger, K. Kaulum)
B. Status of the sale of ATLANTIS II (D. Pittenger)
C. Status of KNORR's reconversion (K. Johnson)

VIII. Upgrade Plan for Deep Submergence Assets - Implementation Strategy:

A. Navigation Proposal - Status of progress in defining proposal (J. Bellingham, Ad hoc Chair)
B. Status of National Research Council Findings (J. Fox, D. Pittenger)
C. Review strategy plan (J. Fox)

IX. Review ALVIN/AII Tentative 1995/96 Schedule. (WHOI)

12:00 noon to 13:00 - Lunch

X. Improved Utilization of ROVs:

A. JASON/MEDEA Needs (A. Bowen)
   (a) Improvements envisioned in near term (Define technology needs to meet requirements for work on Juan de Fuca in 1996/97 while ALVIN is in overhaul and in other global arenas)
   (b) Phased sequence of technology evolution.
B. ROV Strawman Schedule Review (A. Bowen)

XI. Engineering Dives/Third Party Tools. Review process for tool development and procedures for requesting engineering dives (J. Fox, D. Pittenger, K. VonDamm)

XII. DESSC Report. Finalization of *The Global Abyss: An Assessment of Deep Submergence Science in the United States* Report.

XIII. Assessment of ALVIN Comments. Jeff Fox will summarize the comments received from ALVIN users. DESSC will identify themes that warrant attention by the WHOI ALVIN group.

8:30 a.m. - Wednesday, June 15, 1994 - Carriage House

XIV. Review ALVIN/AII Tentative 1995/96 Schedule. (WHOI)

XV. Discussion on the Use of Navy Assets under the NOAA/NURP MOA. (M. Ledbetter)

XVI. Update on National Deep Submergence Science Plan. (J. Fox)

XVII. Recommendations for DESSC Membership:

A. DESSC Member
B. DESSC Chair

XVIII. Meeting Plans:

A. 1994 DESSC Planning Meeting - AGU fall meeting, Sunday, December 4th - Agenda suggestions
B. 1995 Spring Meeting Plans

XIX. Other Business Arising

Adjourn at Noon on June 15, 1994

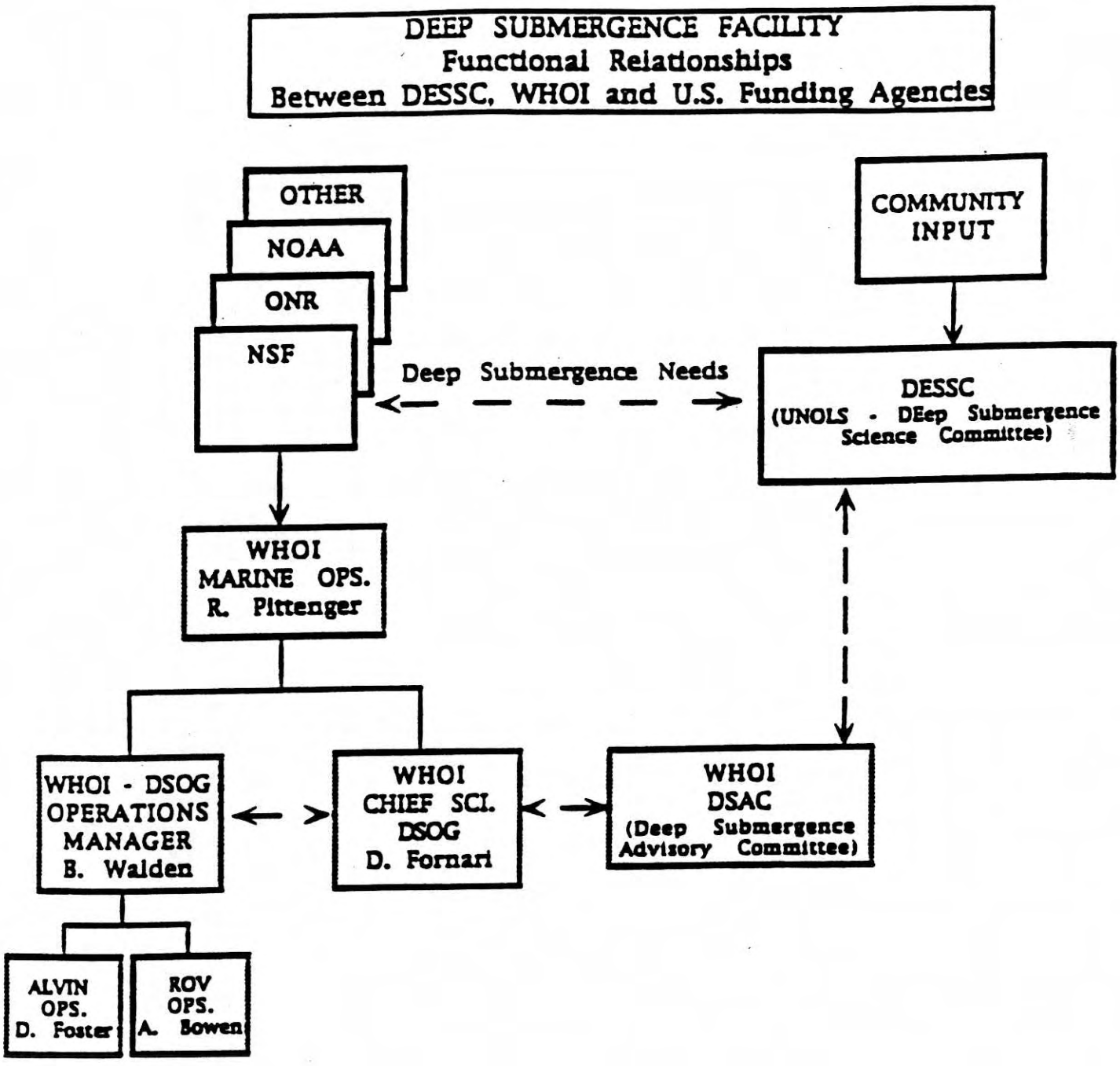
APPENDIX II

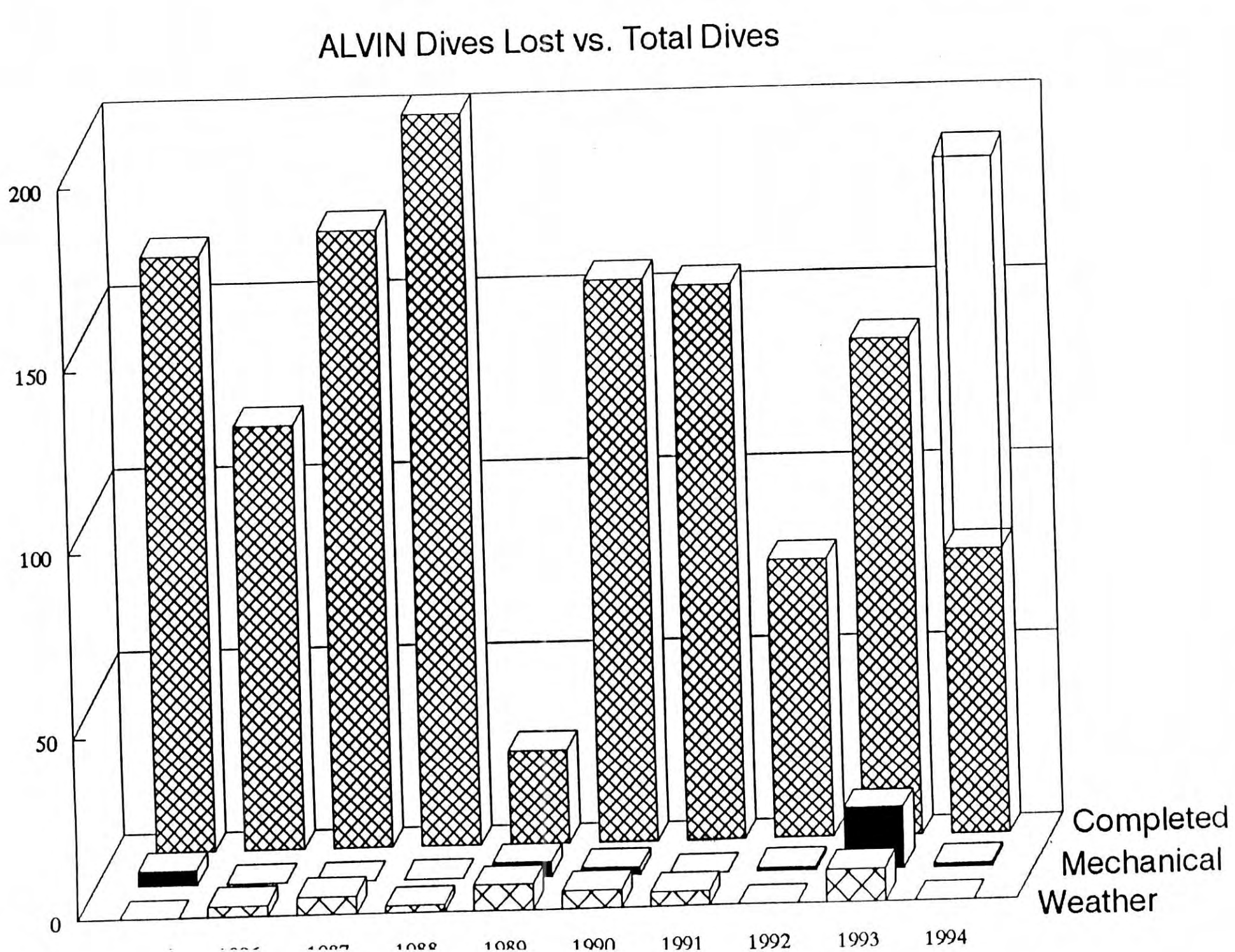
DESSC Meeting - June 13-15, 1994

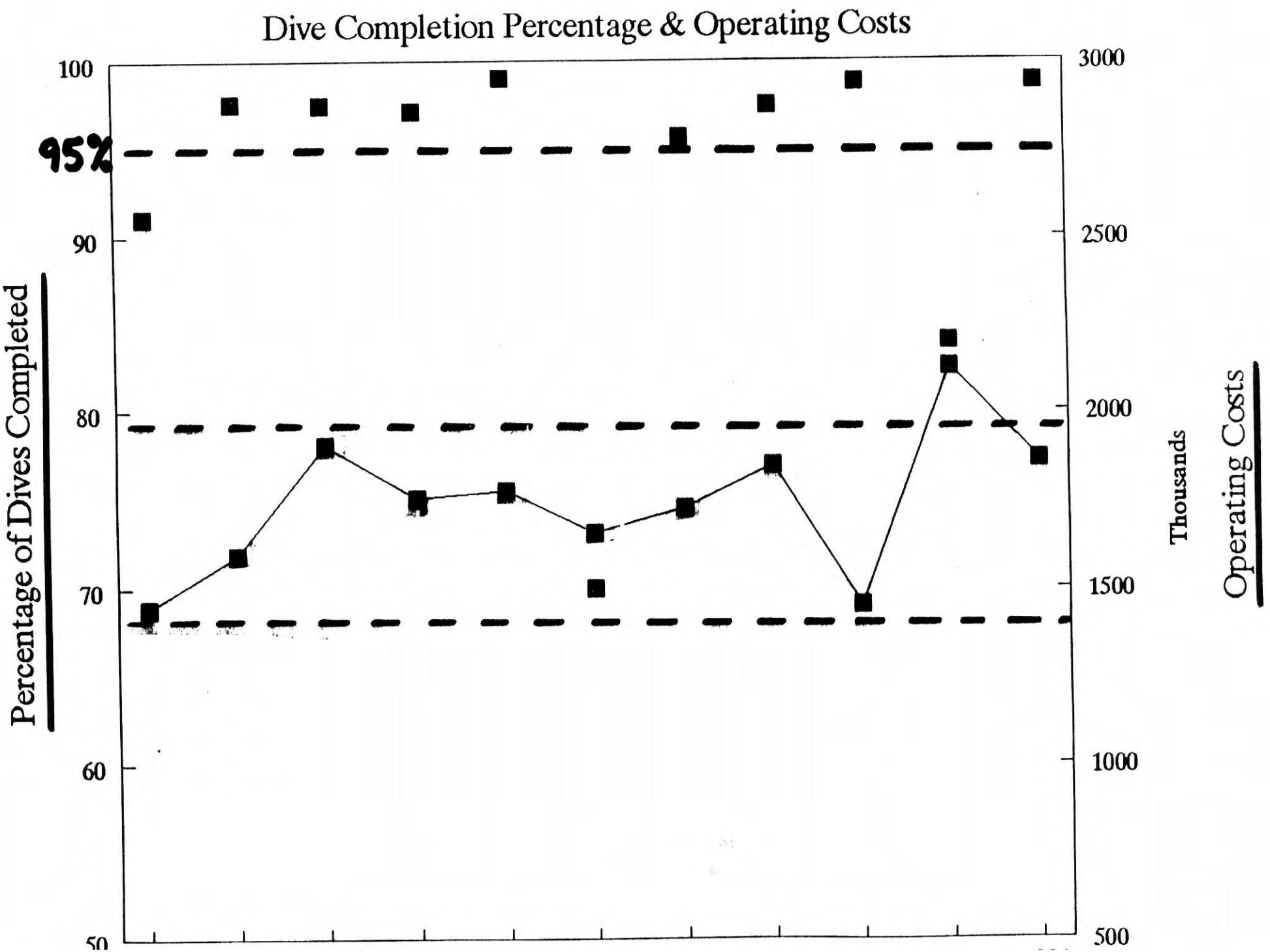
ATTENDEES

NAME	AFFILIATION
Committee Members:	
Jeff Fox, DESSC Chair	URI
Jim Bellingham	MIT/Sea Grant
Bob Collier	OSU
Dan Fornari	WHOI
Hugh Milburn	NOAA/PMEL
Dan Orange	MBARI
Gary Taghon	Rutgers
Karen Von Damm	UNH
Carl Wirsen	WHOI
Ken Johnson	MLML
Dick Pittenger	WHOI
Other Participants:	
John Bash	UNOLS
LCDR Billy	USN
Andy Bowen	WHOI
Garry Brass	UNOLS Chair
Rick Chandler	WHOI
Annette DeSilva	UNOLS
Dolly Dieter	NSF
Dudley Foster	WHOI
CDR John Green	USN
Keith Kaulum	ONR
Michael Ledbetter	NOAA/NURP
Don Moller	WHOI
Barrie Walden	WHOI

APPENDIX III


DEEP SUBMERGENCE FACILITY
Functional Relationships
Between DESSC, WHOI and U.S. Funding Agencies
OTHER
NOAA
ONR
NSF
COMMUNITY INPUT
Deep Submergence Needs
DESSC
(UNOLS - DEep Submergence Science Committee)
WHOI
MARINE OPS.
R. Pittenger
WHOI - DSOG
OPERATIONS
MANAGER
B. Walden
WHOI
CHIEF SCI.
DSOG
D. Fornari
WHOI
DSAC
(Deep Submergence Advisory Committee)
ALVIN
OPS.
D. Foster
ROV
OPS.
A. Bowen


ALVIN Dives Lost vs. Total Dives
200
150
100
50
0
1989
1990
1991
1992
1993
1994
Completed
Mechanical
Weather


Dive Completion Percentage & Operating Costs
95%
100
90
80
70
60
50
3000
2500
2000
1500
1000
500
Percentage of Dives Completed
Thousands
Operating Costs

APPENDIX IV

Summary Impact in 1994

- **Major Equipment**
  Reduced 62% ($82 K)

- **Personnel**
  Reduced 15% (1.05 MY)

- **Based on 8.7 MY requested vice 10-11 people desired.**

- **Eliminate Engineering Dives (6 vs. 8 including INSURV)**

Major Equipment

ITEM	REQUESTED	REVISED
Replacement Main Batteries	$10,000	$12,125
Gyro Replacement	26,400	10,166
Third Battery Charger	10,000	2,860
Replacement VB Saltwater Valve	7,500	0
Two New Science Elevators	4,500	0
Spare Navigation Deck Unit	13,000	0
Replacement QI Lights	7,500	0
Replacement Ti Light	4,745	0
Launch System Lift Lines	2,600	0
Replacement Transponder Ducers	3,600	0
Spare Precision Depth Ducer	3,825	1,000
Spare Altimeter	5,000	0
Replacement In-Hull Video Monitor	1,800	0
Video Data Time Stamp Electronic	8,750	5,500
Comm/Nav Xducer Repairs	7,500	3,750
Replacement 37 kHz Pingers	2,260	0
Spare Underwater Transceiver (UQC)	6,000	0
Two Replacement Go-Flo Bottles	2,200	0
New Emergency Breathing Apparatus	0	6,000
Remote Video Zoom/Focus Control	0	3,000
Battery Service H2 Monitor	2,500	1,000
Battery Vent Caps	3,100	5,000
TOTAL EQUIPMENT REDUCTIONS		$82,379 (-62%)

Manpower

Shore-based

Mechanical Technician	1.50	1.00
Mechanical Engineer (MY)	1.55	1.05
Structural Engineer (MY)	.40	.30
Computer Specialist (MY)	.50	.30
Electrical Engineer (MY)	.75	1.00
	6.95	5.90

TOTAL ENGINEERING MANPOWER REDUCTION (MY) 1.05 (-15%)

Afloat group is funded at 8.7 MY level requested vice 10-11 MY level desired.

Details of Reductions

- Manpower
  - Limiting range and depth
    - . One electrical engineer
    - . Allegiance

- Hardware
  - Bow wave
  - Spares
  - "No-new-money" game
    i.e. motor controller housing

Challenge

- **Are WE (collectively) committed to building a national deep submergence facility?**

- **Requires commitment**

  - **Community-wide (sponsors, users, operators, Congress)**

- **WHOI committed (including eventual competition for the asset)**

  - **<u>However</u>:**
    - **Parochial interests are:**
      - **Tempering community commitment**
      - **Draining the pot**

  - **<u>Short Funding:</u>**
    - **Sets WHOI up for defeat in competition**

WHOI'S DILEMMA

- Wants to lead the charge for upgrading deep submergence with <u>better</u>:
  - Bottom time - power
  - Imaging
    - Lights
    - Cameras
    - Data processing, archiving
  - Sampling/manipulation
  - General assistance to community
  - Cost controls

- Service (and reputation) being eroded by budget realities.
  - Losing:
    - Core personnel
    - Technological edge
  - Users interpret our actions as lack of interest, desire, ability
    - Morale also a casualty
  - Not conducive to staying on technological and performance edges

- At same time, under-subscription of ROV's jeopardizes their future.

Recommendation

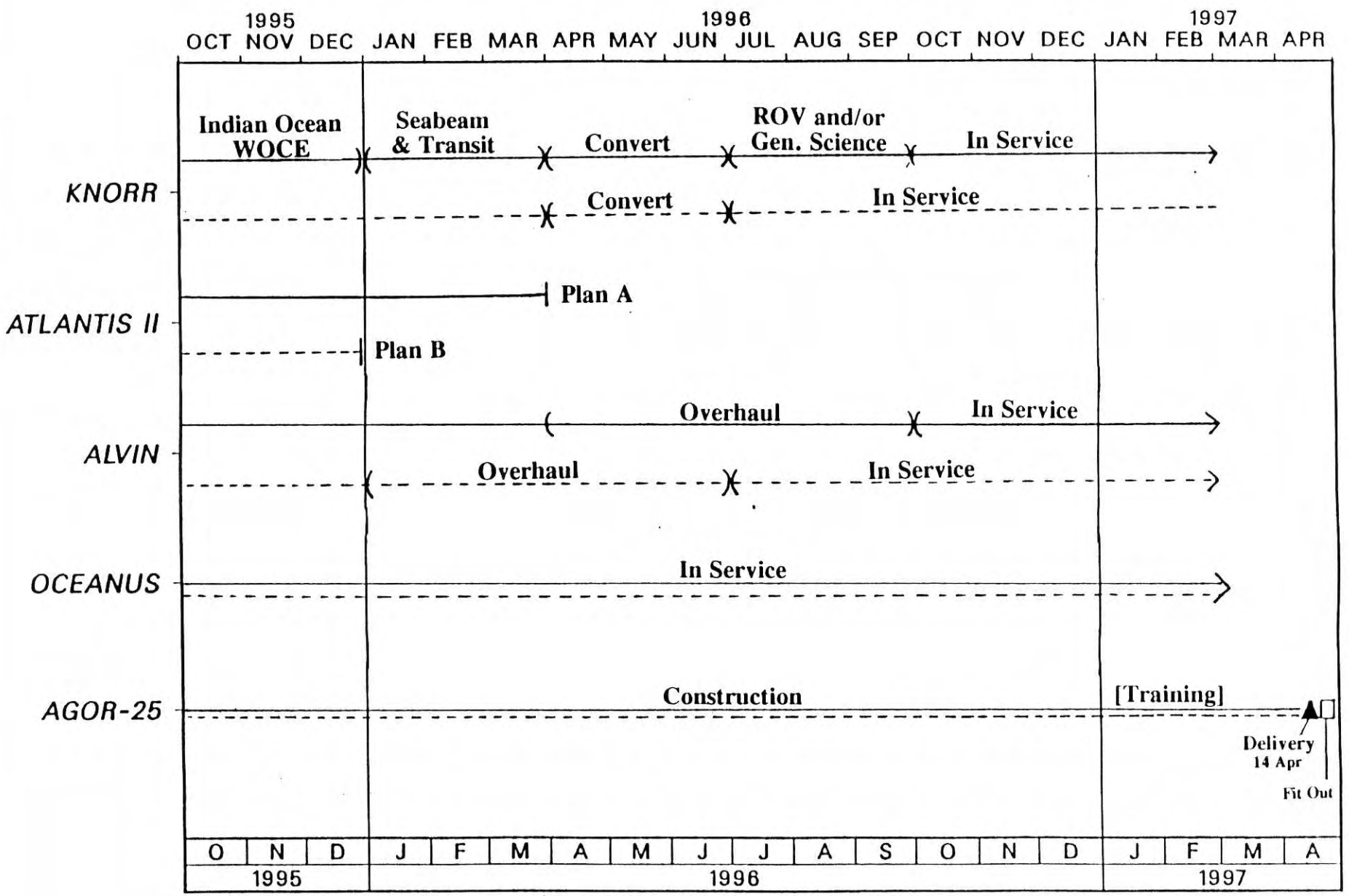
Given community appreciation of WHOI funding dilemma (expected to provide First Class service and upgrades with marginal funding):

- Support KNORR conversion timing and plan;
- Go forward with short-term (imaging) and mid-term ALVIN upgrades;
- Put ROV's on faster track;
- Put together a plan and build a concensus of support.

APPENDIX V

WHOI Ships

Schedule Options for 1995-1997



Plan A (Normal A-II Retirement)

Plan B (Early A-II Retirement)

APPENDIX VI

KNORR RECONVERSION
ENGINEERING PLAN

- **OBJECTIVES**
  - Support Alvin at least as well as currently supported on A-II
  - Support ROV's, using Jason & Medea as guide
  - Maximize capacity for general oceanographic science
- **DESIGN ISSUES**
  - Alvin hangar & workshop without sacrificing too much lab space
  - A-Frame
    - » structural installation design
    - » refurbish or renew decision
  - Stern slamming
    - » high speed ballast system
    - » structural mods to after bottom shape
  - Install Traction winch vs old trawl winch
    - » fiber-optic capability
  - Seabeam installation
  - General habitability
    - » stores
    - » exercise room
  - Increase science berths
    - » offset loss to Deep Sub. team

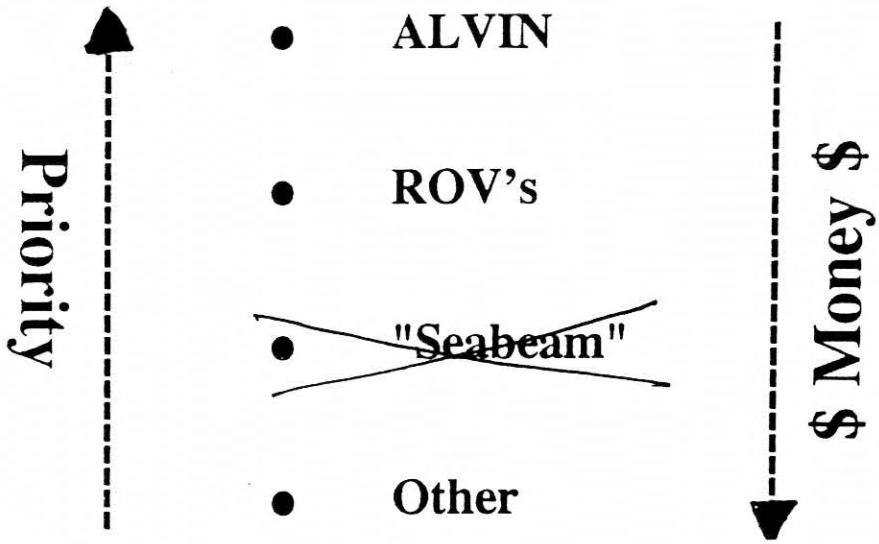
KNORR Conversion

OTHER CONSIDERATIONS:

- Multi-purpose Capability
  - ALVIN
  - ROV's
  - General Science
- New A-Frame or Old?
- ALVIN Crew Berthing
  < Science Berths
- Stern slamming and shudder
- Habitability - work-out room - stores
- Dynacon Winch

KNORR Conversion

PRIORITIES:



Tentative
Planning Schedule

- Preliminary Design Package to WHOI/ONR
  May 1994

- WHOI and Ad Hoc Committee Review

- Discuss at June DESSC

- Decide Priorities, Funding Schemes

APPENDIX VII

MAJOR INITIATIVES FOR THE DEEP SUBMERGENCE RESEARCH FACILITIES

	1994	1995	1996	1997	1998
OP. AREAS	JDF EPR CAL	EPR JDF S. MAR CAL EPR	EPR? ---WHOI---	MAR JDF EPR WEST.PAC	S. EPR JDF EPR INDIAN?
SHIP	------ATLANTIS-II Continued Service---??? KNORR CON-VERSION P-Code GPS ----KNORR Conversion Design Specs.			--------KNORR IN SERVICE----------	
ALVIN	IMAGING UPGRADES SUB. SYSTEMS UPGRADES NEW INTEGRATED NAV. SYSTEM EXACT NAV. NEW TEMP. SENSORS	MAJOR OVERHAUL		INCREASE SUB. POWER-MORE BOTTOM TIME UPGRADE V.B. SYSTEM FWD. FRAME MODS.-MORE SCI. PAYLOAD INCREASE HYD. POWER NAV. AND IMAGING UPGRADES	
ROV & TOWED	ARGO-II & 120 kHz TAG Field Program Fiber Optic Cable Testing - New Cable Jason Manipulator Tests & Upgrade 120 kHz Sonar Operational Upgrades (Phase Bathy., Switched Ducers, Shallow Water Use)	JASON, ARGO-II AND 120 KHZ SCIENCE PROGRAMS MBARI-TIBURON BEGINS OPERATIONS for use with Seafloor Observatory Instrument.		WORLD-WIDE OPERATIONS OF ROVS AND TOWED VEHICLES Continued Upgrades of Systems with Ongoing Engin. Research Initiatives and	
AUV	ABE Development and Field Trials MIT-NOAA & MIT-WHOI ODYSSEY Field Trials	ABE FIELD DEPLOYMENT AT JDF OR EPR CONTINUED ODYSSEY FIELD PROGRAMS MBARI AUV DEVELOPMENT		CONTINUED ABE OPERATIONS MIT-WHOI PARTNERSHIP TO CONTINUE DEVELOPMENT AND OPERATE ODYSSEY-LIKE AUVS	

N.B. - Operating Areas for ALVIN in 1996 and beyond have not been approved by the funding agencies
Operating Areas for ALVIN in 1995 are tentative pending funding decisions.

APPENDIX VIII

ALVIN IMPROVEMENTS

CATEGORY	NEAR TERM	PRIOR TO END OF NEXT OVERHAUL	LONG-TERM (>3 YEARS)
IMAGING	Purchase HMI lights & Spares (TI + QI) Purchase Osprey 1930 3-chip camera from Rutgers Obtain latest generation 3-chip CCD videocam. Provide observer controlled video camera pan & tilt (w/ pencil 1-chipCCD camera(s)??). Increase number of available video recorders. Improve video signal wiring & switching, & method for data overlays & time code recording. Provide improved power ranging / scaling lasers for arm camera.	Provide spare light control relay assembly. Provide color monitors for observers. Provide general use mini-cams.	Provide HDTV format capability.
NAVIGATION	P-Code GPS Upgrade transponder survey programs to increase speed and accuracy. Add "EXACT" system utilization to ALVIN capabilities.	New integrated navigation system Increase number of recoverable transponders available for science use	Augment long-baseline navigation system with hull mounted short / medium baseline & doppler.

ALVIN IMPROVEMENTS

CATEGORY	NEAR TERM	PRIOR TO END OF NEXT OVERHAUL	LONG-TERM (>3 YEARS)
DATALOGGER	Upgrade operating system to improve VP/ix capability and document in User's Manual. Ethernet Connection for data trasfer Run NAV92 under VP/ix. Continue to add compatibility with other science sensors		Hardware & software updates & / or replacements to keep pace with latest computer technology
SENSORS & SAMPLERS	Provide general use science computers (Apple and PC) and large-format cross-platform science printer. New Hi / Low, Real-Time Temperature Sensors & Coupled to Water Sampling Bottles	Obtain spare gyro. Provide two-head capability for Mesotech and obtain "imaging head". Replace / supplement major and gas-tight samplers with new design.	Provide Hydrowinch ROV and AUV capability. Redesign personnel sphere interior (viewport locations?)
DIVE DURATION	Evaluate and Track Power Consumption During Dives versus Science Tools/Sensors Used (e.g. Lights, Manip. etc.) Continue to evaluate battery charging procedures		Increase available power Replace main batteries (NiCd?)

ALVIN IMPROVEMENTS

CATEGORY	NEAR TERM	PRIOR TO END OF NEXT OVERHAUL	LONG-TERM (>3 YEARS)
SUBMERSIBLE SYSTEMS	Evaluate alternate sources for pressure housing connectors and cables. Replace all explosive release devices. Replace emergency breathing assemblies. Evaluate lower cost motor controllers.	Upgrade obstacle avoidance sonar (possibly complete replacement). Provide motor controller spares.	Replace major components of variable ballast system. Increase hydraulic system horsepower. Redesign forward frame to increase manipulator/science basket payload.

APPENDIX IX

WHOI - UNOLS NATIONAL FACILITY
DEEP SUBMERGENCE COMPONENTS

ALVIN
ROV/TOWED VEHICLES
SUPPORT VESSEL
ENGINEERING SUPPORT AND DEVELOPMENT

SHORT-TERM GOALS

- Find Solutions to Chronic Funding Shortages for Operational Support for Submersible and ROV/Towed Vehicle Operations

- Continue to Upgrade Submersible Systems (connectors, explosive releases, motor controllers, gyro, scanning sonar)

- Complete Imaging Upgrade - Hardware Acquisition and Installation

- Implement EXACT- High-Frequency Nav. with ALVIN Navigation System

- Review Sub./ROV Navigation Systems - Compile Design Specifications & Implement Next Generation of Integrated Navigation System

- New Hi- and Low-Temperature Sensors Coupled to Hydrothermal Water Samplers

- P-Code GPS on Support Vessel (***Done***)

- Finalize Design Specifications for KNORR Conversion

- Refine ROV Manipulator Functions and Capabilities

- Complete ROV and Towed Vehicle Systems Operations Manuals and Documentation

- Standardize Phase-Bathymetric Processing for 120 kHz Sonar System

- Study MBARI ToolSled Concept for Interchangeability Between Different ROV Systems

WHOI - UNOLS NATIONAL FACILITY
DEEP SUBMERGENCE COMPONENTS

ALVIN
ROV/TOWED VEHICLES
SUPPORT VESSEL
ENGINEERING SUPPORT AND DEVELOPMENT

LONG-TERM GOALS

- Help Define National Deep Submergence Plan to Provide Operational Support for Submersible and ROV/Towed Vehicle Operations into 21st Century

- Major Upgrades of Sub. Systems (increase sub. power, variable ballast system, increase hydraulic system horsepower, re-design forward frame to increase science basket payload)

- Continue to Upgrade Imaging Hardware for ALVIN and ROV Systems to Keep Pace with Latest Technology

- Continue to Upgrade Navigation Systems - Develop Hardware/Software for Utilizing Combination of Integrated - Multibeam Array on Support Ship, Short-Baseline, and Doppler Sonars

- Provide Needed Technical Support for Submersible and ROV Interfacing with Ocean Floor Observatory Sensors and Systems

- Stable Funding for Continued Engineering Research in Support of Deep Submergence Vehicles and Operations

- Steady-State Utilization of ROV and Towed Systems for Science

- Provide Proven AUV Technology (long-duration and short-duration vehicles) to Science Users to Complement other Deep Submergence Assets

- Provide Comprehensive Data Archiving and Image Storage/Analysis System for All Deep Submergence Datasets

- New Major and Gas-Tight Water Samplers for Submersible and general ROV use

- Optimization of Surface Control Software and Procedures to Consolidate & Reduce Manpower Requirements for ROV/Towed Vehicle Ops.

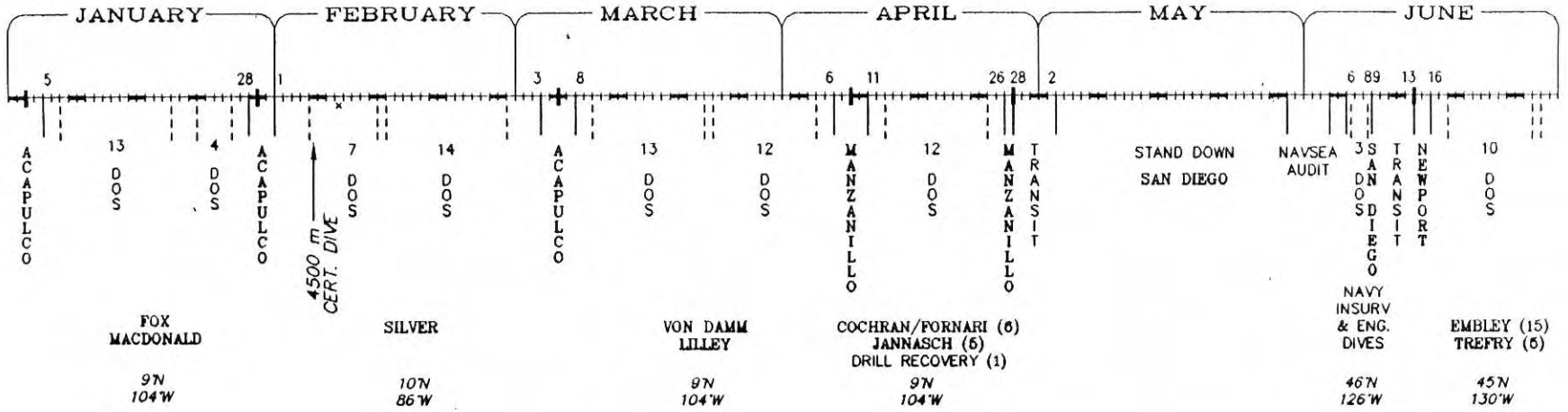
APPENDIX X

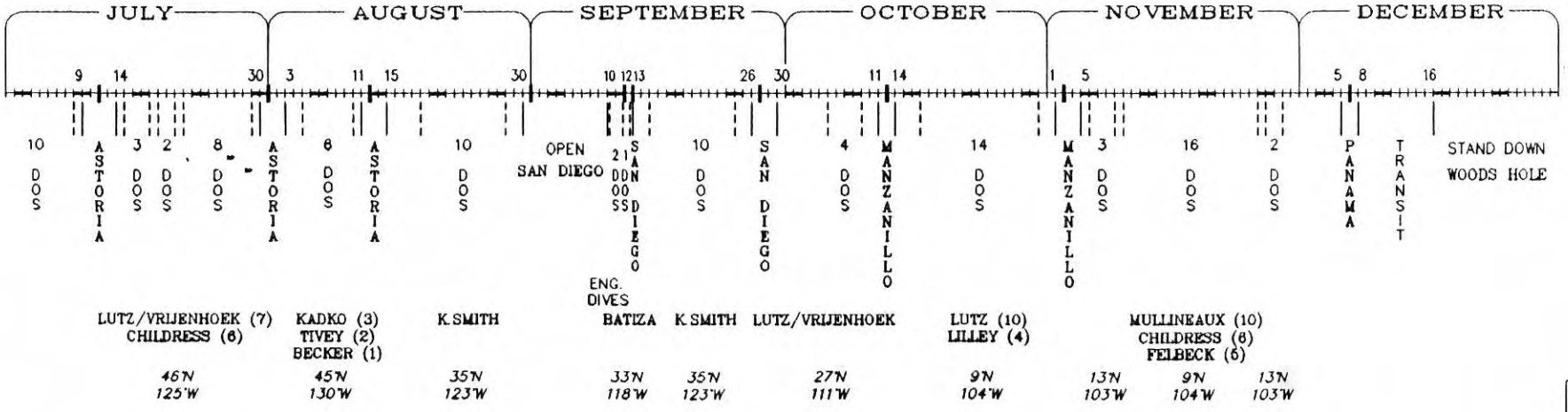
R/V ATLANTIS II & ALVIN OPERATIONS

1994

OPERATIONAL SCIENTIFIC SERVICES
WOODS HOLE OCEANOGRAPHIC INSTITUTION

02 MAY 94
~~18 FEB 94~~
~~01 DEC 93~~
~~18 NOV 93~~
~~28 SEP 93~~

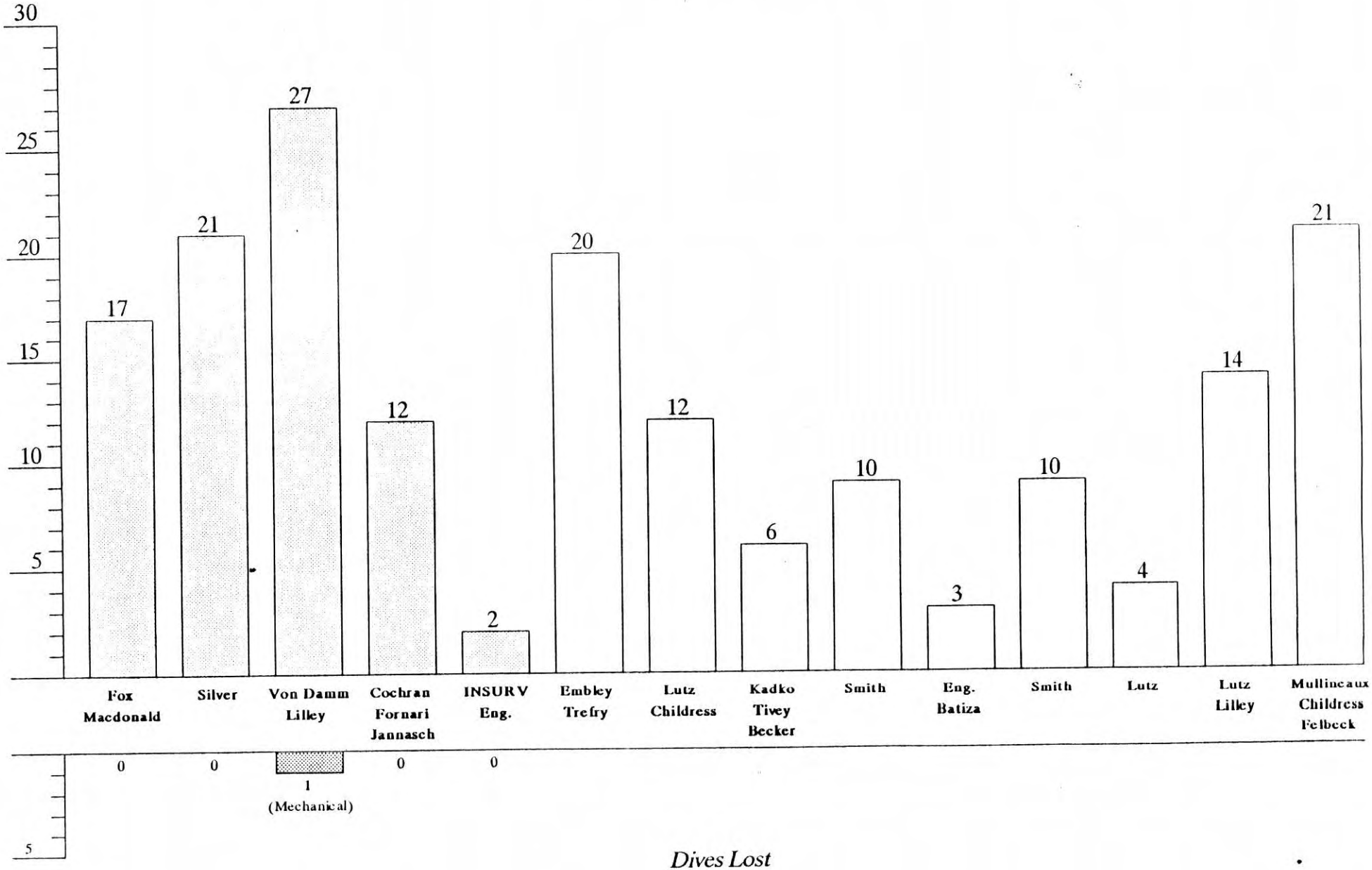




ALVIN Dives	
Science	174
Cert / Eng	5
Total	179

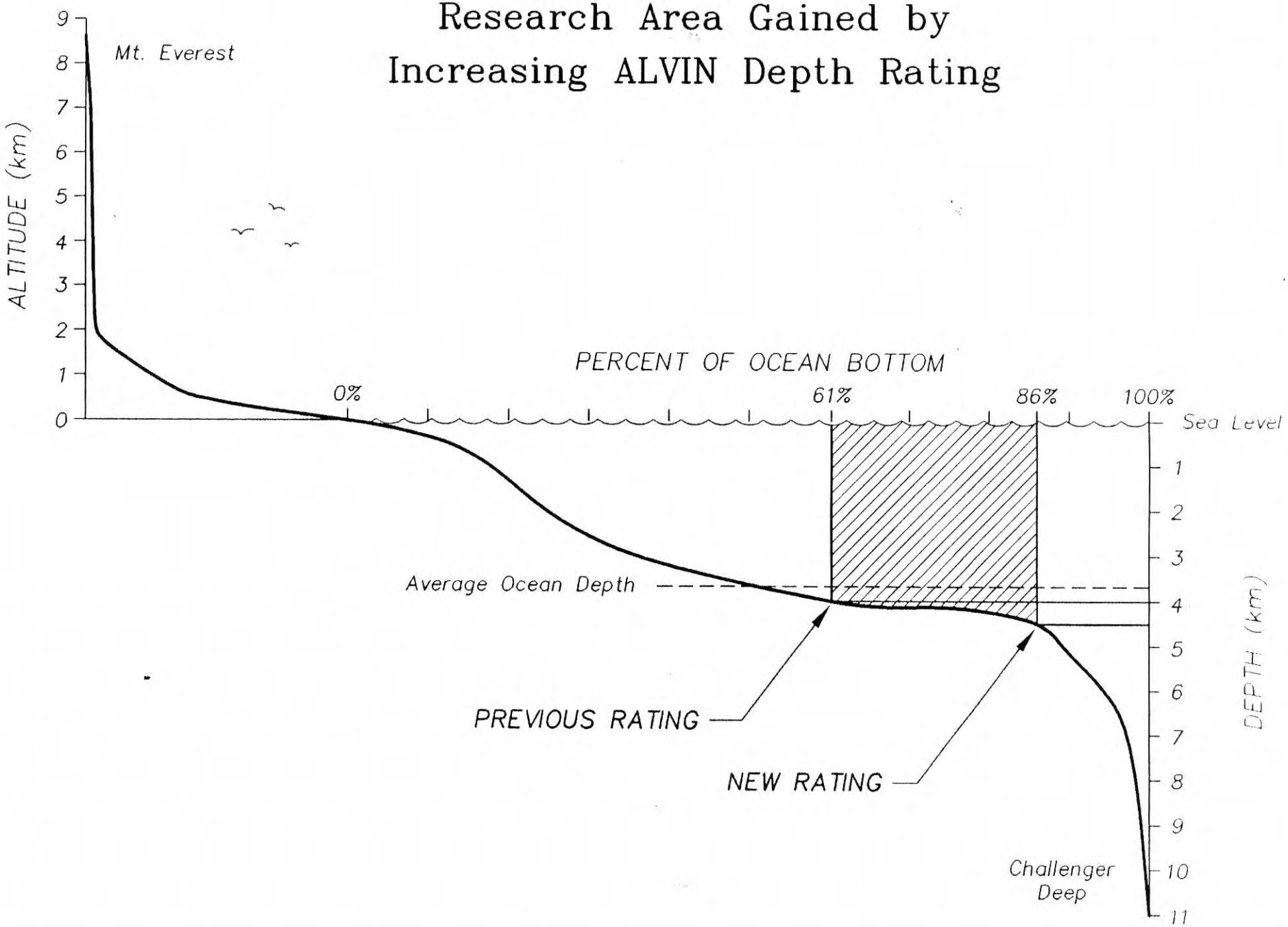
1994 ALVIN Dives

181 Planned
80 Completed (as of 6/8)



Dives Lost

Research Area Gained by Increasing ALVIN Depth Rating



APPENDIX XI

OCEAN SCIENCES DIVISION

	FY 1992	FY 1993	Estimated FY 1994
Ocean Sciences Division	$177.5 M	$177.7 M	$ 188.9 M
Ocean Sciences Research	90.0 M	92.5 M	100.0 M
Ocean Drilling Program	36.3 M	36.0 M	38.7 M
Oceanographic Facilities	51.2 M	49.2 M	50.2 M

OCEANOGRAPHIC FACILITIES DETAIL

Operations			
Ship Operations	31.1 M*	29.4 M*	31.6 M *
ALVIN, Aircraft, etc.	0.9 M	1.4 M	2.2 M
Marine Techs	4.3 M	4.2 M	4.2 M
	$ 36.3 M	$ 35.0 M	$ 38.0 M
Infrastructure			
Science Instruments	1.7 M	1.3 M	2.5 M
Shipboard Equipment	2.8 M	2.1 M	2.5 M
Ships, Upgrades	2.9 M	7.2 M	2.3 M
UNOLS, Misc.	0.6 M	0.5 M	0.7 M
	$ 8.0 M	$ 11.1 M	$ 8.0 M
Technology, Centers, Reserves			
Technology Development	4.4 M	-	-
AMS Center	1.2 M	1.0 M	1.5 M
Cross Directorate/Reserves	1.3 M	2.1 M	2.7 M
	$ 6.9 M	$ 3.1 M	$ 4.2 M

*Plus $1.6 M from ODP (1992 and 1993), $1.5 M (1994)

NSF FY 1995 BUDGET REQUEST

Ocean Sciences

- **Total Request is $207.9 million**
- **Increase of $19.0 million or 10.1%**

	Total	Increases
Ocean Science Research Support (OSRS)	$114.0M	$14.0M or 14.0%
Oceanographic Centers & Facilities (OCFS)	53.9M	3.7M or 7.3%
Ocean Drilling Program (ODP)	40.0M	1.3M or 3.4%
• Major Research Initiatives		
Global Change Programs	71.4M	17.8M or 33.2%
Biotechnology	3.6M	-0.4M or -10.0%
High Performance Computing	1.6M	1.2M or 300.0%
Environmental Research	2.5M	0.5M or 25.0%
	$79.1M	$19.1M or 31.8%
• Other Research activities	$128.8M	-$ 0.1M or 0.0%

APPENDIX XII

MISCELLANEOUS PROJECTS

* DEVELOPMENT OF DSV BATTERY REMOVAL AND MAINTENANCE SYSTEM (CART AND RAIL SYSTEM FOR RAPID AND SAFE AT-SEA REPAIRS)

* PRODUCTION OF IN-HOUSE, MISSION SPECIFIC TOOLS (PRE-APPROVED TEMPMODS FOR RECURRING USE ITEMS)

  * * SONY, DXC-930 3- CHIP CCD CAMERA PACKAGED FOR DEPTHS TO 20,000 FT (FOR DSVs, ATV OR SCORPIO USE)

  * * 7-FUNCTION HYDRAULIC ACTUATOR (FOR DSVs)

  * * MICRO-LASER SCALING SYSTEM

  * * MID-COLUMN WATER SAMPLER (8) WITH LIGHT RACK

  * * HYDRAULIC SUCTION PUMP

  * * MESOTECH SONAR SYSTEM CONVERTED FOR THERMAL IMAGING (DEVELOPING FOR ATV AS WELL AS DSVs USE)

TECHNOLOGY INITIATIVES TO IMPROVE SCIENCE OPERATIONS

WHOI/SCRIPPS PROJECTS (FY 94 AND 95)

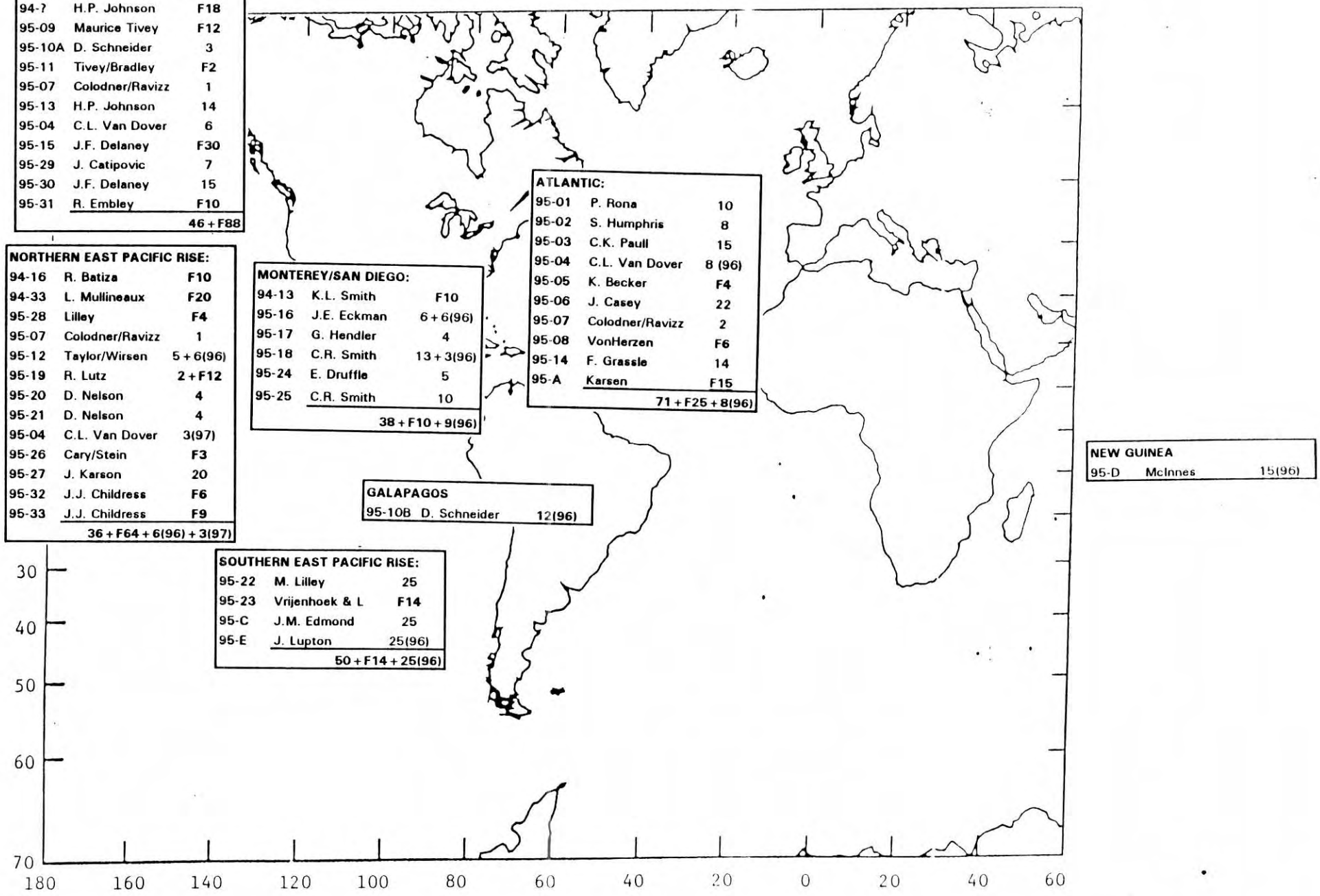
* UPGRADE POST-PROCESSING CAPABILITIES OF SEA BEAM SYSTEM
* INCREASE SCORPIO'S DEPTH CAPABILITY FROM 5,000 TO 10,000 FEET
* VEHICLE TRACKING SYSTEM RELIABILITY UPGRADES FOR DOLORES AND LANEY CHOUEST
* EVALUATIONS OF ATV AND SCORPIO CABLE DESIGNS
* VISUAL IMAGING AND LIGHTING EVALUATIONS AND UPGRADES FOR DSVs, ATV AND SCORPIO
* EVALUATION AND STANDARDIZATION OF DATA RECORDING SYSTEMS
* DEVELOPMENT OF ENVIRONMENTAL MONITORING SUPPORT PACKAGES

APPENDIX XIII

#	Investigator	Disc.	1995 Proposed Dives	1995 Funded Dives	1996 Proposed Dives	1997 Propose Dives
ATLANTIC:						
95-01	P. Rona	Multi	10			
95-02	S. Humphris	G&G	8			
95-03	C.K. Paull	Chem	15			
95-04	C.L. Van Dover	Biol			8	
95-05	K. Becker	G&G		4		
95-06	J. Casey	G&G	22			
95-07	Colodner/Ravizza	Chem	2			
95-08	VonHerzen	GChem		6		
95-14	F. Grassle	Biol	14			
95-A	Karsen	G&G		15		
	Total		**71**	**25**	**8**	**0**
JUAN DE FUCA:						
94-04	M. Mottl	B & C		16		
94-?	H. P. Johnson	G&G		18		
95-09	Maurice Tivey	G&G		12		
95-10	D. Schneider	G&G	3			
95-11	Tivey/Bradley	G&G		2		
95-07	Colodner/Ravizza	Chem	1			
95-13	H.P. Johnson	G&G	14			
95-04	C.L. Van Dover	Biol	6			
95-15	J.F. Delaney	G&G		30		
95-29	J. Catipovic	Tech	7			
95-30	J.F. Delaney	G&G	15			
95-31	R. Embley	Multi		10		
	Total		**46**	**88**	**0**	**0**
MONTEREY/SAN DIEGO:						
94-13	K.L. Smith	Biol		10		
95-16	J.E. Eckman	Biol	6		6	
95-17	G. Hendler	Biol	4			
95-18	C.R. Smith	Biol	13		3	
95-24	E. Druffle	Chem	5			
95-25	C.R. Smith	Biol	10			
	Total		**38**	**10**	**9**	**0**

#	Investigator	Disc.	1995 Proposed Dives	1995 Funded Dives	1996 Proposed Dives	1997 Proposed Dives
GYAMAS BASIN:						
95-B	H. Jannasch	Biol				
	Total		**0**	**0**	**0**	**0**
NORTHERN EAST PACIFIC RISE:						
94-16	R. Batiza	G&G		10		
94-33	L. Mullineaux	Biol		20		
95-28	Lilley	Chem		4		
95-07	Colodner/Ravizza	Chem	1			
95-12	Taylor/Wirsen	Biol	5		6	
95-19	R. Lutz	Multi	2	12		
95-20	D. Nelson	Biol	4			
95-21	D. Nelson	Biol	4			
95-04	C.L. Van Dover	Biol				3
95-26	Cary/Stein	Biol		3		
95-27	J. Karson	G&G	20			
95-32	J.J. Childress	Biol		6		
95-33	J.J. Childress	Biol		9		
	Total		**36**	**64**	**6**	**3**
GALAPAGOS						
95-10	D. Schneider	G&G			12	
	Total		**0**	**0**	**12**	**0**
SOUTHERN EAST PACIFIC RISE:						
95-22	M. Lilley	GChm	25			
95-23	Vrijenhoek & Lutz	Biol		14		
95-C	J.M. Edmond	Chem	25			
95-E	J. Lupton	GChm			25	
	Total		**50**	**14**	**25**	**0**
NEW GUINEA						
95-D	McInnes	Multi			15	
	Total		**0**	**0**	**15**	**0**
GRAND TOTAL:			**241**	**201**	**75**	**3**

ALVIN REQUESTED DIVES BY REGION



JUAN DE FUCA:

94-04	M. Mottl	F16
94-?	H.P. Johnson	F18
95-09	Maurice Tivey	F12
95-10A	D. Schneider	3
95-11	Tivey/Bradley	F2
95-07	Colodner/Ravizz	1
95-13	H.P. Johnson	14
95-04	C.L. Van Dover	6
95-15	J.F. Delaney	F30
95-29	J. Catipovic	7
95-30	J.F. Delaney	15
95-31	R. Embley	F10
		46 + F88

NORTHERN EAST PACIFIC RISE:

94-16	R. Batiza	F10
94-33	L. Mullineaux	F20
95-28	Lilley	F4
95-07	Colodner/Ravizz	1
95-12	Taylor/Wirsen	5 + 6(96)
95-19	R. Lutz	2 + F12
95-20	D. Nelson	4
95-21	D. Nelson	4
95-04	C.L. Van Dover	3(97)
95-26	Cary/Stein	F3
95-27	J. Karson	20
95-32	J.J. Childress	F6
95-33	J.J. Childress	F9
		36 + F64 + 6(96) + 3(97)

MONTEREY/SAN DIEGO:

94-13	K.L. Smith	F10
95-16	J.E. Eckman	6 + 6(96)
95-17	G. Hendler	4
95-18	C.R. Smith	13 + 3(96)
95-24	E. Druffle	5
95-25	C.R. Smith	10
		38 + F10 + 9(96)

ATLANTIC:

95-01	P. Rona	10
95-02	S. Humphris	8
95-03	C.K. Paull	15
95-04	C.L. Van Dover	8 (96)
95-05	K. Becker	F4
95-06	J. Casey	22
95-07	Colodner/Ravizz	2
95-08	VonHerzen	F6
95-14	F. Grassle	14
95-A	Karsen	F15
		71 + F25 + 8(96)

GALAPAGOS

95-10B	D. Schneider	12(96)

SOUTHERN EAST PACIFIC RISE:

95-22	M. Lilley	25
95-23	Vrijenhoek & L	F14
95-C	J.M. Edmond	25
95-E	J. Lupton	25(96)
		50 + F14 + 25(96)

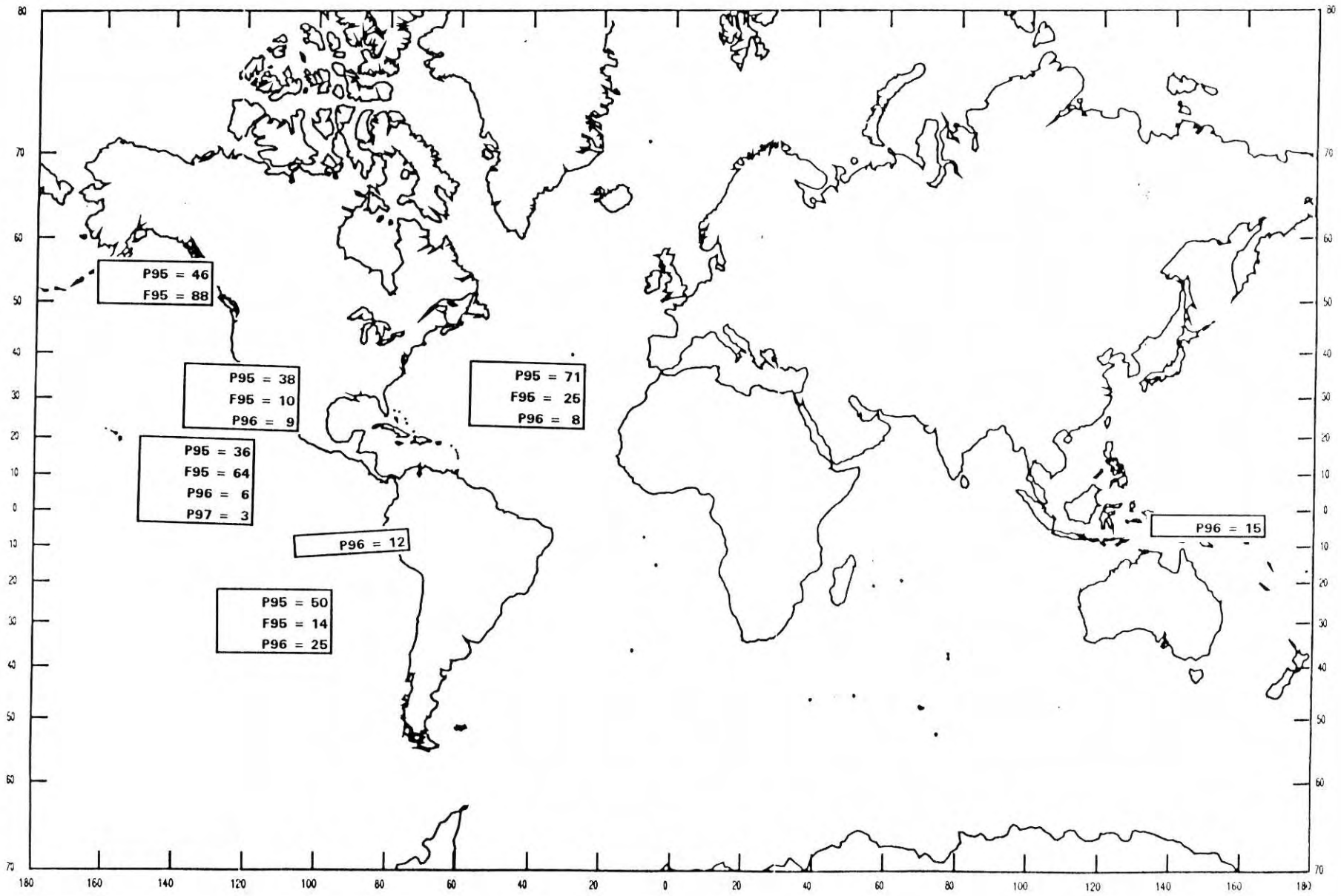
NEW GUINEA

95-D	McInnes	15(96)

30
40
50
60
70

180 160 140 120 100 80 60 40 20 0 20 40 60

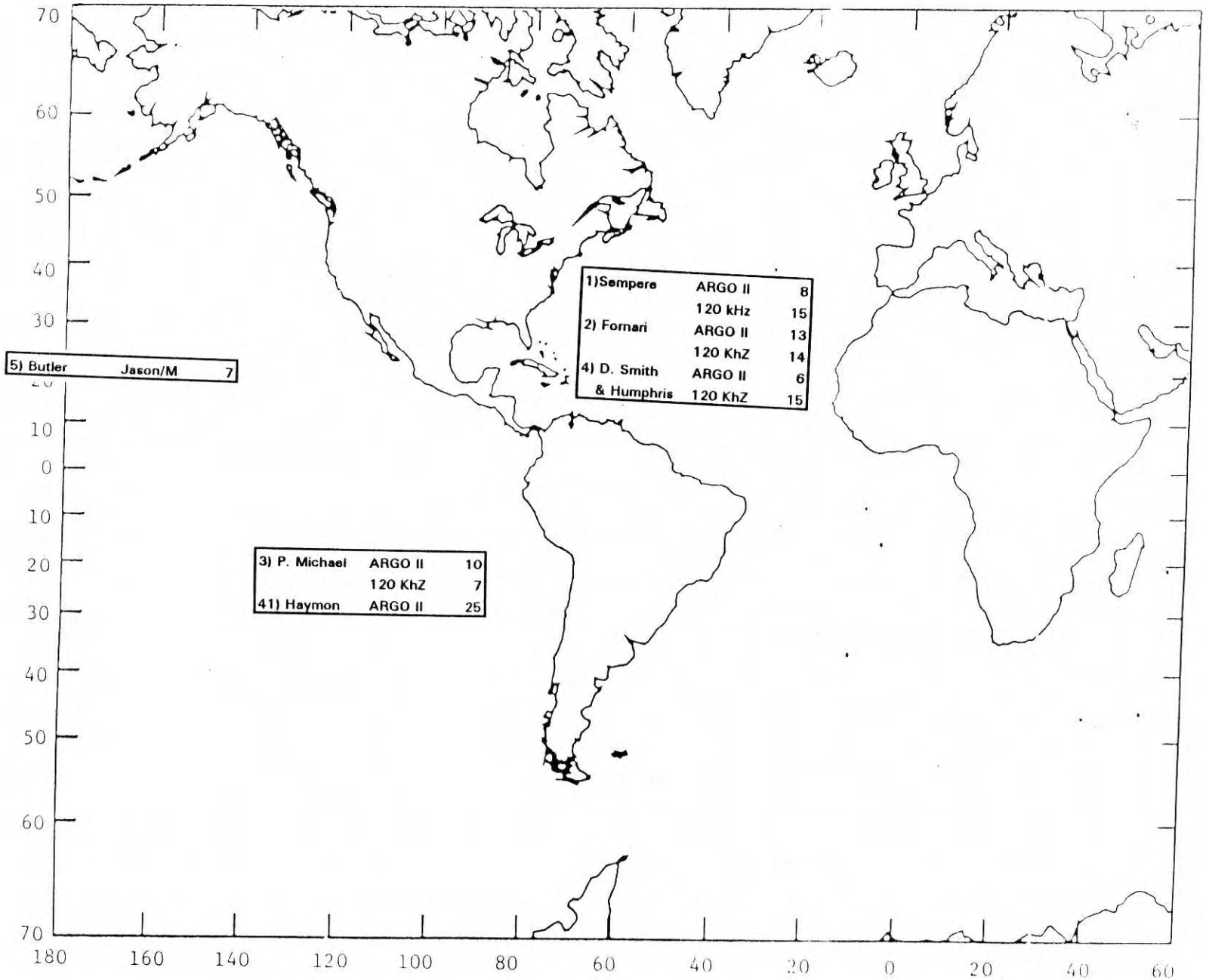
ALVIN REQUESTED DIVES BY REGION



ROV REGIONAL SUMMARY

#	Investigator	Disc.	1995 Proposed 120 kHz	1995 Proposed ARGO II	1996 Proposed Jason/Medea	1996 Proposed 120 kHz
ATLANTIC:						
ROV-1	J.C. Sempere	G&G	15	8		
ROV-2	D.J. Fornari	G&G	14	13		
ROV-4	Smith & Humphris	G&G	15	6		
	TOTAL		**44**	**27**		
JUAN DE FUCA:						
ROV-F	R. McDuff	G&G				?
SOUTHERN EAST PACIFIC RISE						
ROV-3	P.J. Michael	G&G	7	10		
94-41	R. Haymon	G&G		25		
	TOTAL		**7**	**35**		
HAWAII						
ROV-5	R. Butler	Tech			**7**	

ROV DIVES REQUESTED



Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.

ALVIN PROPOSALS:

ATLANTIC:

95-01	P. Rona, Rutgers	M. Kleinrock, WHOI M.A. Tivey, WHOI M. Hanninton & S. Peterson, G.S. Can S. Humphris, WHOI M.K. Tivey, WHOI C. Lalou, CRF J.L. Rayes, CRF P. Hertsig, U.Freiburg	26N, 45W	TAG Relict Hydrothermal Zones: Evolution of TAG Field. Multidisciplinary studies (structures, heat flow, of relict zones will complement ODP Leg 138 drilling of active zones of active zones to determine evolution of TAG field.	RIDGE (FARA) ODP	Mar-Jun 1995	Open	10		Multi
95-02	S. Humphris, WHOI	M. Kleinrock, WHOI R.P. VonHerzon	MAR: TAG site 26 08'N, 44 49'W	Investigating Changes in the Morphology, Structure and Venting Resulting from Drilling the TAG Hydrothermal Mound	NSF ODP	Late Spring 1995	none	8	dives to be coordinated with other programes	G&G
95-03	C.K. Paull, UNC	W. Ussler, UNC C. Martens, UNC	Carolina Trough 32 30.5'N, 76 11.5' W & 33 N, 75 55'W	ALVIN diving on Carolina Trough diapirs: Dynamics of gas venting, gas-dydrates, diapiric effects, salt sources, and fluid chemistry.	NSF	Spring 1995	Summ 1995	15		Chem
95-04	C.L. Van Dover, WHOI	A. Chave, WHOI	MAR Lucky Strike	Field Reconnaissance of ambient light at deep-sea hydrothermal vents.	NSF MG&G	Winter 1996		8		Biol
95-05 A	K. Becker, U.Miami		TAG: 26 08'N, 44 49' W	Acquisition of a High-Temp, memory temp. tool for use during ODP drilling at Hydrothermal sites and duirng post-drilling submersible operations at ODP cork sites.	NSF FUNDED 9402805 ODP	Spring/ 1995	1996	2	Part of 10 dive program (2 Becker + 6 Von Herzon/Edmond)	G&G
95-05 B	K. Becker, U.Miami		TAG: 26 08'N, 44 49' W	Insturmented borehole seals for FY94-FY95 ODP drilling in the Atlantic Ocean	NSF FUNDED 9301995 ODP	Spring/ 1995	1996	2	Part of 10 dive program (2 Becker + 6 Von Herzon/Edmond)	G&G

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
95-06	J. Casey, U. Houston	P. A. Rona, Rutgers H. Dick, WHOI J. Carlou, IFREMER C. Colodner, LDEO J. Edmond, MIT H. Elderfield, U. Camb S. Humphris, WHOI Y. Fouquet, IFREMER P. Keleman, G. Ravizza, M. Tivey, WHOI	MAR 15N, 45W Rift Valley N&S of 15-20 Fracture Zone	FARA ALVIN 15N: Mantle-Crust Processes ALVIN dives and dredging-water sampling at largest known exposure of ultramafic rocks known in rift valley (NES) at Fifteen-Twenty Fracture Zone to define mantle-crust melting relations and hydrothermal systems to ODP site consideration and FARA program	NSF ODP/ RIDGE (FARA) 9416574	Mar-July 1995	open	22		G&G
95-07	D. Colodner, LDEO G. Ravizza, WHOI		MAR 15 20' N	Re, Os isotopes and Platinum Group Elements in Mid Ocean Ridge Hydrothermal Systems	NSF RIDGE	Win/Spr 1995		1	add on to Rona	Chem
95-08	VonHerzen	A. Schultz, UW C. VanDover, WHOI J. Edmond, MIT D. Kadko, U.Miami	TAG 26 N	The TAG Hydrothermal Site (MAR): Monitoring Temporal Variability and the Effect of Drilling	NSF ODP Funded	Jan-Mar 1995	1995	6	Part of 10 dive program (4 Becker)	GChem
95-07	D. Colodner, LDEO G. Ravizza, WHOI		TAG 26 N	Re, Os isotopes and Platinum Group Elements in Mid Ocean Ridge Hydrothermal Systems	NSF RIDGE	Win/Spr 1995		1	add on to VonHerzen	Chem
95-14	F. Grassle, Rutgers	M. Bothner B. Butman R. Calwell B. Brownawell R. Petrecca F.Sayles P. Snelgrove C.L. Van Dover R. Hill	Dumpsite 106 39.20.034 N 70.40.196 W	Fate and effects of sludge deposition on the continental rise in the vicinity of Municipal Sludge Site - 106	NOAA	Jul-95	Aug-95	14		Biol
95-A	J. Karsen		MAR	In 1994, Jeff Karsen's dive program was cut short because of ALVIN's mechanical problems. It is anticipated that additional dives will be needed in 1994	NSF	1995		15?		G&G

JUAN DE FUCA RIDGE/GORDA RIDGE:

94-04	M. Mottl, SOEST	C.G. Wheat, UH E. Baker, NOAA E. Davis, PGC R. Thomson, Canad V. Tunnicliff, U. Victoria M. Whiticar, U. Victoria	Eastern flank of Juan de Fuca Ridge Within 10 km of 47 47'N 127 44'W	Hydrothermal venting through outcrops on the eastern flank of the Juan de Fuca Ridge near 48 N: a manned-submersible study. Heat flow, coring for pore waters, temperature and flow velocity of springs to estimate fluxes. Sampling of rocks, deposits, organisms.	NSF 9314632 FUNDED	Jun - Sep 1995		16		Chem thermal Biol

ALVIN and ROV Proposals - 1994

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
94-?	H.P. Johnson, UW	M. Tivey, WHOI M.C. Holes, USGS	JDF	?	NSF RIDGE **FUNDED**	Sum 1995		18		G&G
95-09	Maurice Tivey, WHOI	H.P. Johnson, UW M. Holmes, USGS T. Juteau, UBO	44 30'N, 130 W	Direct Measurement of a Magnetic Polarity Boundary with Depth in Oceanic Crust	NSF/MG&G **FUNDED** 9400623	Sum-Fall 1995		12		G&G
95-10 A	D. Schneider, WHOI	Maurice Tivey, WHOI	45N, 130W	"Geomagnetic Paleointensity and 14C Production: the Record from Sediments Acquired by Submersible" (test dive program)	NSF MG&G	1995		3		
95-11	M. Tivey, WHOI A.M. Bradley, WHOI		Cleft Segment, Juan de Fuca Ridge 45 N, 130 W	Development of a versatile thermocouple/ thermistor array package for monitoring temperature at hydrothermal vent sites. Two instruments will be deployed and recovered at Cleft Site using ALVIN	NSF RIDGE/ MG&G **FUNDED** 9300434	early JDF late JDF		1 1		G&G
95-07	D. Colodner, LDEO G. Ravizza, WHOI		JDF	Re, Os isotopes and Platinum Group Elements in Mid Ocean Ridge Hydrothermal Systems	NSF RIDGE	Sum/Fal 1995		1	add on to Meg Tivey	Chem
95-13	H.P. Johnson, UW	M.L. Holmes, USGS M. Tivey, WHOI T. Juteau, U.Bret R. Holcomb, USGS	Juan de Fuca/ Blanco Fract. Zn 44 30' N, 130 to 127 W	An Experimental Determination of the Density of Upper Oceanic Crust as a Function of Depth.	NSF MG&G	Sum 1995	Spring or Fall 1995	14		G&G
95-04	C.L. Van Dover, WHOI	A. Chave, WHOI	Juan de Fuca: Endeavor Segment	Field Reconnaissance of ambient light at deep-sea hydrothermal vents.	NSF MG&G	Summer 1995		6		Biol
95-15	J.F. Delaney, UW	R.E. McDuff, UW M.D. Lilley, UW D. Butterfield, J.Lupton, NOAA	JDF 47 58'N, 129 W	Are up Flow Zones Boundaries Between Adjacent Hydrothrmal Systems? Geological and Geochemical Tests.	NSF MG&G **FUNDED** 9406965	a) Jul 95 b) Sep 95	a) Aug 95 b) early Oct 1995	20 10		G&G
95-29	J. Catipovic, WHOI	C. Van Dover S. Humphris Meg Tivey A. Chave	JDF Endeavor Seg 47 57 N, 129 06 W	Acoustic Local Area Network for Deep-Sea Ridge Monitoring	NSF Ocean Tech	Sum 1995		7		Tech
95-30	J. R. Delaney, UW	R. McDuff, UW M. Lilley, UW J. Baross, UW W. Wilcock D. Norton, UAZ	JDF 46 11.5 N 129 34W	Physical, Chemical and Biological Consequences of Diking/Eruptive Events in the Oceanic Crust	NSF MG&G	May-95	Oct-95	15		Multi

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
95-31	R. Embley, NOAA		JDF	Continue time series into 1995 to fully document the evolution of the thermal. chemical and geologic spatial and temporal effects of a small crustal accretion event and to complete picture of the CoAxial event.	NOAA Funded	1995 JDF season		10		Multi
MONTEREY/SAN DIEGO:										
94-13	K.L. Smith, SIO	A.F. Carlucci C.E. Reimers P.M. Williams E.R.M. Druffel J. Bauer, FSU	34 50'N, 123 W	Temporal variations in the deep-sea benthic boundary layer communites, long time series measurements.	NSF FUNDED OCE-9217334	Sept 1994 Nov 1994 Feb 1995		10 10 10		Biol.
95-16	J.E. Eckman, Skidaway	D. Thistle, Florida State U. G. L.J. Paterson	San Diego Trough 32 51'N, 117 46'W	Evaluation impacts of predation by large, motile epifauna on microfauna and meiofauna in deep sea: a test of cage performance ALVIN will be used to deploy and subsequently sample within cages in order to evaluate procedures for a subsequent study of predation.	NSF Biol.	Sep-95 Mar-96	Jun-Nov 95 5-7 mo. after first cruise	6 6		Biol
95-17	G. Hendler, Nat. History Museum	L. Lewis, SIO	San Diego Trough 32 30' N, 117 30' W	Behavior and adaptations related to the feeding and locomotion of deep-sea brittlestars in the San Diego Trough	NOAA/ NURP	1995		4		Biol
95-18	C.R. Smith, UH	D.J. DeMaster, NC State	Santa Catalina Basin 33 12'N, 118 30'W	Age-dependent bioturbation of deep-sea sediments: tests of mechanisms at three bathyal sites	NSF Biol.	a) Spr-Sum 1995 b) Sum-Fall 1995 c) Sum-Fall 1996	a) any b) 100 day after (a) c) 1 year after (b)	10 3 3		Biol.
95-24	E. Druffle, UC Irvine	J.E. Bauer, VIM P.M. Williams, K. Smith, SIO	34 50' N, 123 W	Radiocarbon Investigations of Marine Snow and Detrital Aggregates from the North Pacific Ocean. Collection of marine snow from 10-1000 m depth and detrital aggregates/sediment surface slurry from 4100 m depth.	NSF Chem 9396278	Feb-95 during K. Smith cruise	none	5	Must be in conjunction with K. Smith Cruise	Chem
95-25	C. R. Smith, UH	R. Vrijenhoek, Rutgers	33 20' N, 120 3' W and 32 27' N, 118 9' W	Succession and phylogenetic affinities of deep-sea whale-fall communities on the northeast Pacific slope.	ONR	Sum-Fall 1995	Winter 1995	10		Biol

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
GUAYMAS BASIN										
95-8	H. Jannasch, WHOI		Guaymas Basin	A timely, joint and comparative study with molecular biologists on the functional (physiological) and genetic, or the phenotypical and genotypical, diversity of vent bacteria with biotechnologocal overtones.	NSF	late 1995			Proposal to be submitted in the Fall 1994	Biol
NORTHERN EAST PACIFIC RISE										
94-16	R. Batiza, U Hawaii	G.P.L. Walker, UH S. Self, UH L. Wilson, UH D. Bercovici, UH J.D.. White, U NZ G. Parker, U Minn.	Seamount 6 12 44'N 102 35'W 150 km east of EPR axis	Dynamics of Basalt Eruptions in the Deep Sea. A detailed study of eruptive hyaloclastite deposits with ALVIN.	NSF 9314288 **FUNDED**	late 1994	early 1995	10		G&G
94-33	L. Mullineaux, WHOI	C.H. Peterson C. R. Fisher	EPR: 9 50' N	Roles of Larval Settlement, Species Interactions and Physiological Adaptations During Colonization of Hydrothermal Vents. Program involves in-situ manipulation of recruitment plates in vent habitats.	NSF 9315554 RIDGE **FUNDED**	a) Apr 95 b) Oct 95		10 10		Biol
95-28	M.D. Lilley, UW	K.L. Von Damm	EPR: 9 50' N 104 17' W	Coupled Temporal Changes in Water Chemistry and Biological Community Structure at Newly-Formed Hydrothermal Vents on the EPR Crest.	NSF **FUNDED** 9302606	Oct-Nov 1995		4	Request dives be added to Lutz cruise.	Chem
95-07	D. Colodner, LDEO G. Ravizza, WHOI		EPR 9 N	Re, Os isotopes and Platinum Group Elements in Mid Ocean Ridge Hydrothermal Systems	NSF RIDGE	late spring/ Sum 95		1	add on to Lilley/VonDam	Chem
95-12	C. D. Taylor, WHOI C. O. Wirsen, WHOI	S. Molyneaux, WHO D. Nelson, UCDavis R. Lutz, Rutgers	EPR 9 51' N, 104 17' W	"U.S. Ridge: Automated temporal and spatial study of chemosynthesis and chemical energy flux in diffuse flow hydrothermal vents." Using time series instrumentation, five highly coupled variables will be measured: vent fluid POC; bacterial chemosynthesis rates; H2S content; vent flow rates and temperature.	NSF Biol RIDGE	a) early fall 1995 b) early wint 1996	late summ 1995 late fall 1995	5 6		Biol
95-19	R. Lutz, Rutgers	R. Hessler, SIO D. Fornari, LDGO R. Haymon, UCSB D.M. Desbruyeres France P.A. Tyler, UK	EPR 9 45' to 9 52'N	Temporal changes in biological community structure and assoicated geological features at newly-formed hydrothermal vents along the East Pacific Rise Crest.	NSF-RIDGE **FUNDED** * OCE 9217026	Oct-95	Sep-95	14 (12 of these dives are funded)	Requests that the 4 funded Lilley/VonDamm dives be added to this cruise.	GChm Biol

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
95-20	D. Nelson, UC Davis		EPR 9 45' N	Host Specificity, in Situ Physiology and Fine-Scale Evolution of Thioautotrophic Endosymbionts at Vents and Seeps.	NSF BIO	Spring 95 Fall 95	any 2 cruises separated by at least 4-6 months	1 to 2 1 to 2		Biol
95-21	D. Nelson, UC Davis		EPR 9 45' N	Nourishment of Bivalves by Endosymbiotic Sulfur Bacteria: Lysis or Leakage?	NSF BIO	Spring 95 Fall 95	any 2 cruises separated by at least 4-6 months	2 2		Biol
95-04	C.L. Van Dover, WHOI	A. Chave, WHOI	EPR 9N	Field Reconnaissance of ambient light at deep-sea hydrothermal vents.	NSF MG&G	Summer 1997		3		Biol
95-26	C. Cary, OSU J. Stein, Agouron I.		13 N/9 N Sites EPR - 12 48'N, 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 Biol Funded 9314595	open	open	3		Biol
95-27	J. Karson, Duke	S. Hurst E. Klein S. Agar C. MacLeod	EPR Hess Deep Rift north wall	Internal Structure of the Uppermost Oceanic Crust Exposed at the Hess Deep Rift: Manifestations of Waxing and Waning Magnatism Along the EPR. An ALVIN and video study of lavas and dikes created by seafloor spreading processes.	NSF MG&G ODP	Apr-May 1995		20		G&G
95-32	J.J. Childress, UCSB	C, Fisher, Penn	NEPR 9 and 13 N	Studies on the Physiological Ecology of Hydrothermal Vent Chemoautrophic Symbioses	NSF 9301374 FUNDED	Sum 1995		6	To be combined with Fisher dives	Biol
95-33	J.J. Childress, UCSB	H. Felbeck, SIO D. Desbruyeres, IFREMER	NEPR 12 48-50 N, 103 56-58 W & 9 N site	Studies on the Physiological Ecology of Hydrothermal Vent Chemoautotrophic Symbioses	NSF 9301374 FUNDED	Spring or Fall 1995		9	To coordinate with Mullin Mullineaux dives	Biol
GALAPAGOS:										
95-10 B	D. Schneider, WHOI	Maurice Tivey, WHOI	3N 93W Northern Galapagos	"Geomagnetic Paleointensity and 14C Production: the Record from Sediments Acquired by Submersible"	NSF MG&G	1996		12		

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Dives	Remarks	Disc.
SOUTHERN EAST PACIFIC RISE:										
95-22	M. Lilley, UW	K.L. Von Damm, UN J.E. Lupton, NOAA/PMEL D. Fornari, WHOI R. Collier, OSU	SEPR 17-21.5 S, 112 W	Gas and fluid chemistry of hydrothermal systems on a superfast spreading center: Southern East Pacific Rise	NSF RIDGE MG&G 9417121	late 95/ early 96		25		Geo Chem
95-23	R.C. Vrijenhoek R. A. Lutz Rutgers		SEPR: 17S and 22S	Gene Flow, Dispersal, and Systematics of Deep-Sea Hydrothermal Vent Organisms.	NSF **FUNDED** OCE 9302205	1995	1996	14		Biol.
95-C	J. Edmond		Easter Island 26-30 S, 110W	Hydrothermal Studies on the Easter Microplate	NSF RIDGE	Austral Sum 1995		25?	Proposal will be resubm. in the Fall	Chem
95-E	J. Lupton, NOAA	R. Embley, D. Butterfield G. Massoth D. Feely	Southern EPR	Vent fluid sampling and geologic mapping on Southern EPR.	NOAA	1995/ 1996		25	Letter of Interest	GChm
NEW GUINEA:										
95-D	B. McInnes, CIT	D. Colodner, LDEO P. Herzig, Freiberg M. Perfit, U. Fla V. Tunnicliffe, U.Vic	1) Lihir Is. 2 50'S to 3 30'S, 152 E 2) Kilinailau Trench 2 30'S to 2 40'S, 153 E 3) Kavachi Vol 9 S, 157 58'E	Submersible Investigation of Hydrothermally Active Alkaline Volcanoes in the New Ireland Forearc, Papua New Guinea	NSF MG&G, German Research Foundation			1) 9 2) 4 3) 2	NSF Proposal is expected to be submitted in Nov 94	Multi

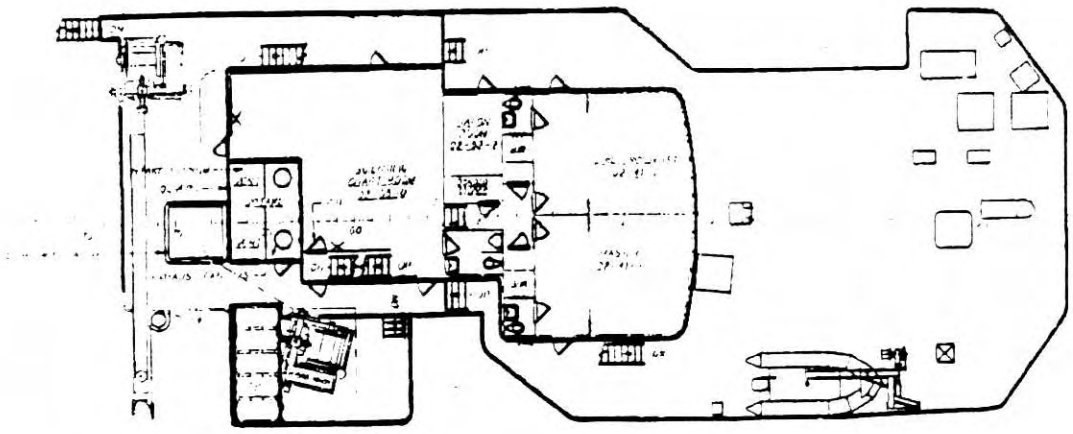
ROV PROPOSALS:

	Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	Duration	Remarks	Disc.
95. ROV-1	J. C. Sempere, UW		29 N, 43 W MAR	Program FARA: Fine scale segmentation and structural variability within a slow-spreading segment (Mid-Atlantic Ridge, 24 N)	NSF	Sum 95	Anytime 1995	15 8	120 Khz ARGO II	G&G
95. ROV-2	D.J. Fornari, WHOI	S.E. Humphris, WH C.H. Langmuir, LDE	37 17' N, 32 16.5' W MAR	Investigation of the Relations between Volcanic, Tectonic and Hydrothermal Activity within the Segment of the Mid-Atlantic Ridge Influenced by the Azores Hotspot: the Lucky Strike Segment at 37 N	NSF	May-Jun 1995	Jul-95	13 14	ARGO II and 120 Khz	G&G
95. ROV-3	P.J. Michael, U. Tulsa	D. Fornari, WHOI M.R. Perfit, U. Flori	Southern EPR: 7 - 9 S, 108 W	Petrologic and Morphologic Study of a Giant Lava Field at 8 S, EPR: A Window into Mid Ocean Ridge Magma Chamber Processes Mapping and Sampling of a large lava flow using ARGO II 120 kHz & rock corer (glass)	NSF MG&G RIDGE	May-Sep 1995	Dec 95 to Feb-96	10 7	ARGO II and 120 Khz	G&G
95. ROV-4	D. K. Smith, WHOI S. Humphris, WHOI	K. Gillis, WHOI W. Bryan, WHOI	MAR 24 58 N, 25 20' W	Investigating Crustal Melt Delivery Systems at the Mid-Atlantic Ridge: Linking Morphology and Petrology of Volcanic Edifices	NSF	Mar-Jul 1995		6 15	ARGO II and 120 Khz	G&G
95. ROV-5	R. Butler, Iris D. Yoerger, WHOI R. Butler, IRIS	F. Dnannebier, UH A. Chave, WHOI A. Schultz, U. Camb R. Watts, URI	28 N to 141 W	The Hawaii-2 Observatory: A Deep Ocean Geoscience Facility Re-using the Hawaii-2 Telephone Cable	NSF	Jul-96	Jun or Aug 1996	7	JASON/MEDEA	Tech
94-41	R. Haymon, UCSB K. Macdonald, UCSB		Southern EPR 17 S	Hydrothermal Vent Distribution Along the Axial Zone of the Ultrafast-Spreading EPR at 17-18 S: A Near-Bottom Fiber Optic Photo/Acoustic Survey using ARGO II	NSF Ridge	Jul-Dec 1995		25 days	ARGO II	G&G
95. ROV-F	R. McDuff, UW		N.E. Pacific 46 N	Examine Reminants of the Co-Axial Eruptive Event	NSF	Jan-Dec 1996			120 kHz May be submitted for the Fall Panel	G&G

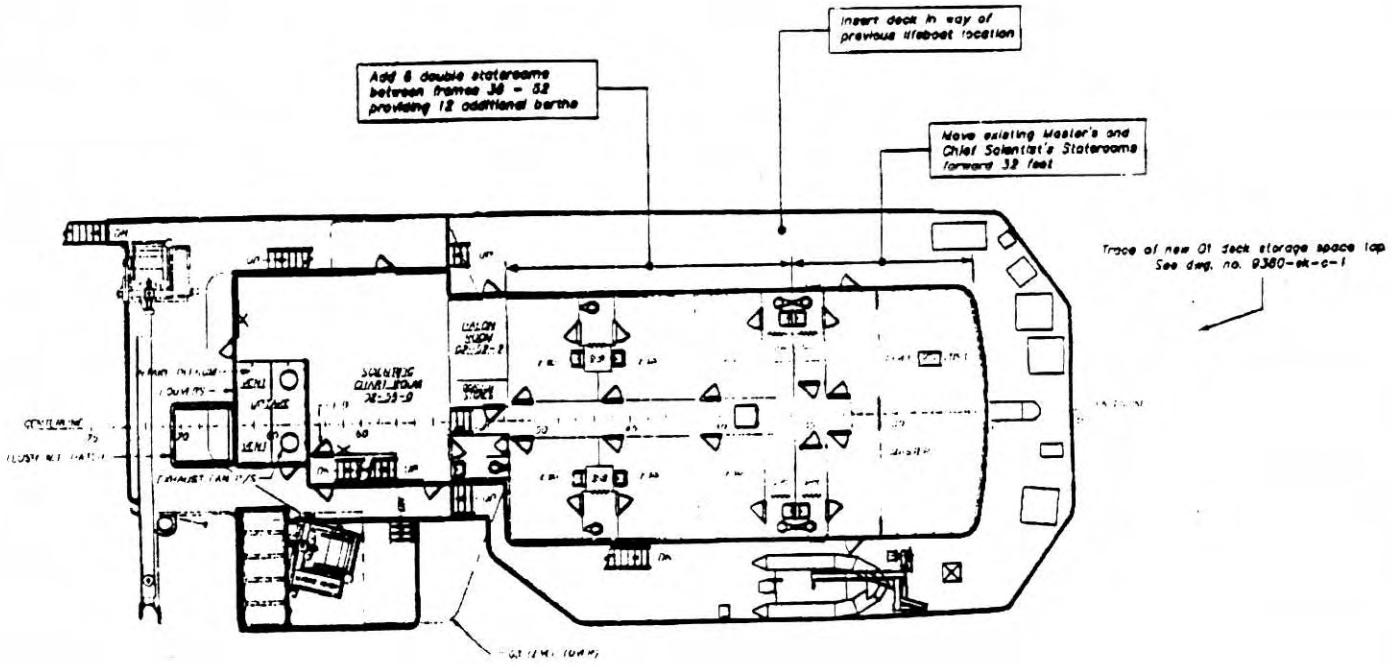
APPENDIX XIV

KNORR CONVERSION PLANS

DSRV & ROV Facility Options	Weight long tons	Cost $K
1. Removable vans	170	1,790
2. Centerline hangar	170	1,450
3. Port side hangar	159	1,290
Additional Berthing Options		
1. 12 berths 02 level	24.3	845
2. 4 berths internal well	4.4	179
Additional Storage Options		
1. 315 sf 01 deck	13.5	245
2. 1600 sf internal well	2.0	124



Existing Arrangement



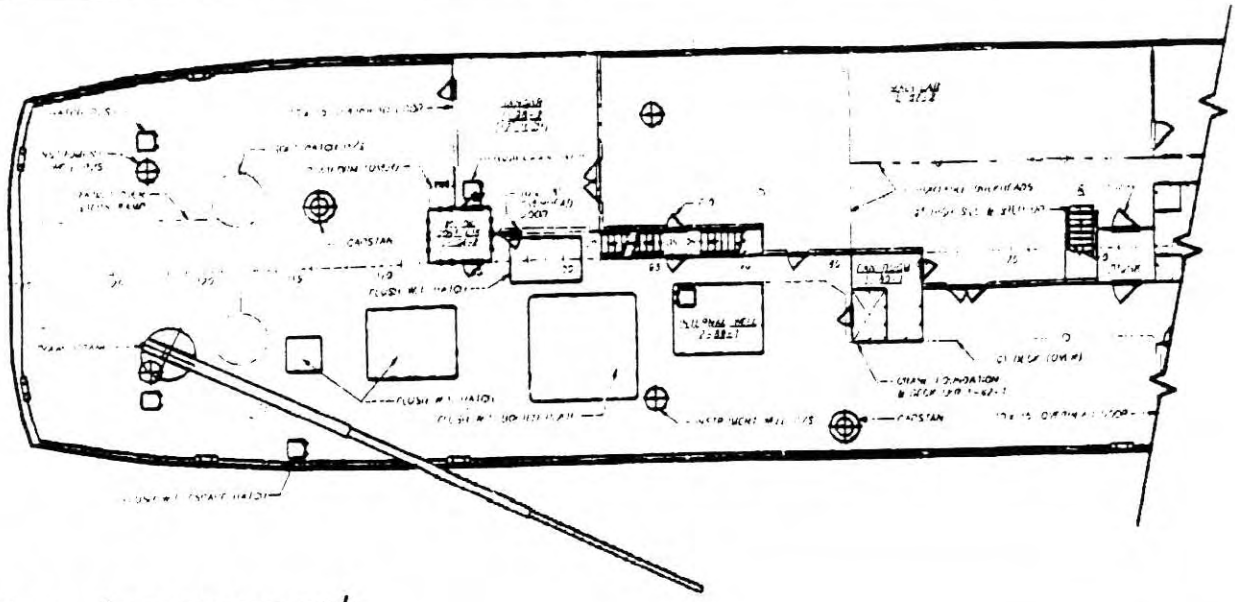
R/V Knorr, Conversion To DSRV Alvin Support
Additional Berthing On 02 Level

THE GLOSTEN ASSOCIATES, inc.

BY D. Kristensen

DWG. NO.

Sheet 1 of



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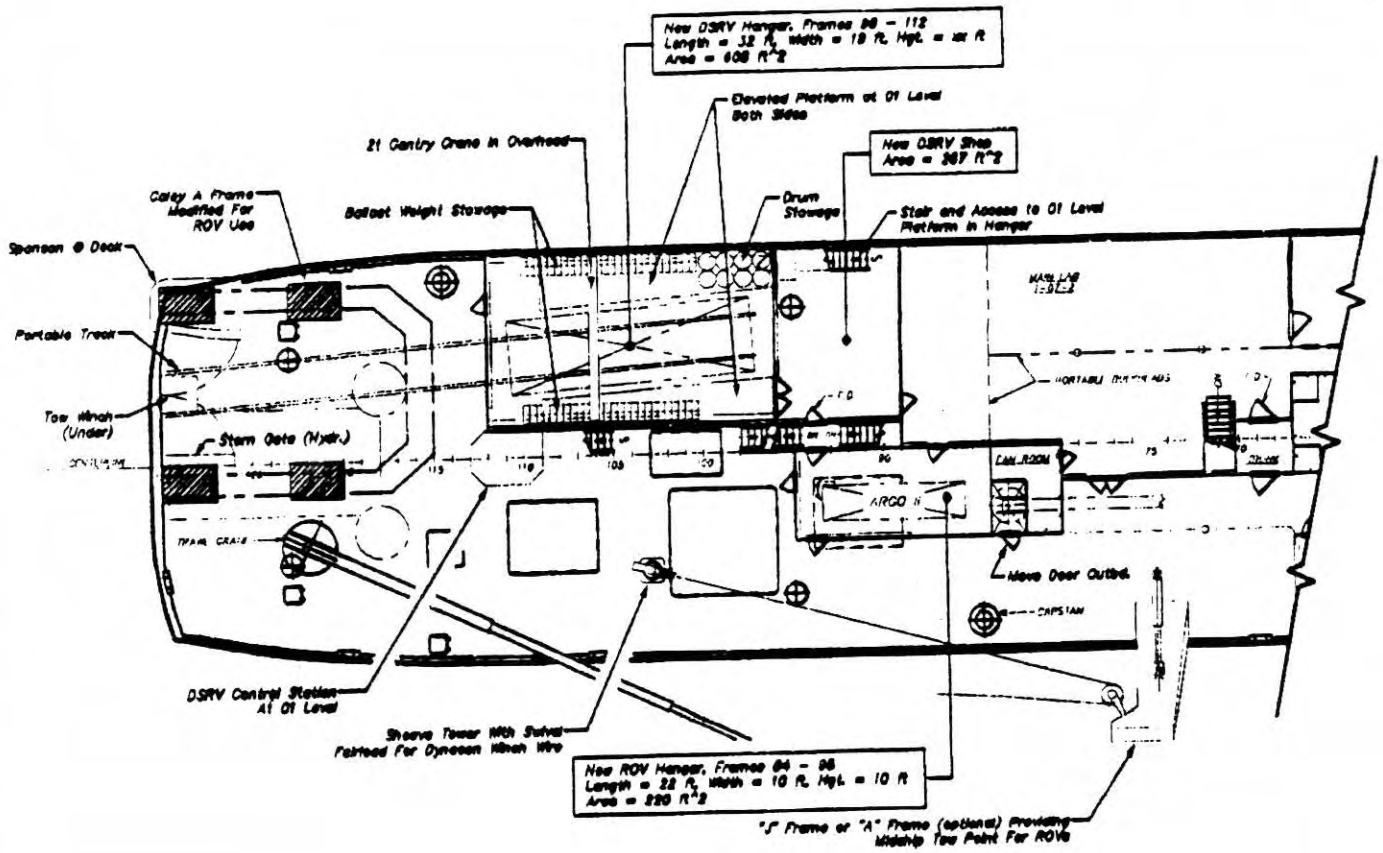
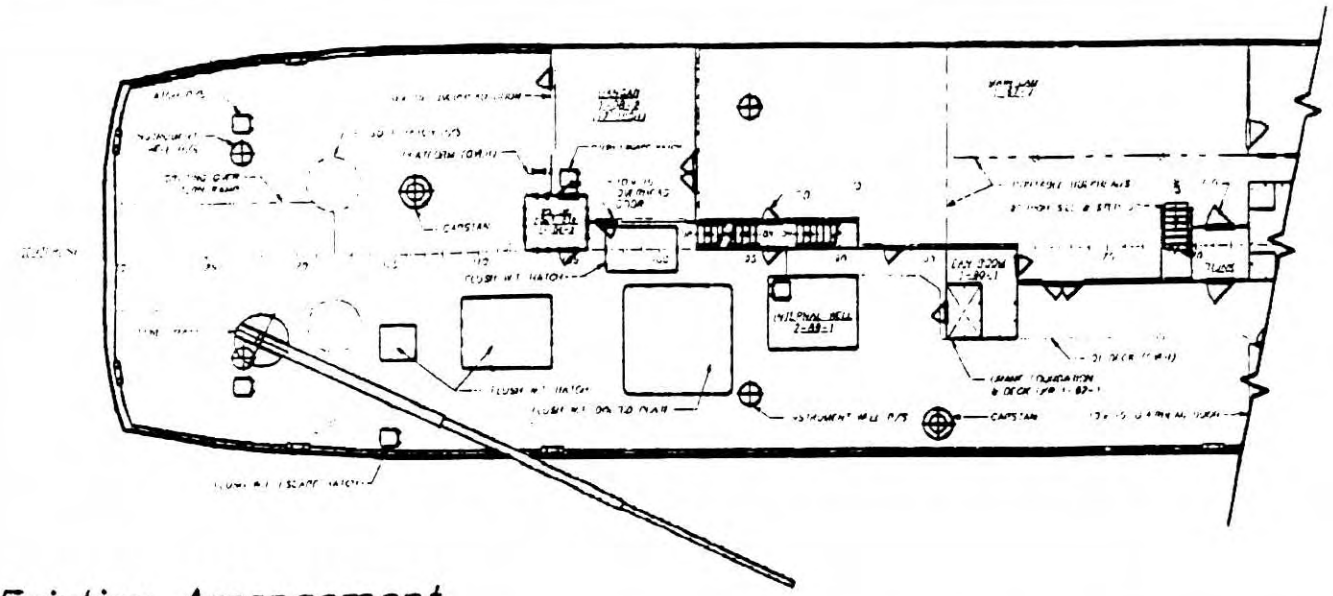


R/V Knorr, Conversion To DSRV Alvin Support
Option 3: Port Side DSRV Hangar

THE GLOSTEN ASSOCIATES Inc | BY D. Kristensen | DWG. NO. 9360-SK-A Sheet 1 of



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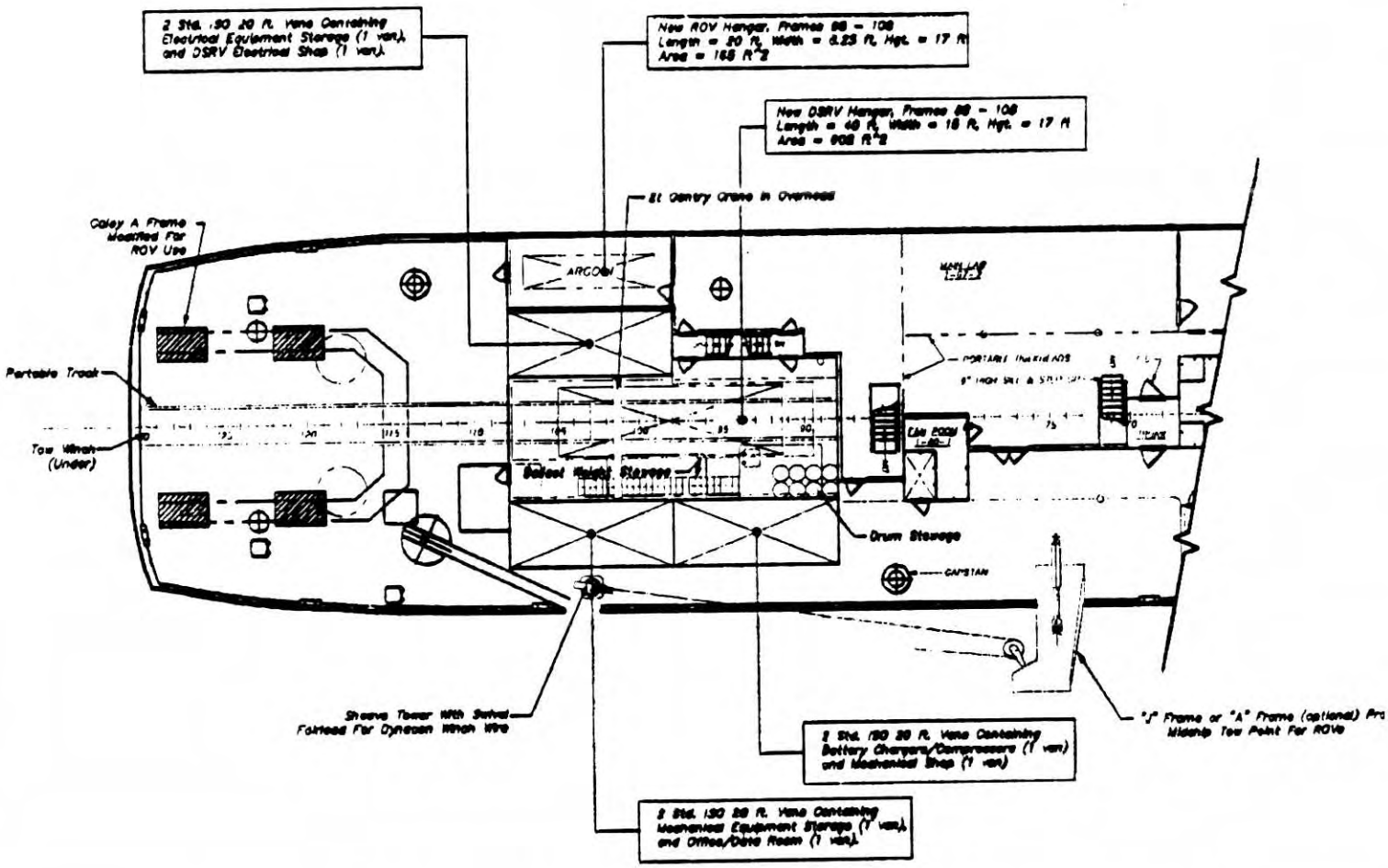


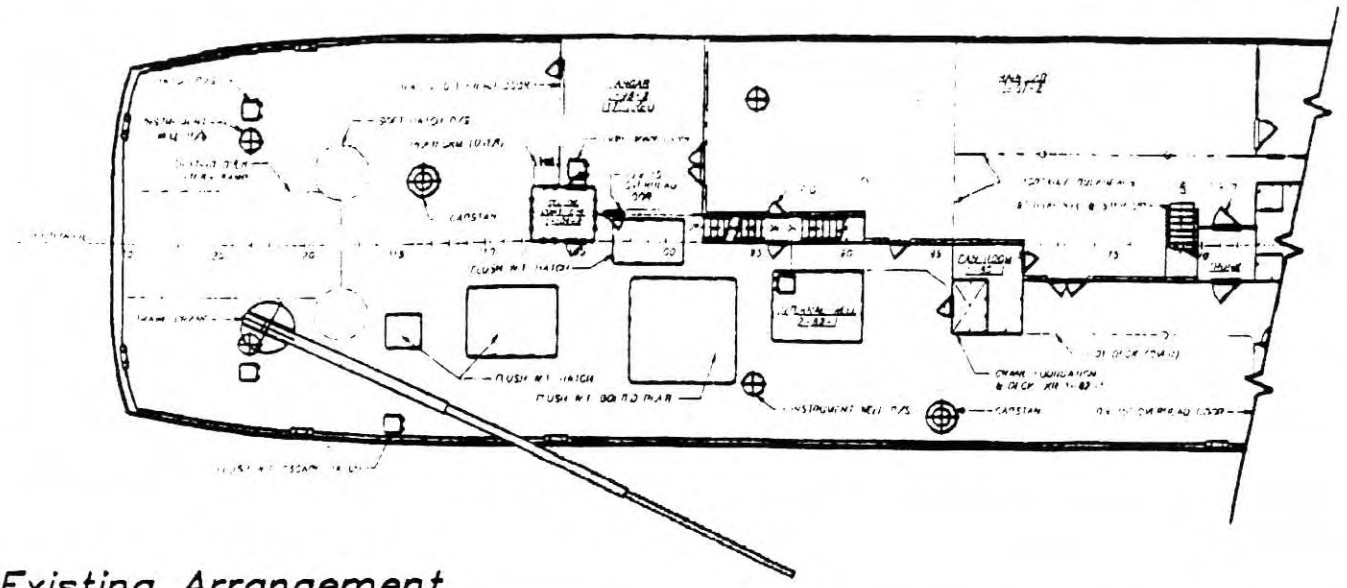
R/V Knorr, Conversion To DSRV Alvin Support

Option 1: Removable Containerized Handling Scheme

THE GLOSTEN ASSOCIATES, Inc.

BY D. Kristensen

DWG. NO. 9360-SK-
Sheet 1 o



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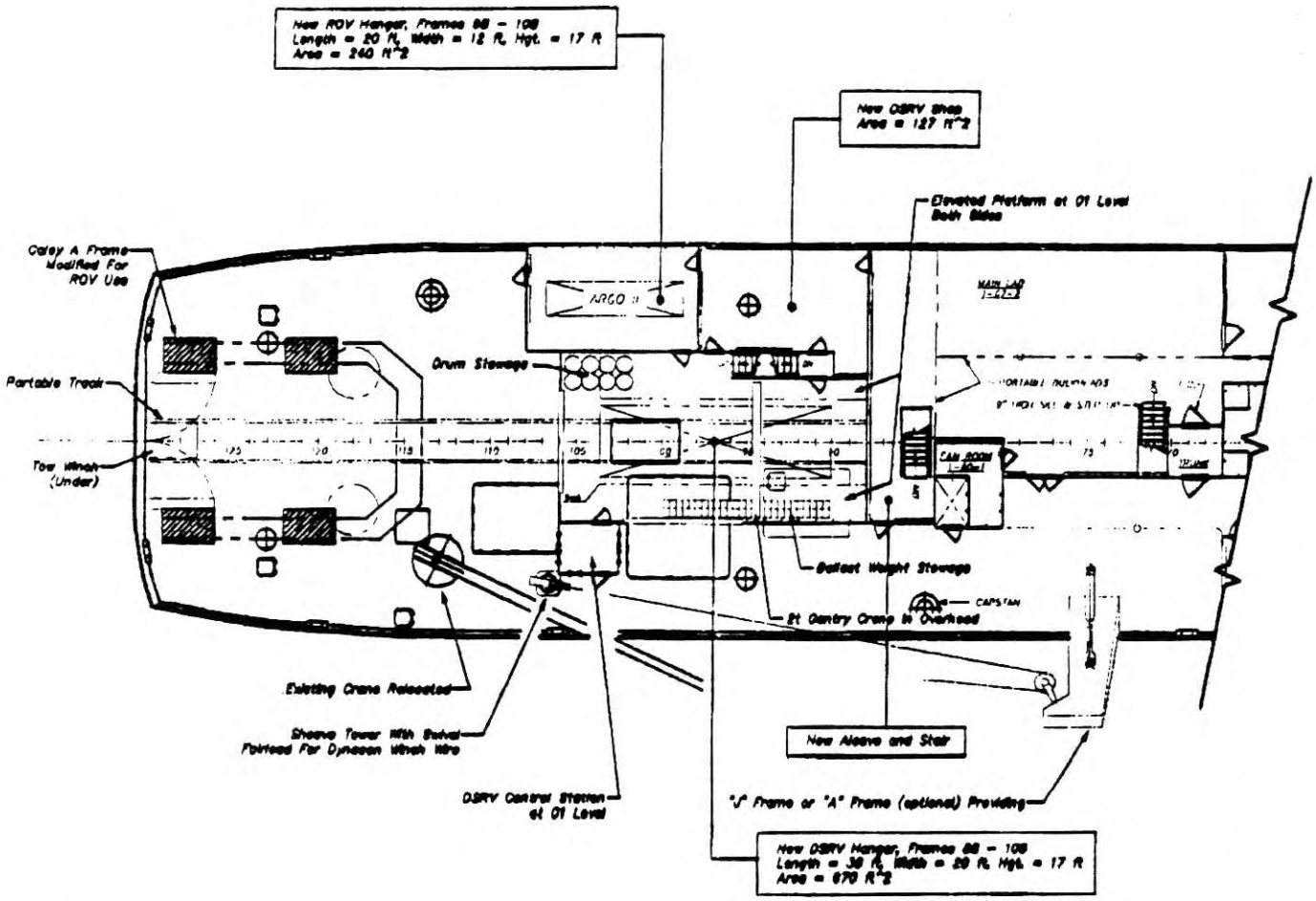


R/V Knorr, Conversion To DSRV Alvin Support

Option 2: Centerline DSRV Hangar

THE GLOSTEN ASSOCIATES, Inc. CONSULTING ENGINEERS SERVING THE MARINE COMMUNITY	BY D. Kristensen	DWG. NO. 9360-SK-A- Sheet 1 of 3
	DATE April 1994	SCALE: N.T.S.

APPENDIX XV

Navigation charter

- assist Barrie in preparing resubmission of Nav. portion of last NSF equip. proposal
- prepare for full-scale nav. proposal for next year

- Barrie Walden
- Dana Yoerger
- Ken Stewart
- Jim Newman
- Rus McDuff
- Dan Fornari ⇐ users

Constraint
- LBL
- USBL
- GPS
- Doppler
- Cor. Log
- Geophys.
- INS
- Gyro

Position fix
- Com. packages - LBL/US
- DUNS
- ---- custom

Logging
- Hardware
- op. system
- drivers/software

Display/Configuration - real-time

Postprocessing/Representation/Fast

Site preparation
- SeaBeam
- LBL calibration
- --- side scan

Documentation

Community feedback (7)

- strong support for nav. upgrade
- frustration & desparation

Engineering

- can do much better even with simple upgrades
- powerful navigation tech. other than LBL & USBL now exist
- solution required across all assets - ROV, manned, AUV as well as systems outside WHOI

APPENDIX XVI

JASON/MEDEA-ARGO II-DSL 120

NEAR TERM IMPROVEMENTS

- REFINE JASON MANIPULATOR FUNCTIONS AND TEST

    1. SAMPLE COLLECTION: SEDIMENT TUBE CORES
       ROCKS
       BIOTA
       HYDROTHERMAL FLUIDS

    2. INSTRUMENT MANIPULATION AND DEPLOYMENT

    3. ADVANCED MEASUREMENTS AND CAPABILITIES

- RECONFIGURATION OF DSL 120 VEHICLE:

    1. TOW BODY

    2. POWER DISTRIBUTION

- INSTALL AND TEST IMPROVED VEHICLE ATTITUDE SENSORS

-INTEGRATION OF REAL-TIME PHASE BATHYMETRIC PROCESSING FOR 200KHz AND 120KHz SIDE SCAN SYSTEMS.

- DEFINE IMPROVED ELEVATOR TO AID SAMPLE RECOVERY AND INSTRUMENT DEPLOYMENT

- ACTIVELY MONITOR PLANNING AND DEVELOPMENTS FOR SEABEAD OBSERVATORIES

6/14/94

JASON/MEDEA-ARGO II-DSL 120

LONG TERM IMPROVEMENTS

- FOSTER AND PROMOTE CONTINUED COUPLING BETWEEN FUNDAMENTAL ENGINEERING RESEARCH AND OPERATIONS (DSL--->DSOG)

- IMPROVED NAVIGATION CAPABILITIES UTILIZING USBL AND BOTTOM REFERENCED DOPPLER SONAR

- STREAMLINE AT SEA PRODUCTION OF DATA PRODUCTS (COUPLE MORE EFFECTIVELY WITH ALVIN)

- INDOCTRINATE AUV TECHNOLOGY

- DECREASE AT SEA MANPOWER BY:

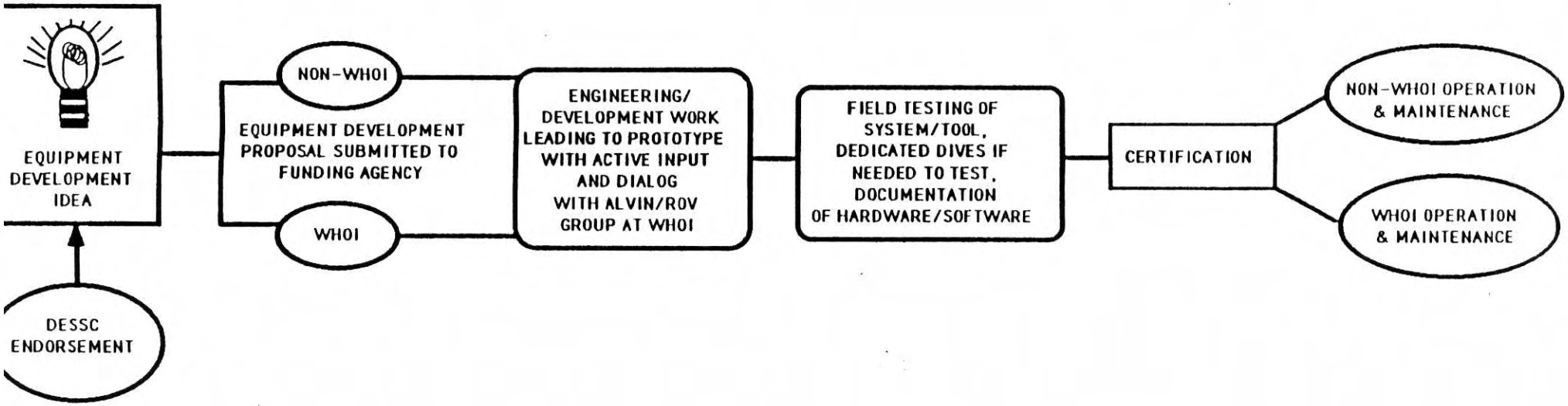
    1. STREAMLINING AND CONSOLIDATING SURFACE CONTROL DUTIES.

    2. OFF-BOARD PROCESSING UTILIZING EVENTUAL DEVELOPMENT OF "SEANET"

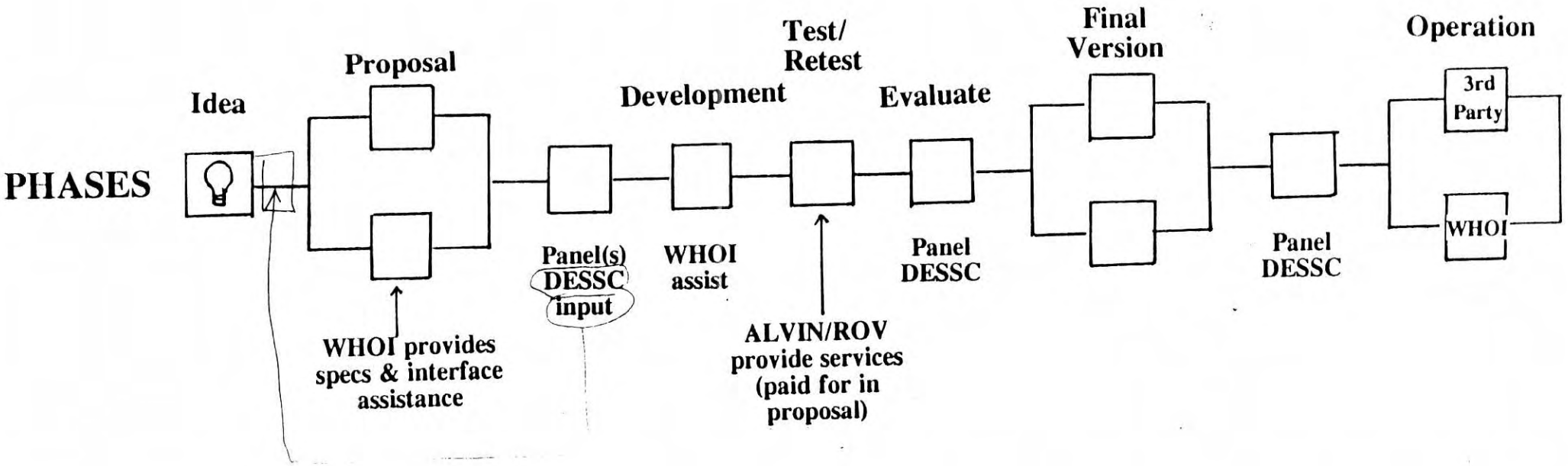
- IMAGING SYSTEM UPGRADES TO IMPROVE QUALITY AND ALLOW QUATITATIVE MEASUREMENTS

6/14/94

APPENDIX XVII


EQUIPMENT DEVELOPMENT IDEA
DESSC ENDORSEMENT
NON-WHOI
WHOI
EQUIPMENT DEVELOPMENT PROPOSAL SUBMITTED TO FUNDING AGENCY
ENGINEERING/ DEVELOPMENT WORK LEADING TO PROTOTYPE WITH ACTIVE INPUT AND DIALOG WITH ALVIN/ROV GROUP AT WHOI
FIELD TESTING OF SYSTEM/TOOL, DEDICATED DIVES IF NEEDED TO TEST, DOCUMENTATION OF HARDWARE/SOFTWARE
CERTIFICATION
NON-WHOI OPERATION & MAINTENANCE
WHOI OPERATION & MAINTENANCE

Tool Development for ALVIN / ROV's



ODP PARADIGM

Development Tools		Certified Tools		Mature Tools	
P.I. Develops plan in coordination with Operator or Logging Contractor	DMP endorsement	P.I. formulates request for certification	Presented to DMP by Operator with P.I. assistance	Operator submits	DMP endorses Planning Committee approves

Development Tools

The Development Plan should:

- Indicate the usefulness of the proposed measurements and the financial and technical feasibility of making them;
- Include a brief description of the tool, schematic diagram(s), details of the operational procedure, and technical specifications such as dimensions, weight, temperature and pressure ratings, cable-length restrictions, cable type, etc.;
- Identify development milestones in terms of both the level and the timing of technical achievements;
- Make provision for initial testing on land;
- Satisfy safety considerations;
- Specify shipboard requirements such as the data processing necessary to make the information accessible on board ship, any special facilities (emphasizing areas where the tool is not compatible with existing hardware and software), and appropriate technical support;
- Make provision for transporting tools for shipboard testing, in terms of both cost and time; and
- Contain a signed (pro forma) statement of (a) agreement and these requirements and (b) intent that the tool would be available for post-development deployment in ODP.

Mature Tools

For a tool to be considered an ODP Mature Tool, the following criteria must be met:

1. The tool must satisfy all the requirements for an ODP Certified Tool.

2. A Mature Tool Proposal should be submitted for approval to the ODP Downhole Measurements Panel. This submission should be made by the science Operator or the Logging Contractor, as appropriate. DMP will advise on the long-term scientific benefits of the proposal.

3. If DMP proposes and the Planning Committee endorses the Mature Tool Proposal, the Science Operator or Logging Contractor will proceed toward the acquisition of the tool for ODP.

4. When several Certified Tools are competing for the same Mature Tool slot, DMP will require the appropriate contractor to evaluate all these tools and to submit their multiple-tool evaluations to DMP for Panel consideration. DMP will advise on the most suitable option(s).

5. Tools that have not undergone this process cannot be adopted by ODP as Mature Tools and will therefore remain third-party tools.

Recommendations

- DESSC appoint a subcommittee to work with WHOI to codify process.
- WHOI/DESSC submit procedures to NSF/ONR/NOAA for comment prior to June DESSC.
- At June DESSC, further discussion.
- Issue interim tool development guidelines.
- Evaluate at AGU DESSC Meeting.

"Final" Guidelines

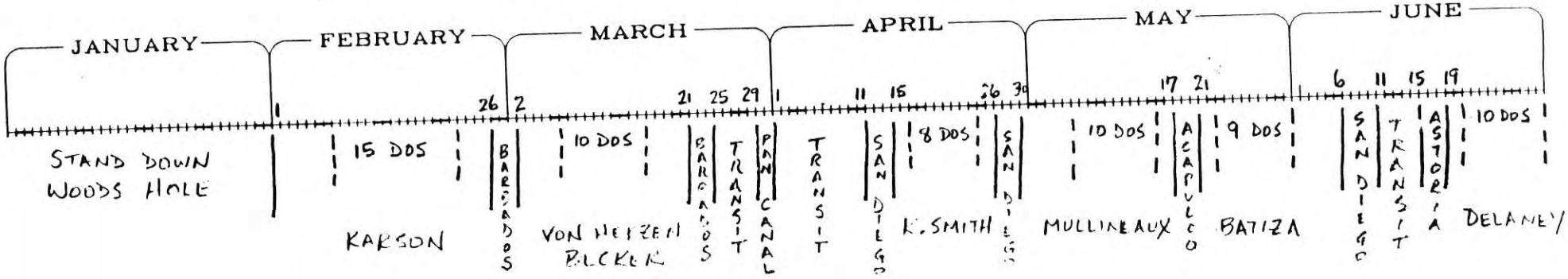
APPENDIX XVIII

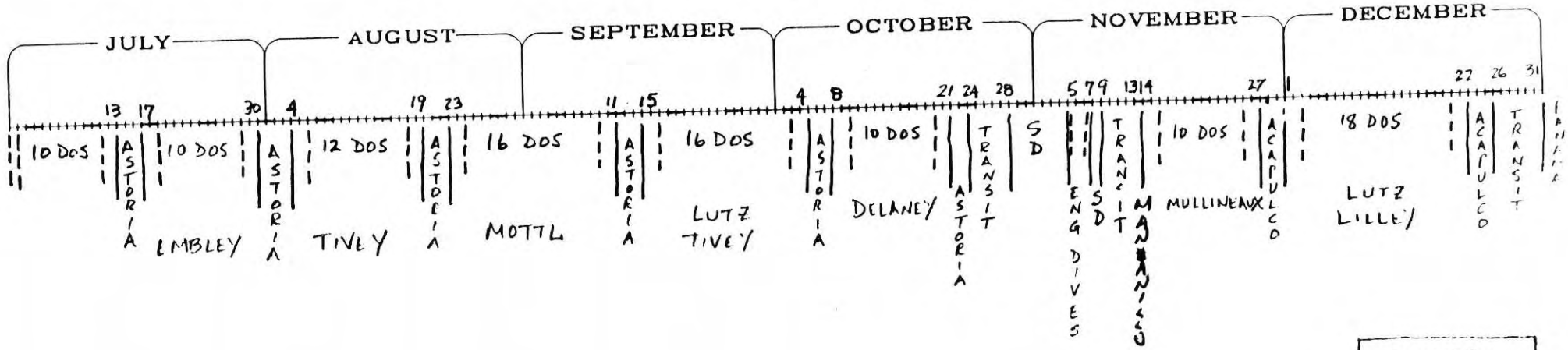
— DRAFT —

R/V ATLANTIS II & ALVIN OPERATIONS

1995

OPERATIONAL SCIENTIFIC SERVICES
WOODS HOLE OCEANOGRAPHIC INSTITUTION





SHIP DAYS : 327

DIVES :
SCL. 172

1 of 5

(DATED: 14 JUNE 1994)

R/V ATLANTIS II
- - - OPTION B - - -
PRELIMINARY 1995 SCHEDULE PRELIMINARY

CRUISE DATES	MAP INDEX/AREA/ PURPOSE	P.I./INSTITUTION/ PROPOSAL NO.	PORTS	DAYS/AGENCY/ STATUS
01 JAN 31 JAN	NA6/ATLANTIC/ IN PORT	STAND-DOWN (31 days)	WOODS HOLE	NC
01 FEB 26 FEB	NA7/MID.ALT.RIDGE ALVIN OPS.- 15 DIVES	KARSON/DUKE/ OCE-9115071	WOODS HOLE BARBADOS	27/NSF/F
02 MAR	NA10/MID.ALT.RIDGE ALVIN OPS.- 6 DIVES NA10/MID.ALT.RIDGE ALVIN OPS.- 2 DIVES NA10/MID.ALT.RIDGE	VONHERZEN/WHOI/ OCE-? ? ? BECKER/MIAMI/ OCE-9402805 BECKER/MIAMI/	WOODS HOLE	23/NSF/F
21 MAR	ALVIN OPS.- 2 DIVES	OCE-9301995	BARBADOS	
25 MAR 30 MAR	NA9/CARIBBEAN/ INCL CANAL TRANSIT	TRANSIT (TO PANAMA)	BARBADOS PANAMA	9/NSF/F
01 APR 11 APR	NP13,NP9/COASTAL/	TRANSIT (TO SAN DIEGO)	PANAMA SAN DIEGO	12/NSF/F
15 APR 26 APR	NP9/CALIF COAST/ ALVIN OPS- 8 DIVES	SMITH,K./SIO/ OCE-9217334	SAN DIEGO SAN DIEGO	15/NSF/F
30 APR 17 MAY	NP13/EPR,10N/ ALVIN OPS- 10 DIVES	MULLINEAUX/WHOI/ OCE-9315554	SAN DIEGO ACAPULCO	21/NSF/F
21 MAY 06 JUN	NP13/EPR,10N/ ALVIN OPS- 9 DIVES	BATIZA/HAW/ OCE-9314288	ACAPULCO SAN DIEGO	21/NSF/F
11 JUN 15 JUN	NP9/CALIF COAST/ - - - -	TRANSIT TO ASTORIA	SAN DIEGO ASTORIA	8/NSF/F
19 JUN 13 JUL	NP9/JUAN DE FUCA/ ALVIN OPS.- 20 DIVES	DELANEY/WASH/ OCE-9406965	ASTORIA ASTORIA	28/NSF/F (Canada)
17 JUL 30 JUL	NP9/JUAN DE FUCA/ ALVIN OPS.- 10 DIVES	EMBLEY/PMEL/ - - - - -	ASTORIA ASTORIA	18/NOAA/F (Canada)
04 AUG 19 AUG	NP9/JUAN DE FUCA/ ALVIN OPS.- 12 DIVES	TIVEY/WHOI/ OCE-9400623	ASTORIA ASTORIA	19/NSF/F (Canada)

23 AUG	NP9/JUAN DE FUCA/	MOTTL/HAW/	ASTORIA	23/NSF/F
11 SEP	ALVIN OPS.- 16 DIVES	OCE-9314632	ASTORIA	(Canada)
15 SEP	NP9/JUAN DE FUCA/	LUTZ/RUTGERS/	ASTORIA	21/NSF/F
	ALVIN OPS.- 14 DIVES	OCE-9302205		(Canada)
	NP9/JUAN DE FUCA/	TIVEY/WHOI/		2/NSF/F
04 OCT	ALVIN OPS.- 2 DIVES	OCE-9300434	ASTORIA	(Canada)
08 OCT	NP9/JUAN DE FUCA/	DELANEY/WASH/	ASTORIA	17/NSF/F
21 OCT	ALVIN OPS.- 10 DIVES	OCE-9406965	ASTORIA	(Canada)
24 OCT	NP9/CALIF COAST/	TRANSIT	ASTORIA	5/NSF/F
28 OCT	- - - -	TO SAN DIEGO	SAN DIEGO	1/NOAA/F
29 OCT	NP9//	UNASSIGNED	SAN DIEGO	NC
04 NOV	INPORT			
05 NOV	NP9/COASTAL/	ALVIN OPS/WHOI/	SAN DIEGO	1/NSF/F
				1/NOAA/F
07 NOV	ALVIN OPS.- 3 ENGR. DIVES		SAN DIEGO	1/NAVY/F
09 NOV	NP13/MEXICAN COAST/	TRANSIT	SAN DIEGO	6/NSF/F
13 NOV	- - - -	(TO MANZANILLO)	MANZANILLO	
13 NOV	NP13/EPR, 9-10N/	MULLINEAUX/WHOI/	MANZANILLO	15/NSF/F
27 NOV	ALVIN OPS.- 10 DIVES	OCE-9315554	ACAPULCO	
01 DEC	NP13/EPR, 9-10N/	LUTZ/RUTGERS/	ACAPULCO	21/NSF/F
	ALVIN OPS.- 12 DIVES	OCE-9217026		
	NP13/EPR, 9-10N/	LILLEY/UW/		4/NSF/F
20 DEC	ALVIN OPS.- 4 DIVES	OCE-9302606	ACAPULCO	
26 DEC	NP13/CENT.AMER.COAST/	TRANSIT	ACAPULCO	8/NSF/F
31 DEC	- - - -	(TO PANAMA)	PANAMA	

ATLANTIS II	TOTAL	FUNDED	PENDING
NSF=	306	306	0
NAVY=	1	1	0
NOAA=	20	20	0
TOTAL=	327	327	0

(175 dives)

ALVIN DIVES	TOTAL	FUNDED	PENDING
NSF=	162	162	0
NAVY=	0	0	0
NOAA=	1 0	10	0
ENGR=	3	3	0
TOTAL=	175	175	0

UNSCHEDULED: Funded= 17 Pending= 253 Total= 270

NA6/CAROLINA TROUGH/	15 DIVES	PAULL/UNC/	?	NSF/P
NA6/DWDS-106/	14 DIVES	GRASSLE/NURP/	?	NOAA/TBS
NP13/GUAYMAS BASIN/	? DIVES	JANNASCH/WHOI/	?	NSF/TBS
SP3/SOUTH EPR/	25 DIVES	LILLEY/UW/	?	NSF/P
SP3/SOUTH EPR/	25 DIVES	EDMOND/MIT/	?	NSF/P
SP3/SOUTH EPR/	14 DIVES	LUTZ/RUTGERS/	OCE-9302205	NSF/F
NA10/MAR/	10 DIVES	RONA/RUTGERS/	?	NSF/P
NA10/MAR/	22 DIVES	CASEY/HOUSTON/	?	NSF/P
NA10/MAR/	2 DIVES	COLODNER/LDEO/	?	NSF/P
NA10/MAR/	8 DIVES	HUMPHRIS/WHOI/	?	NSF/P
NP9/JUAN DE FUCA/	12 DIVES	JOHNSON/UW/	?	NSF/F***
NP9/JUAN DE FUCA/	14 DIVES	JOHNSON/UW/	?	NSF/P
NP9/JUAN DE FUCA/	3 DIVES	SCHNEIDER/WHOI/	?	NSF/P
NP9/JUAN DE FUCA/	6 DIVES	VAN DOVER/WHOI/	?	NSF/P
NP9/JUAN DE FUCA/	15 DIVES	DELANEY/UW/	?	NSF/P
NP9/JUAN DE FUCA/	1 DIVE	COLODNER/LDEO/	?	NSF/P
NP9/JUAN DE FUCA/	7 DIVES	CATAPOVIC/WHOI/	?	NSF/P
NP9/CALIF/	13 DIVES	SMITH,C/HAW/	?	NSF/P
NP9/CALIF/	4 DIVES	ECKMAN/SKIDAWAY/	?	NSF/P
NP9/CALIF/	4 DIVES	HENDLER/N.H.M./	?	NOAA/P
NP9/CALIF/	5 DIVES	DRUFFEL/UC,I/	?	NSF/P
NP13/10N,EPR/	2 DIVES	LUTZ/RUTGERS/	?	NSF/F***
NP13/13N,EPR/	3 DIVES	CARY/OSU/	?	NSF/F***
NP13/10N,EPR/	4 DIVES	NELSON/UC,DAVIS/	?	NSF/P
NP13/10N,EPR/	4 DIVES	NELSON/UC,DAVIS/	?	NSF/P
NP13/10N,EPR/	1 DIVE	COLODNER/LDEO/	?	NSF/P
NP13/10N,EPR/	5 DIVES	TAYLOR/WHOI/	?	NSF/P
NP13/HESS DEEP/	20 DIVES	KARSON/DUKE/	?	NSF/P
NP13/GALAPAGOS	12 DIVES	SCHNEIDER/WHOI/	?	NSF/P