UNIVERSITY - NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

UNOLS
DEEP SUBMERGENCE SCIENCE COMMITTEE MEETING

SUMMARY REPORT

December 14, 1996
Moscone Center, Room 256
San Francisco, CA

DEEP SUBMERGENCE SCIENCE COMMITTEE
PLANNING MEETING MINUTES
DECEMBER 14, 1996

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WELCOME, INTRODUCTORY REMARKS: The Fall Deep Submergence Science Committee (DESSC) Planning Meeting was held on December 14, 1996 in Room 256 of the Moscone Center, San Francisco, CA. The meeting was called to order at 8:30 a.m. Mike Perfit, DESSC Chair, welcomed the meeting participants and introduced new DESSC members Marv Lilley and Patty Fryer. He also noted that Dan Orange, Jim Bellingham and Bob Collier had been asked and agreed to serve on DESSC for second, three year terms. Mike reviewed the meeting agenda, ***Appendix I*** and summarized the major issues that have concerned DESSC during the past year. The list of meeting participants is included as ***Appendix II***.

1996 SCIENCE REPORTS: PIs who conducted science cruises using deep submergence assets over the past year were invited to present brief overviews of their science programs along with critiques of the facility operations. Viewgraphs presented by the PIs are included in ***Appendices III*** through ***VIII***. A brief review of each program is provided below.

Paul Johnson reviewed his September 1996, geophysical investigation of two new eruption sites on the Juan de Fuca and Gorda Ridges (see ***Appendix III***). The goals for the 1996 program were to pick up the sea floor magnetometers, repeat previous magnetic surveys of New Flow, deploy a thermal blanket on young crustal rocks, recover additional rock samples from eruption sites, survey ten-year-old flows in the same area, and investigate a January 1996 eruption on Gorda Ridge. Scientific results showed that the magnetization seems to be decreasing. The CoAxial New Flow has a very low density and high porosity. Jason and ABE were used during Paul's cruise. Jason completed 84 hours of continuous operations on the bottom during one lowering. Jason's elevators were used with great success allowing for almost unlimited payload. Other functions carried out by Jason included recovery and deployment of magnetometers, several deployment/recoveries of the heat flow blanket, rock sampling, Mesotech surveys, CTD data and video imaging. Paul remarked that Jason is a mature, reliable vehicle.

ABE also worked very well. It flew a pre-determined course with great accuracy. ABE acquired magnetometer, CTD data and photographs using Hi8 video captures. Paul provided samples of the ABE surveys. He characterized ABE as now being a working research vehicle.

Dan Scheirer reported that he had just returned from MELVILLE on the Sojourn leg II cruise to 17°S on the East Pacific Rise. Rachel Haymon and Ken MacDonald were the PIs; their cruise plan is included as ***Appendix IV***. The primary purpose of the cruise was to survey the narrow axial zone of the ultrafast-spreading EPR at 17° 18'-42' using the Argo II near-bottom optical/acoustic system and the DSL-120 sonar system. The cruise took place from October 28 through December 13, 1996. Dan carried out an ancillary study of magnetics during the cruise using a magnetometer mounted on Argo, and analyzed high resolution bathymetry collected with an Imagenix sonar mounted on the Argo sled. They also collected CTD and transmissometer data using instruments mounted on the Argo sled and on the towing cable. The first two and half cruise days used DSL-120. There were some problems associated with processing the DSL-120 sonar phase bathymetry which were resolved by the end of the cruise. Dan Fornari mentioned that the new sonar acquisiton and processing package funded by NSF will eliminate the problems encountered on this cruise. The new acquisition hardward and software will be integrated with the DSL-120 system by mid-1997.

- Dan Scheirer provided a list of positive highlights of the cruise and recommendations: The color zoom camera and HMI lights worked very well (downward-looking). Dan recommend getting another one of the same color zoom cameras for forward-looking observations.
- The tail on Argo II and the two new, horizontal thrusters helped prevent crabbing. The ESC also worked well.
- One of E. Baker's MAPR self-contained CTD units was used on the wire above Argo-II and the DSL-120 sonar vehicle. It worked very well and collected good data and should be considered for routine use on towed instrument deployments for collecting water properties data.

Dan Fornari gave reports on three dive programs. **Bill Martin & Fred Sayles** had an ATLANTIS II/ALVIN cruise in June/July 1996 on the NW Atlantic continental margin at 70°W.

The purpose was to use benthic flux measurements to estimate the recycling rates of organic and inorganic carbon and nitrogen at the sea floor, see ***Appendix V***. They successfully used ALVIN to deploy the OSPRE (in situ O2 microelectrode profiling instrument) and the SQUIRTs (in situ benthic flux chambers).

The second report provided by Dan was for **Greg Ravizza's** field work at hydrothermal vents on the EPR. Greg participated on the Legacy Cruise cruise to 9°50'N EPR. Vent fluids were studied for Os and other elements, and a graph of the vent fluid data is provided as ***Appendix VI***.

Dan Fornari reported that the Lucky STRike Exploration 1996 (LUSTRE '96) cruise (he and S. Humphris were coPIs), to Lucky Strike Seamount on the Mid Atlantic Ridge went very well. The cruise took place from 26 June through 8 August on KNORR. All three vehicles were used; Jason, **Argo and DSL**-120. They surveyed a 16 x 10 km section of ridge crest with DSL-120 and carried out detailed mapping and sampling with Argo and Jason. Jason collected excellent water samples at hot vents using majors and gas tight Ti bottles and real-time inductively coupled link temperature probes. ***Appendix VII*** gives an operational summary of the LUSTRE 96 cruise along with some examples of the survey data.

Richard Lutz reported on his NSF/GEOMAR funded cruise using ROPOS in the Gulf of Alaska in July. Their first dive lasted 17 hours and was very successful. Unfortunately, the ROPOS cable collapsed ending their ROV work. Prior to the collapse, they were able to video a clam community. Richard showed slides of the images obtained. He reported that ROPOS had excellent navigational capability, many samples were collected, and the 3-chip camera performed very well. All of the cruise objectives were met.

Peter Rona provided a report on his dive series, Acoustic Imaging of Hydrothermal Plumes, using SEA CLIFF at the MonoLith vent on the northern segment of Juan de Fuca. Engineering testing of Mesotech 971 sonar was completed. The sonar would be used to measure flow rates and water temperature fluctuations of black smoker's buoyant plumes. Peter reported that he would like to first standardize the plume imaging sonar as a submersible tool, secondly adapt it as a towed vehicle tool and third integrate it as part of a bottom mapping system.

Cindy Van Dover reported that she participated in two ALVIN cruises and two ROV cruises during 1996. In April, Cindy had an ALVIN cruise with Alan Chave to the northern East Pacific Rise. This was followed by a NOAA/NURP funded ALVIN cruise with Fred Grassle to Dump Site 106 in the Atlantic in early June. In late June through early August, Cindy participated in the LUSTRE'96 program on KNORR. Jason was used to collect muscle samples. Cindy's last cruise was on MELVILLE with Dan Scheirer. Cindy reported that she and A. Chave are now in the process of building the Ambient Light Imaging and Spectral System (ALISS), which will be deployed using Alvin at several vent sites in 1997-1998.

Cindy Van Dover continued by providing reports for two other dive programs. **Colleen Cavanaugh** conducted an ALVIN program on the Northern East Pacific Rise in April to study the molecular and biochemical basis for stable carbon isotope ratios in hydrothermal vent communities. A summary of her science results are included in ***Appendix VIII***. **Craig Cary and**

Jeff Stein also conducted an ALVIN dive program in April on the northern East Pacific Rise. Their research involved determining the functional role of opibiotic bacterial microflora associated with the pompeii worm, Alvinella pompejana.

John Delaney reported on his ROV ROPOS cruise aboard THOMPSON to the Endeavour Segment of the Juan de Fuca Ridge. Four discrete hydrothermal vent fields were investigated: Salty Dawg, High Rise, Maine Endeavour and Mothra. The areas were two football fields in size each and 2-3 Km apart. Sidescan views were obtained. John was very pleased with the data collected.

Veronique Robigue reported on the educational component of the cruise carried out from THOMPSON. Each year, the state of Washington provides funds to support 45 days of transit and/or education ship time on THOMSPON. In 1996, these funds were used to support the Research and Education: Volcanoes - Exploration - Life (REVEL) 1996-1997 pilot program. The program provides an opportunity for science teachers to gain hands-on experience in oceanographic research aboard THOMPSON. The recent 1996 cruise explored the submarine volcano systems in the Northeast Pacific using the Canadian robotic submersible ROPOS. Eight science teachers from grades 7-12 from Washington schools took part in the research cruise (which included K.Juniper and C. Fisher as PIs) to the Juan de Fuca Ridge on 11 August through 27 August. Veronique reported that the group was very enthusiastic. They hope to be able to continue the program on a regular basis and perhaps expand it to other states in the future. For additional information on the REVEL program, you can visit the Web site: ***http://www.ocean.washington.edu/revel/***

Robert Embley reported on his SEA CLIFF/ATV cruise to the Juan de Fuca and Gorda ridges on 19 August through 2 September. The purpose of the cruise was to investigate various processes at Blanco Depression and to map lava flows at Gorda Ridge. Bob noted that ATV is a very large, capable vehicle; however, during his cruise problems occurred with the vehicle and with weather. When on the bottom, ATV worked well. The heat flow measurements were successful. Bob remarked that the vehicle needs upgrading for navigation improvements.

NATIONAL FACILITY OPERATOR'S REPORT: Dick Pittenger began the Operator's presentation with an introduction of the Deep Submergence team. He noted that over the past few years they have come a long way in improving and expanding the deep submergence vehicle capabilites for science with the support of funding from the federal agencies. Over the past year, the ROVs have been operated from MELVILLE, THOMPSON and KNORR.

Status of R/V ATLANTIS and Delivery Schedule - Dick reported that ATLANTIS' construction is nearing completion and the vessel will be a very capable support ship for ALVIN and ROVs. ATLANTIS Builders Trials have been completed. The ship will be delivered to WHOI on 25 February 1997. In March, the ship will undergo a fitting-out period in Pascagoula for various science equipment before transiting to Woods Hole. In April and May, the ship will continue outfitting in Woods Hole. ALVIN will be placed on board and certification dives are

planned for late May/June. Viewgraphs for the National Facility Operator's report are contained in ***Appendix IX***.

1996 Operational Statistics (see *Appendix IX*):

ALVIN Cruises in 1996 - Rick Chandler began the report by reviewing ALVIN's dives lost versus completed statistics for the past 12 years. In 1996, nearly all dives were successfully completed. ALVIN operating costs for the year were close to $1.8M. 1996 was a short operating year with only five ALVIN cruises scheduled. ATLANTIS II was taken out of service in July after completing operations. ALVIN began its overhaul period. In 1996, ALVIN had 86 days at sea. The average bottom time was 4.7 hours.

ROVs Cruises in 1996 - In 1996, there were three ROV cruises. The LUSTRE '96 cruise used DSL-120, Argo II and Jason from KNORR on the Mid-Atlantic Ridge. Dan Fornari and Susan Humphris were the PIs. The next ROV cruise was conducted by Paul Johnson and Maurice Tivey using Jason from THOMPSON on the Juan de Fuca Ridge. The last ROV cruise was on MELVILLE on the Southern East Pacific Rise. The PIs were Rachel Haymon and Ken MacDonald using DSL-120 and Argo II.

1997 Tentative Deep Submergence Vehicle Schedules (see *Appendix IX*) - ALVIN is scheduled to begin science operations in late June. The first cruise will be on the Mid Atlantic Ridge. In late July/August, ATLANTIS will transit through the Panama Canal. Work will continue in August off California. ATLANTIS is scheduled to begin a Post Shipyard Availability (PSA) in September through mid October in San Diego. In the Fall, ALVIN will resume operations on the northern East Pacific Rise. At the end of the year ATLANTIS/ROV operations are planned on the Southern EPR. There are a number of funded programs on the Southern EPR and there is potential for some additional work. Conducting ATLANTIS' PSA period in September opens the schedule allowing the ship to remain at the Southern EPR to complete all funded programs.

The ROVs have a full schedule in 1997. ROV operations are planned in the western Pacific (Mariannas), Juan de Fuca, the Mediterranean Sea and the Southern East Pacific Rise. The systems are currently scheduled to be used from three different platforms: THOMPSON, C. CHOUEST and ATLANTIS.

1998 Schedule Preview - In 1998, there are ALVIN and ROV programs funded on the Southern East Pacific Rise, Northern East Pacific Rise and in the Equatorial Pacific (Hess Deep), see ***Appendix IX***.

INTEGRATED DEEP SUBMERGENCE MANAGEMENT AND OPERATIONS PLAN:
Dick Pittenger reviewed WHOI's proposed Integrated Deep Submergence Plan, see ***Appendix X*** for all view graphs on this topic. The plan outlines the integrations of ALVIN and ROV programs. It provides a plan for shore based and shipboard operations that accomodates various operational scenarios. Lastly the plan addressed communications within DSOG and with PI's planning to utilize DSOG facilities. Dick began by describing the Deep Submergence Facility

which consists of ATLANTIS, ALVIN and the ROVs (Argo/Medea/Jason/DSL-120). An overview of the WHOI Deep Submergence Organization was provided along with the functional relationships between DESSC, WHOI and funding agencies.

- **Management Issues** - Dick reviewed the management issues relating to an integrated facility. In summary, these are:
- Advanced planning and scheduling of the vehicles is necessary.
- There are cost benefits in operating from ATLANTIS; however, maintaining a "fly-away" capability will ensure flexibility.
- Well established protocols between federal funding agencies, UNOLS and WHOI are required.
- Long-range planning for vehicles and equipment should be factored into the continued support structure for the Deep Submergence Facility.

Operational Issues - Next, Dick reviewed the operational issues of an integrated facility, these in summary are:

- A 24 hour switch-over period has been estimated to be required between ALVIN and Jason use at sea. This time period is an initial, conservative guideline that includes consideration of switching personnel/watch schedules from 24 hr/day ROV ops. to Alvin ops. an vice versa. WHOI will continue to evaluate this as operational experience is gained during use of closely timed submersible and ROV operations during the same cruise.
- ROV and tethered vehicle switch-over time at sea has been estimated at 12-18 hrs, depending on which vehicles are being used and in what sequence.
- Special vehicle and science sensor requirements for cruises must be indicated by PIs early during the planning process prior to the field program.
- ROVs and tethered vehicles of the National Facility should NOT be considered "night-time" survey vehicles.

Cruise Prep and Science Liaison - Dick reviewed the Deep Submergence Facility (DSF) contacts for shore and at-sea support. WHOI's operation plan centralizes cruise preparation and science liaison. PIs would contact the Marine Operations Coordinator, Don Moller, who in turn would communicate with the appropriate ROV, ALVIN and/or SSSG coordinator(s). The concept proposes a single point of contact. Coordination would stay with the marine operations coordinator through all stages of a cruise. The entire marine operations cruise preparation sequence was reviewed. It begins with assembling funded and proposed deep submergence science work and concludes with cruise demobilization.

WHOI Marine Ops Communication Path - Rick Chandler reviewed the Marine operations communication path. It would begin with investigators browsing the WHOI web site <***http://www.marine.whoi.edu***> and submitting their cruise planning questionnaire to Don Moller via the web. Don Moller would receive and process the information between scientists, shipboard ops groups and shoreside engineers. Rick reviewed the Marine Ops web pages including the request form. The communication tools to be used include the World Wide Web and Lotus Notes.

WHOI Archives - Dick Pittenger reviewed the WHOI preservation program, see ***Appendix XI***. The goal is to preserve and digitize DSOG media and make electronic retrieval of the information readily available and useful to the science community. Dick reviewed the WHOI projects underway to repair and archive media from the past. He reviewed WHOI's current archive policy. For ALVIN, all original film from the external 35mm cameras is archived along with original tapes from the primary video source. WHOI will also archive copies of other sources at the discretion of the Expedition Leader. This sparked a discussion on what and when media should be archived and available to the public. It was pointed out that steps need to be taken to protect the PI's interests, but at the same time make the data available to the community. It was suggested to consider password protection for archived data. The recommended action was for WHOI, DESSC and the Funding agencies is to review the current archive policies and draft revisions.

ALVIN AND JASON REPORTS:

ALVIN Overhaul Status - Dudley Foster provided an overview of the ALVIN Overhaul Status, see ***Appendix XII***. He reported that during ALVIN's overhaul, some of the ALVIN team has been participating in ROV operations. Activities of the overhaul have included:

- frame repair,
- variable ballast repair,
- manipulators rebuild,
- emergency transponders rebuilt and aligned,
- personnel and VB/HP air spheres inspected,
- pressure test all implodables, and
- hydraulic components rebuilt.

WHOI is still waiting for approval from the Navy for explosive bolt replacement. ALVIN component re-installation has begun.

A number of ALVIN upgrades have been implemented during the overhaul period. These include:

- Wiring for a 3rd battery,
- Pan and tilt installation,
- New 1-chip video camera,
- New motor controllers,
- Pelagic pump motors for slurps, and
- New in-hull Nikon cameras.

Jason - Derbyshire Survey Cruise Preparations - Andy Bowen gave a brief history of M/V DERBYSHIRE. In 1980, the ship and all hands were lost in a typhoon in the Western Pacific. The location of the wreck has been determined to be 400 nm east of Okinawa. The U.K. has requested a complete forensic survey of the vessel. The 47-day survey will deploy DSL-120, Argo II and Jason vehicles from THOMPSON, see ***Appendix XIII***. Preparations for the cruise have included:

- Installation of an HDTV camera and associated telemetry, display and recording subsystems.
- Installation of digital high resolution color video camera.
- Installation of stereo video system.
- Upgrade to existing mosaicing capability.
- Refinement of DSG data reduction and processing capabilities.

Andy continued by reviewing upgrade plans for the ROVs. These include upgrading the DSL 120 real-time display and processing. A request for quotes has been sent out. Plans also call for improving Jason's ascent/descent weight dropper to increase its speed. Using internal WHOI funds, a "smart" elevator will be developed. Through a telemetry link, the elevator could be steered during its descent. Video telemetry upgrades for Jason and Argo-II are planned to increase capacity by more uplinks. Other upgrades include increasing Jason's payload and replacement of Jason's neutral tether cable. The full list of planned upgrades is included in ***Appendix XIII***.

AGENCY REPORTS:

National Science Foundation (NSF) - Don Heinrichs provided the report for NSF, see ***Appendix XIV***. He began by reviewing personnel changes at NSF. Sandy Shor has been heading the Marine Technician Program while Lisa Rom is on leave. He continued by reviewing the NSF Ocean Sciences Division budget. Overall, the Division budget had an increase of approximately 4%. The Oceanographic Centers and Facilities budget increased 6.8% from 1996. However, most of the facilities budget increase ($4.5M) will be directed to support a new initiative, Major Research Instrumentation. The Ship Operations budget is approximately level at $31.4M.

Don reviewed UNOLS operations support trends since 1993. NSF continues to be the major contributor. In 1997, the biggest increase in ship support came from "other" non-traditional support. This increase was largely due to the introduction of NAVOCEANO's ship time. International support for the Derbyshire cruise was also a major "other" contributor. NSF predicts that if fleet support returns to the traditional sponsors only, a probable reduction of the fleet size would be necessary. Support from traditional sponsors has declined in recent years. New ships have been added to the fleet, increasing costs by approximately $4.8M in 1997. Outside support in 1997 from NAVO and the UK may not be available in future years. NSF predicts that all of these factors make the future of the large ships vulnerable. Don provided quotes from the 1992 Ocean Studies Board report, "Oceanography in the Next Decade - Building New Partnerships". He noted that a disproportionate share of funds is provided by NSF and that resources for PI grants could be reduced if other agency funding is not obtained. Ken Johnson reported that over the past year, UNOLS has had some success in building new partnerships. NAVO has scheduled ten programs on UNOLS ships in 1997. Additionally, NOAA is interested in bringing its new research vessel, RON BROWN, into the UNOLS scheduling process. Support for BROWN operations would be provided by NOAA. In addition, NOAA plans to use $2.6M of UNOLS ship time in 1997.

Office of Naval Research (ONR) - Sujata Millick provided the report for ONR. The ONR budget is basically level at $80M. There were no ONR funded ALVIN operations in 1996 and none are planned for 1997. One reason is that their deep submergence research directions have shifted to shallower water research. Also, the Navy's interests have been in unmanned development efforts. They are interested in the ability to obtain larger quantities of data at high speeds. The Navy's directions are towards smaller, autonomous and ROV tools and vehicles.

NOAA's National Undersea Research Program (NOAA/NURP) - Gene Smith and Barbara Moore were unable to attend the meeting; however, Gene sent an e-mail message to Mike Perfit reporting on NURP activities. Mike read the e-mail message, see ***Appendix XV***. It is a NURP priority to continue support of deep submergence science and the National facility. NURP is undergoing a reinvention and there will be changes in the way funds are allocated. The changes are being developed to better integrate NURP's research priorities with NOAA's research and management needs. A NURP National Advisory Council and National Review Panel is being formed to make recommendations regarding allocation of funds. The first panel meeting is planned for 19 December. The Panel includes representatives from NOAA, ONR and NSF. Ray Highsmith, Director of the West Coast NURP center, shared his views on this new procedure. In his opinion, the NURP proposal review process has worked fine and these new changes are unnecessary.

FACILITY UPGRADE STATUS AND PLANS: Mike Perfit provided a brief history of the evolution of the facility upgrade proposal. In June 1995, the DESSC realized the potential opportunity to upgrade ALVIN systems during its 1996/97 overhaul period. Dan Orange and Cindy Van Dover solicited the community for input, then compiled a prioritized list of ALVIN upgrades. After a series of meetings and discussions with the operator and funding agencies, the list was revised.

DESSC Upgrade Priority List - Dan Fornari reviewed the prioritized list of upgrades, see ***Appendix XVI***. WHOI/DSOG will soon submit a proposal to fund implementing these upgrades. If funded, the upgrades would be installed between 1997 and 1999. The top three upgrades are: (1) datalogger/video upgrades, (2) additional foam, and (3) ALVIN power management. The datalogger/video upgrades are intended to maximize signal quality and standardize data between systems. As part of the ALVIN power management upgrade, a plan to monitor power through a Web-based "virtual" ALVIN model, is being considered. The system would be used by pilots and scientists to estimate power usage and devise ways for operating more efficiently. The remaining list of upgrades in priority order were:

4. (tie) Obtain dual head scanning sonar
4. (tie) Obtain 4 slurp pumps with chambers
5. Laser ring gyroscope
6. Image infrastructure
7. Improve the in-hull 35 mm cameras
8. Homer Probes
9. Pencil cameras
10. (tie) Obtain an improved CTD pump 10. (tie) Obtain a flat LCD monitors

11. Obtain a new set of push cores with core catchers

Along with the community list of upgrades, WHOI will include additional operator recommended upgrades in their proposal. These include upgrades to the VB system, navigation, digital imaging for ALVIN/Jason/Argo, remote data and temperature logging, and ALVIN thermistor probes.

Dan concluded by reporting that the upgrade proposal will be submitted to NSF after the holidays. (Note: Since the DESSC December Meeting, the upgrade proposal was submitted to NSF (as the lead agency) in January)

Third Party Tool Guidelines - Dan Fornari reviewed the Third Party Tool Guidelines status. The guidelines are still in agency review. The definition of "third party tools" was discussed. After agency review, the guidelines will be put on the Web for community review.

LONG RANGE PLANNING:

1998 and Beyond - Letters of Interest Summary - Mike Perfit reviewed the areas of interest for ALVIN and ROVs for 1997 through 1998. This year, letters of interest were submitted to the UNOLS Office via the Web. Considering that it was the first time using this procedure, response was good. Areas of interest included the Atlantic, Mediterranean, Gulf of Mexico, Juan de Fuca, California borderland, NEPR, Guaymus Basin, Equatorial Pacific, SEPR, Hawaii, Western Pacific and the Indian Ocean, see ***Appendix XVII***. With the exception of one cruise to the Hess Deep, all funded 1997 programs have been scheduled. In 1998, there are funded ALVIN and ROV programs on the Northern and Southern East Pacific Rise and an ROV funded program off of Hawaii. In 1999, there are already two funded programs which plan to use both ALVIN and the ROVs. These programs are planned for the Gulf of Mexico and the Northern East Pacific Rise.

Global Deep Submergence Science Initiatives - Mike reported that Global heroes have been recruited to coordinate work in the non-traditional ALVIN work areas. Patty Fryer is the hero for the Western Pacific. She has indicated that a joint program with JAMSTEC is planned for the year 2000. Other heroes and their respective global areas include:

- Marv Lilley - Southern East Pacific Rise
- Cindy Van Dover - Indian Ocean
- Dan Fornari - Mediterranean
- Dan Orange - Polar regions

It was pointed out that consideration for time series work in the traditional areas of research will need to be addressed if the facility assets are to be sent to non-traditional areas.

Programmatic Ties to other National Programs - Karen Von Damm, RIDGE Chair, reported that a three year RIDGE program is planned for 9°N on the North East Pacific Rise. The program will require surface ship and deep submersible platforms. Long-range InterRIDGE plans include work on the SW Indian Ridge. The FARA RIDGE program has been completed and a any follow-up program plan is, as yet, undetermined.

Future Deep Submergence Vehicle and Facility Requirements - Mike Perfit reported that the Navy plans to retire TURTLE at the end of FY97 and SEA CLIFF at the end of FY98. In early October, ONR requested DESSC's input regarding utilization of the Navy's deep submergence assets and an assessment of deep submergence research objectives for the next few decades. Mike reviewed the actions taken by DESSC in response to the Navy's letter requesting input, see ***Appendix XVIII***. A working group has been formed to address the deep submergence needs (directions and facilities) of the future. The group includes PIs with experience in the deeper parts of the ocean. The members are Kier Becker, Jim Bellingham, Bob Embley, Dan Fornari, Jeff Fox, Patty Fryer, Paul Johnson, Jeff Karson, Mike Perfit, Eli Silver, Peter Lonsdale, and Karen Von Damm. On 11 October, Navy representatives met with WHOI-DSOG to discuss the costs and efforts required to transition SEA CLIFF into the National Facility. In December, DESSC prepared a preliminary response to ONR's request for input. A questionnaire is being developed and will be distributed to the community. The working group will review responses to the questionnaire in March. They will report to ONR in April.

Mike summarized DESSC's preliminary response. The preliminary response in its entirety is included as ***Appendix XIX***. The preliminary response points out that given the current federal funding constraints and the level of technical knowledge necessary to operate deep diving submersibles, it would not be prudent at this time to consider developing additional National centers for operating deep submergence vehicle facilities. The response also recommends that vehicle depth capability should be to approximately 6,000m to allow for research over the widest range of tectonic, sedimentologic and geographic environments that will be investigated in the decades to come. DESSC suggests that the federal agencies, WHOI operators and DESSC evaluate the feasibility of integrating SEA CLIFF or its components into the National facility so that improved submersible facilities could be available to the science community as well as the Navy.

OTHER FACILITY OPERATIONS AND STATUS:

Navy Deep Submergence Operations - Commander John Green reported on SEA CLIFF/ATV science operations in 1996, see ***Appendix XX***. Four science programs were conducted:

19 Aug - 2 Sep:	Bob Embley - Blanco and Gorda Ridges
03 Sep -15 Sep:	Peter Rona - Juan de Fuca Ridge
15 Sep - 1 Oct:	Chris Goldfinger - Southern Oregon Margin
21 Oct - 28 Oct:	Craig Smith - Southern California

There were 25 total days on station for the four cruises (nine days were lost to weather). The depth operations ranged from 2,826 to 12,300 feet. There were 26 dives/333 hours of ATV and SEA CLIFF time. The total bottom time was 225 hours. CDR Green also provided a summary of recent military operations.

Miscellaneous upgrades are planned for ATV. These include upgrades to the tether and telemetry, a new graphics computer system, tracking improvements, imaging sonar, two additional HMI lights and a new responder system. Additionally, Winphrog and Nautronix 916

installation is planned. The Navy's deep submergence master plan calls for retirement of NR-1 in 2003, TURTLE in 1997 and SEA CLIFF in 1998. The vehicles RCV-225, two TUWVS, DSILO, and ATV will stay on line.

MBARI/ROV Operations - Debra Stakes provided a review of MBARI's ROV operations, see ***Appendix XXI***. Debra presented a specification sheet on the ROV VENTANA which listed the structure and ballast features, navigation instrumentation and video/still camera systems. VENTANA normally operates about four days a week. It has an 1800m depth capability. Debra provided viewgraphs showing the datalogger with borehole instruments that can be used with VENTANA. The borehole instruments include seismometers, tiltmeters and an osomotic sampler. A chart of Monterey Canyon showing instrument deployment sites in 1995 and 1996 was presented. WESTERN FLYER, MBARI's new SWATH vessel, is now at their home port in Moss Landing. It is a very stable platform and has a 15 knot speed capability. TIBURON, MBARI's newest ROV, has a 4000 m capability, dual 3-chip cameras, six HMI lights and customized tool sleds. In-water testing is being conducted on the vehicle. Mid-water dives are planned by the end of the year. Operating areas for the ROV might include the NEPR and Hawaii as well as the Juan de Fuca Ridge.

ROPOS/ROV Operations - Larry Mayer provided an update on the ROPOS ROV, see ***Appendix XXII***. ROPOS was lost in October from R/V THOMPSON while diving at Middle Valley when rough weather was encountered. ROPOS was insured and a decision has been made by Canada to replace the vehicle with the insurance money. The replacement will most likely be built by ISE. The estimated rebuild time and sea trials is 16 weeks. The NOAA manifold sampler was also lost with ROPOS during the storm. Vector (fiber optic cable manufacturer) has agreed to supply a new cable for the ROV. Their original cable experienced a massive failure during a ROPOS dive in July. Delivery of the new cable is planned for April 1997. ROPOS may be available in the Atlantic in the late summer of 1997, following dive operations on POLARSTERN from 1 July through 15 August. The POLARSTERN cruise will involve diving under the ice in the Arctic Basin to depths of 4400m.

Scripps Deep Tow - Fred Spiess reported on the specifications for the Deep Tow Wireline Re-entry/Control Vehicle. Deep Tow has an operational depth of 6,000m. It has a suite of video equipment, including a Sony black&white CCD Camera, 2 axis pan and tilt with compass and tilt sensor, a Sony 8mm VHS VCR and a 256x256 video display at the surface every 0.7 seconds. Sonars include a 23.5kHz narrow beam up-looking sonar, a 23.5 narrow beam down-looking sonar and a 325kHz sector scanning sonar. A full list of Deep Tow's specifications are included as ***Appendix XXIII***.

OTHER BUSINESS:

Oceanography in Space - John Delaney reported on the recent finding of ice on Europa. Questions are being asked: If there is ice, is there water under the ice? If so, should we investigate it? How would oceanography in space be conducted? What tools would we need to probe? John suggested that the community keep up-to-date with this recent finding.

Marine Board Publication - Mike Perfit reported that the National Research Council (NRC) has published a report, "*Undersea Vehicles and National Needs*". Charles Bookman, NRC Director, has sent letters to Jack Bash and Mike Perfit indicating that members of the NRC would be willing to meet with DESSC and UNOLS representatives to discuss the findings of their report. Mike will try to arrange a meeting.

The meeting was adjourned at 5:30 pm.

APPENDIX I

Agenda

Deep Submergence Science Committee
Planning Meeting
Moscone Center, Room 256
San Francisco, CA

December 14, 1996

08:30 Welcome, Introductory Remarks (M. Perfit)

08:45 1996 Science Reports
- a. Brief reports from Science PIs (5-10 minutes each)

09:30 National Facility Operators Report (ALVIN and ROVs) (R. Pittenger & WHOI personnel)
- a. 1996 Operational Statistics (ALVIN, ROVs)
- b. Status of R/V ATLANTIS and Delivery Schedule
- c. 1997 Tentative Schedules
- d. 1998 Schedule Preview

10:30 Integrated Deep Submergence Management and Operations Plan (R. Pittenger)
- a. Integration of ALVIN and tethered vehicle personnel
- b. Plan for shorebased and shipboard operations
- c. Draft Operations Scenarios for Vehicle Use on ATLANTIS and, when required, for ROV flyaway operations.

11:30 ALVIN and JASON Reports
- a. ALVIN Overhaul Status (B. Walden)
- b. Jason Status {Derbyshire preparations} (A. Bowen)

12:00 Break for Lunch (Lunches can be purchased for $7.00 at the meeting site)

13:00 Facility Upgrade Status and Plans
- c. DSOG Equipment Upgrade Proposal (D. Fornari)
- d. DESSC Upgrade priorities and status (M. Perfit & D. Orange)
- e. Third-Party Tool Guidelines (D. Fornari)

14:00 Agency Reports
- a. NSF
- b. ONR
- c. NOAA/NURP

15:00 Long-Range Planning
- a. 1998 and beyond - letters of interest summary (M. Perfit)
- b. Global Deep Submergence Science Initiatives (M. Perfit & heroes)
- c. Programmatic Ties to other National Programs (RIDGE, ODP)
- d. Future deep submergence vehicle and facility requirements - discussion on utilization of Navy submersible assets.

Continued on back...

16:00 Other Facility Operations and Status
   a. Navy Deep Submergence Operations
   b. MBARI/ROV Operations (D. Stakes)
   c. ROPOS/ROV Operations
   d. NOAA/HURL

16:30 Other Business and Issues

17:00 Adjourn

APPENDIX II

Dec. 14, 1996

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APPENDIX III

A Geophysical Investigation of Two New Eruption Sites on the Juan de Fuca and Gorda Ridges

Field Program; September, 1996

P.I. - H. Paul Johnson
University of Washington

Science Party

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Tivey, Maurice
Holmes, Mark
Van Patten, Darcy
Pruis, Matt
Nelson, Erin
Hutnak, Michael
Ruppel, Byron
Rees, Sheri
Johnson, Matthew

JASON Group

Andy Bowen, Tom Crook, Bob Elder, Skip Gleason, Peter Lemmond, Craig Sayers, Will Sellers, Hanu Singh, Bob Waters, Bob Williams

ABE Group

Al Bradley, Dana Yoerger, Rod Catanach, Al Duester, Steve Libertore

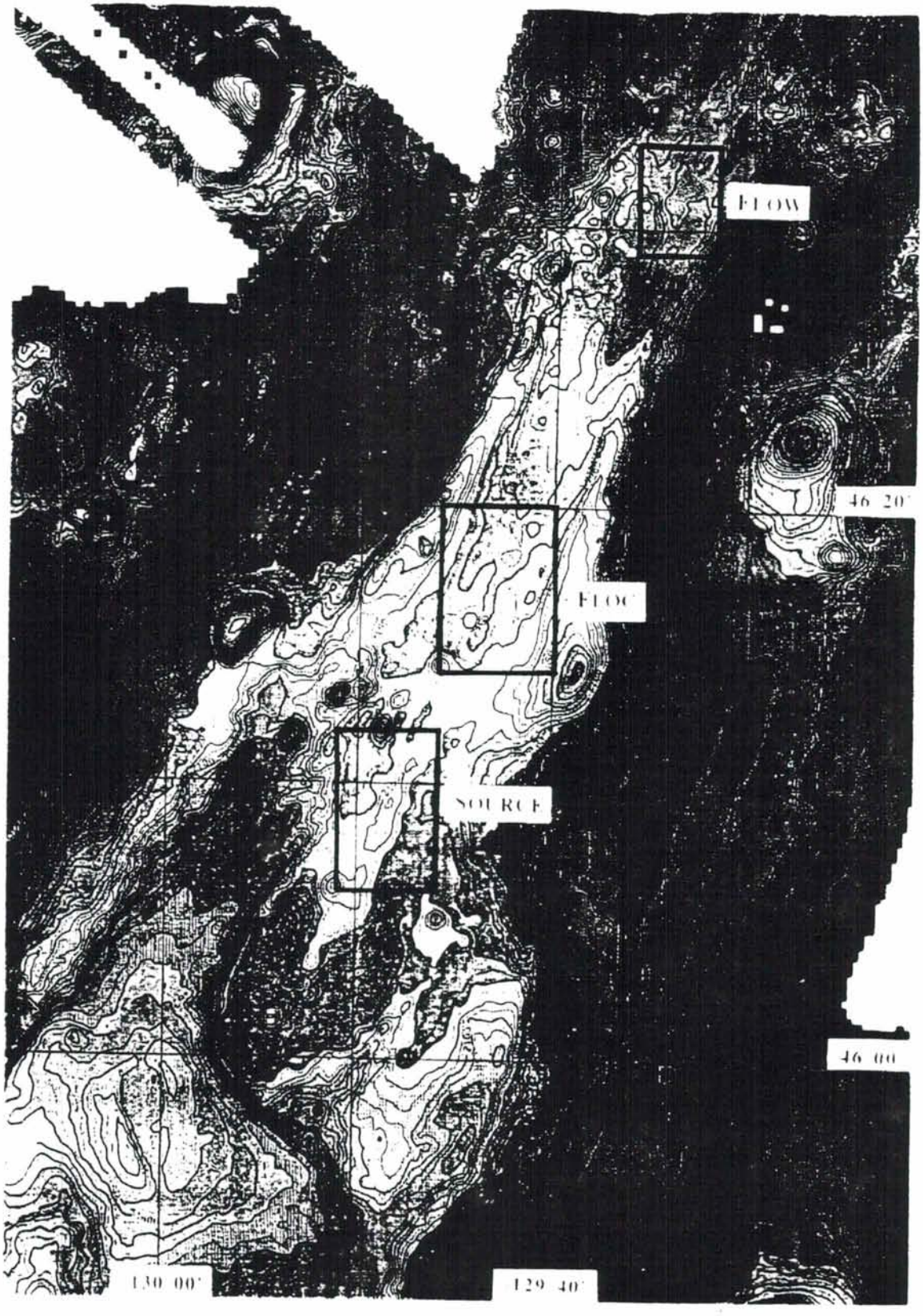
Large-Scale Goals:

To study the Formation and Evolution of Oceanic Crust; particularly the Near Zero-age Changes in Physical Properties of Young Lava Flows.

Specific Goals for 1996 program:

1. pick up sea floor magnetometers/tiltmeters
2. repeat previous magnetic surveys of New Flow
3. deploy thermal blanket in young crustal rocks
4. recover additional rock samples from eruption site
5. survey 10-year-old flows in same area

6. investigate January, 1996 eruption on Gorda Ridge


FLOW
FLOW
SOURCE
46 20'
46 00'
130 00'
129 40'

Continuation of Time Series of Geophysical Measurements on the CoAxial Eruption Site

1993 - ALVIN

1994 - TURTLE/ATV (Navy assets)

1995 - ALVIN (+ ABE)

1996 - JASON (+ ABE)

1997 - JASON (recovery of mag/tiltmeters from Gorda)

SCIENTIFIC RESULTS

1. MAGNETICS - magnetization seems to be decreasing systematically over three year period. Axial 'notch' in middle of New Flow is growing (due to alteration).

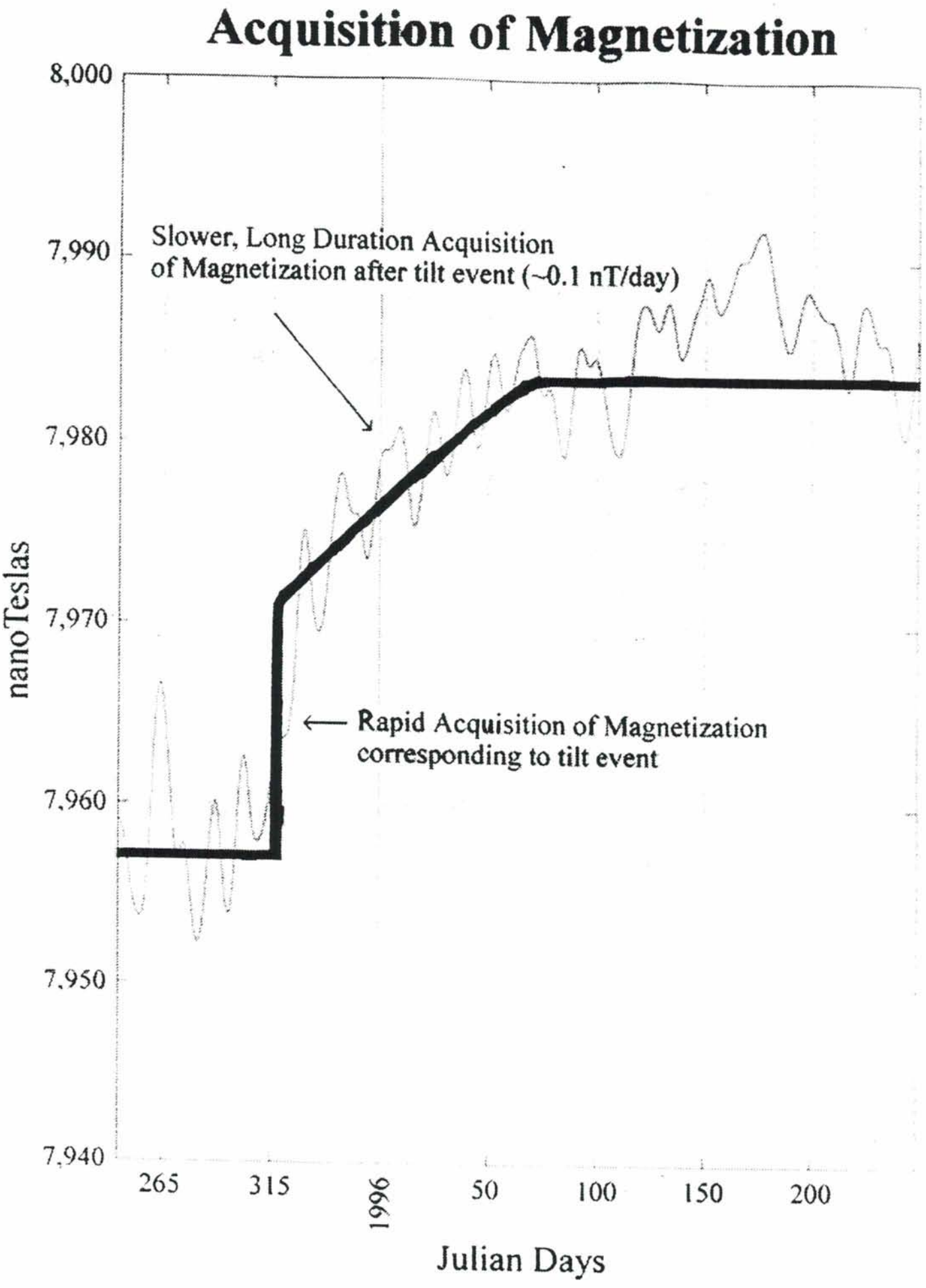
2. GRAVITY - CoAxial New Flow has a very low density and high porosity near 28%. Surrounding lava flows are higher in density, and have porosities of 11 to 13%. This implies a high permeability and predicts mechanical collapse soon after formation.

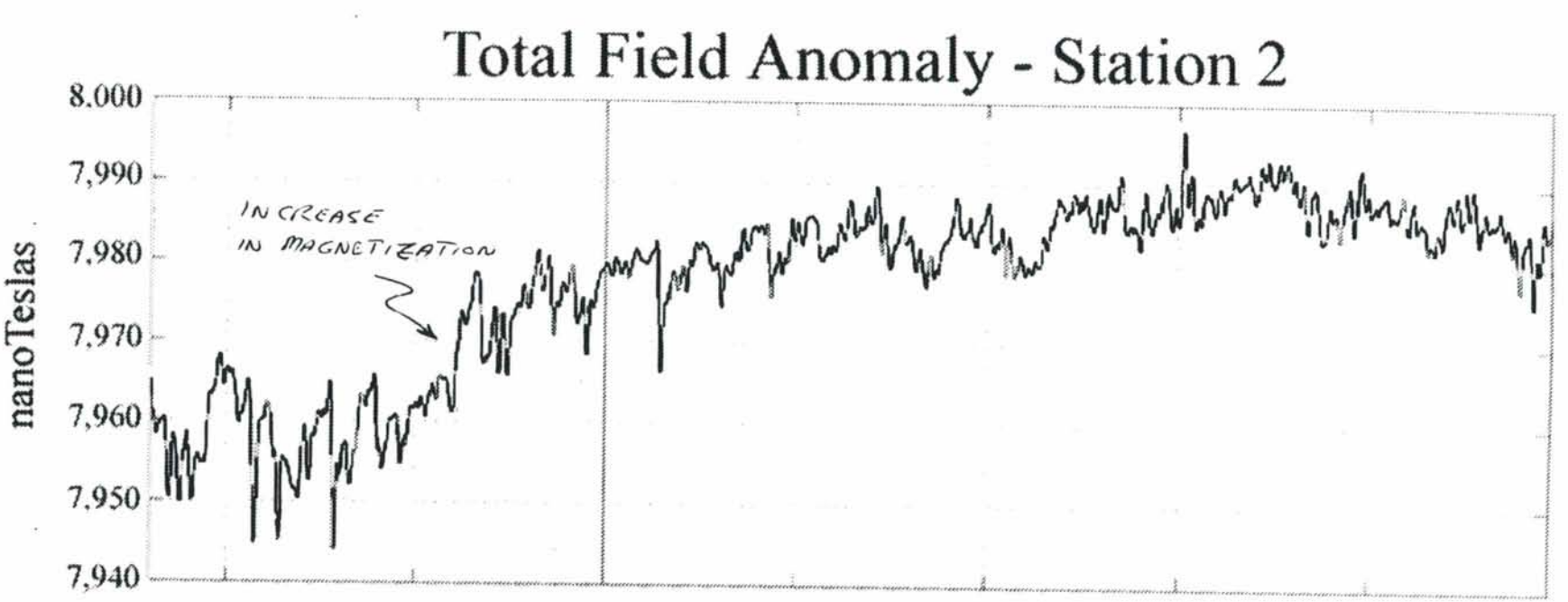
3. HEAT FLOW - bare rock HF measurements indicate that the extrusives cool by internal convection very quickly, and after 10 years have heat flux values near ambient.

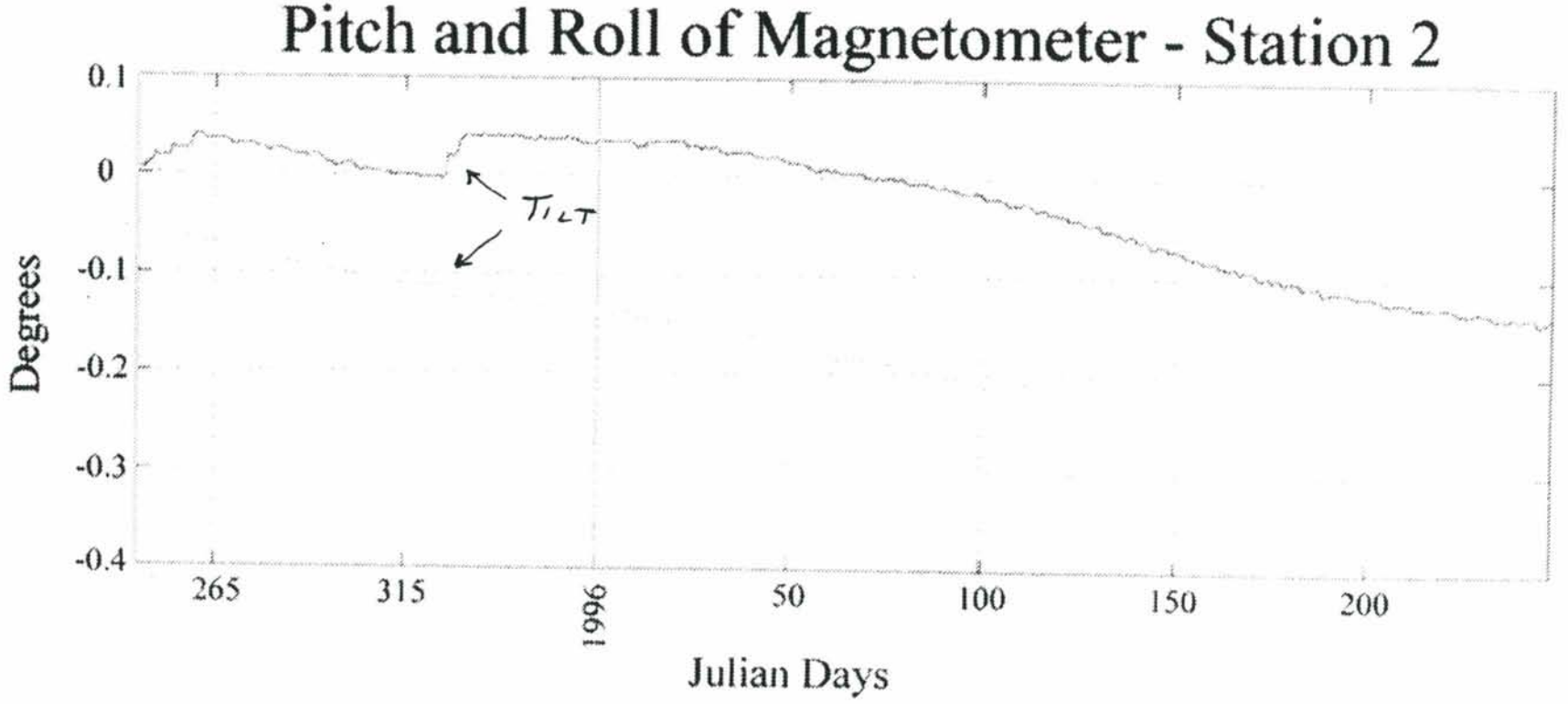
RESULTS - Hardware

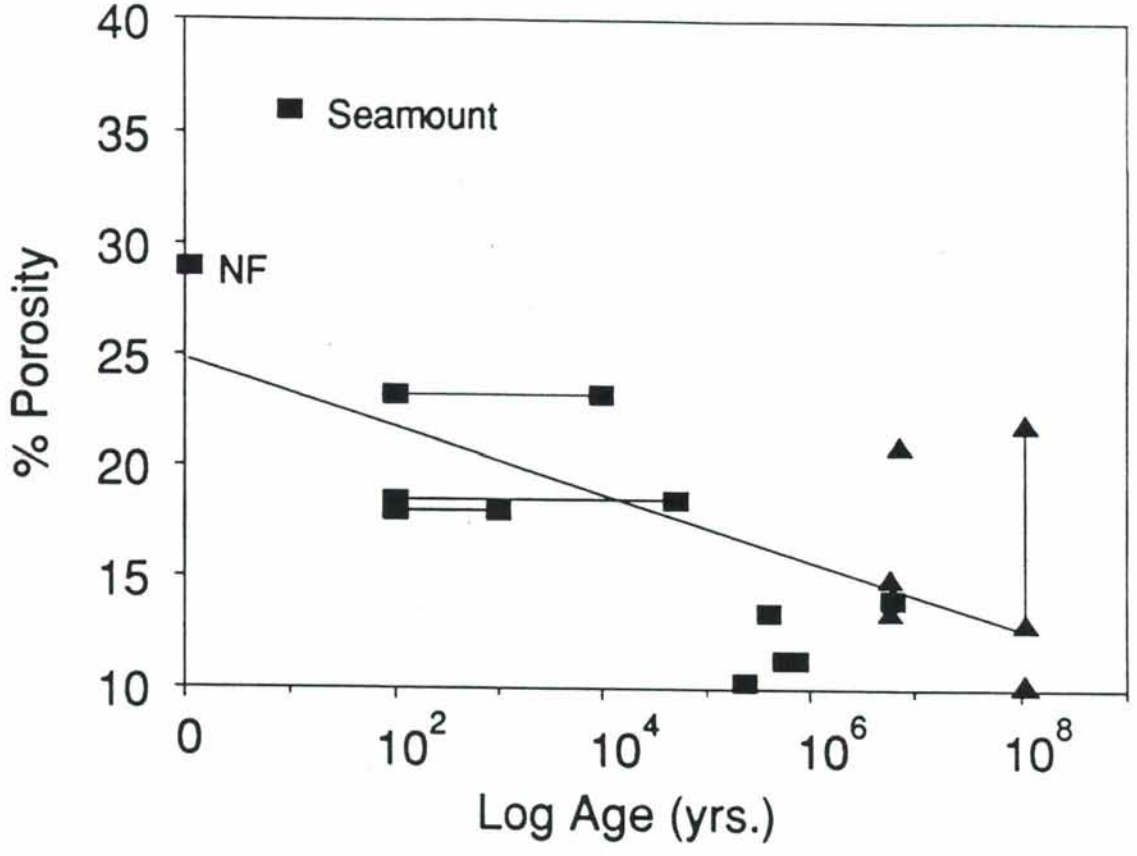
JASON - worked very well. Had several long dives, including one 84 hours long. Recovered and deployed sea floor magnetometers, deployed heat flow blanket 13 times, recovered rocks, near-bottom magnetometer and Mesotech survey, CTD data, superb video. Use of elevators allows almost unlimited payload. **mature, reliable vehicle.**

ABE - our third cruise with this vehicle. Worked very well. Fly pre-determined course with remarkable accuracy. Constant altitude, constant depth. Magnetometer, CTD, photos. **now a working vehicle.**


Acquisition of Magnetization
8,000
7,990
7,980
7,970
7,960
7,950
7,940
nanoTeslas
Slower, Long Duration Acquisition
of Magnetization after tilt event (~0.1 nT/day)
Rapid Acquisition of Magnetization
corresponding to tilt event
265
315
1996
50
100
150
200
Julian Days


Total Field Anomaly - Station 2
8.000
7,990
7,980
7,970
7,960
7,950
7,940
nanoTeslas
INCREASE
IN MAGNETIZATION

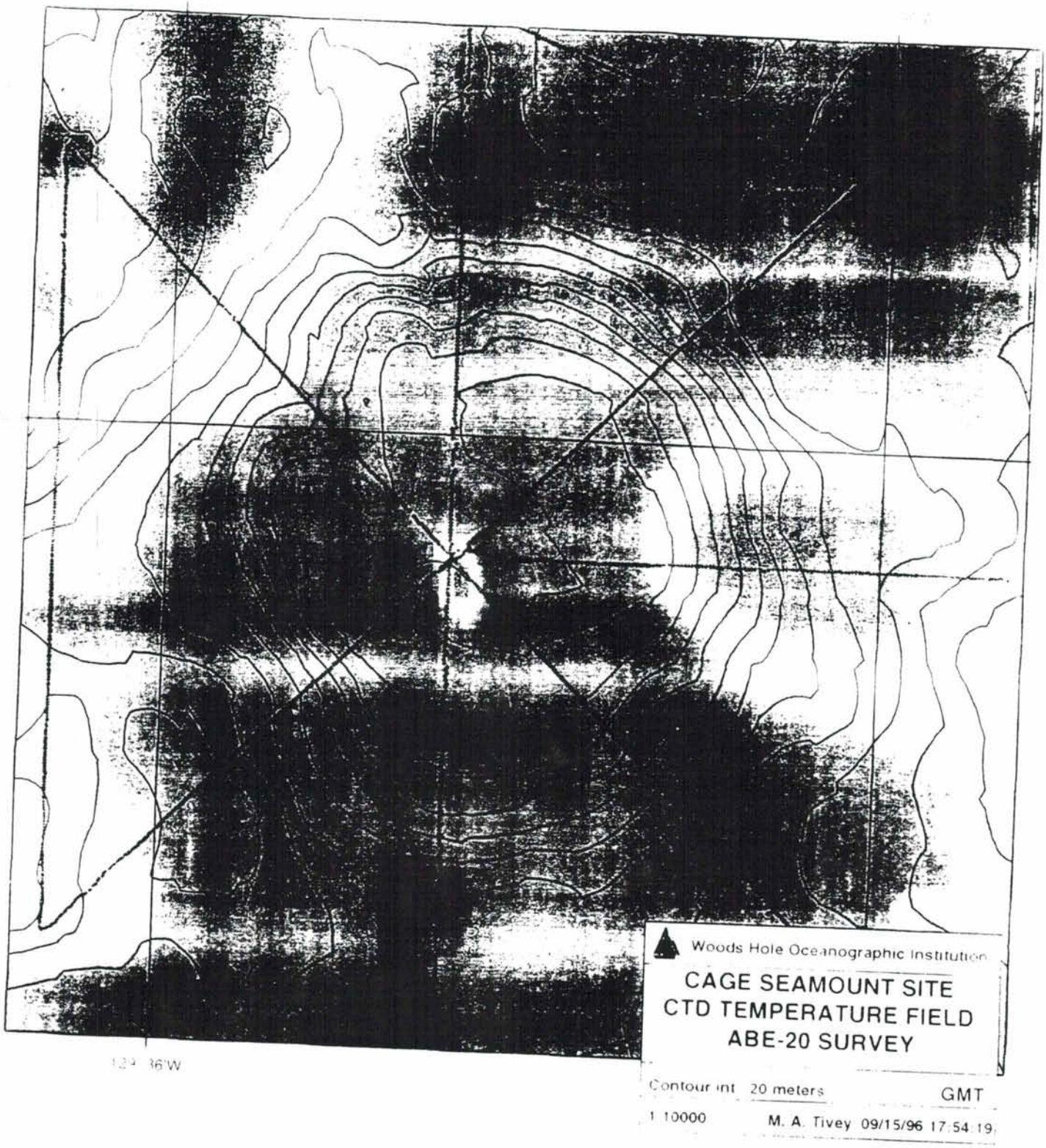

Pitch and Roll of Magnetometer - Station 2
0.1
0
-0.1
-0.2
-0.3
-0.4
Degrees
TILT
265
315
1996
50
100
150
200
Julian Days


40
35
30
25
20
15
10
% Porosity
Seamount
NF
0
10^2
10^4
10^6
10^8
Log Age (yrs.)

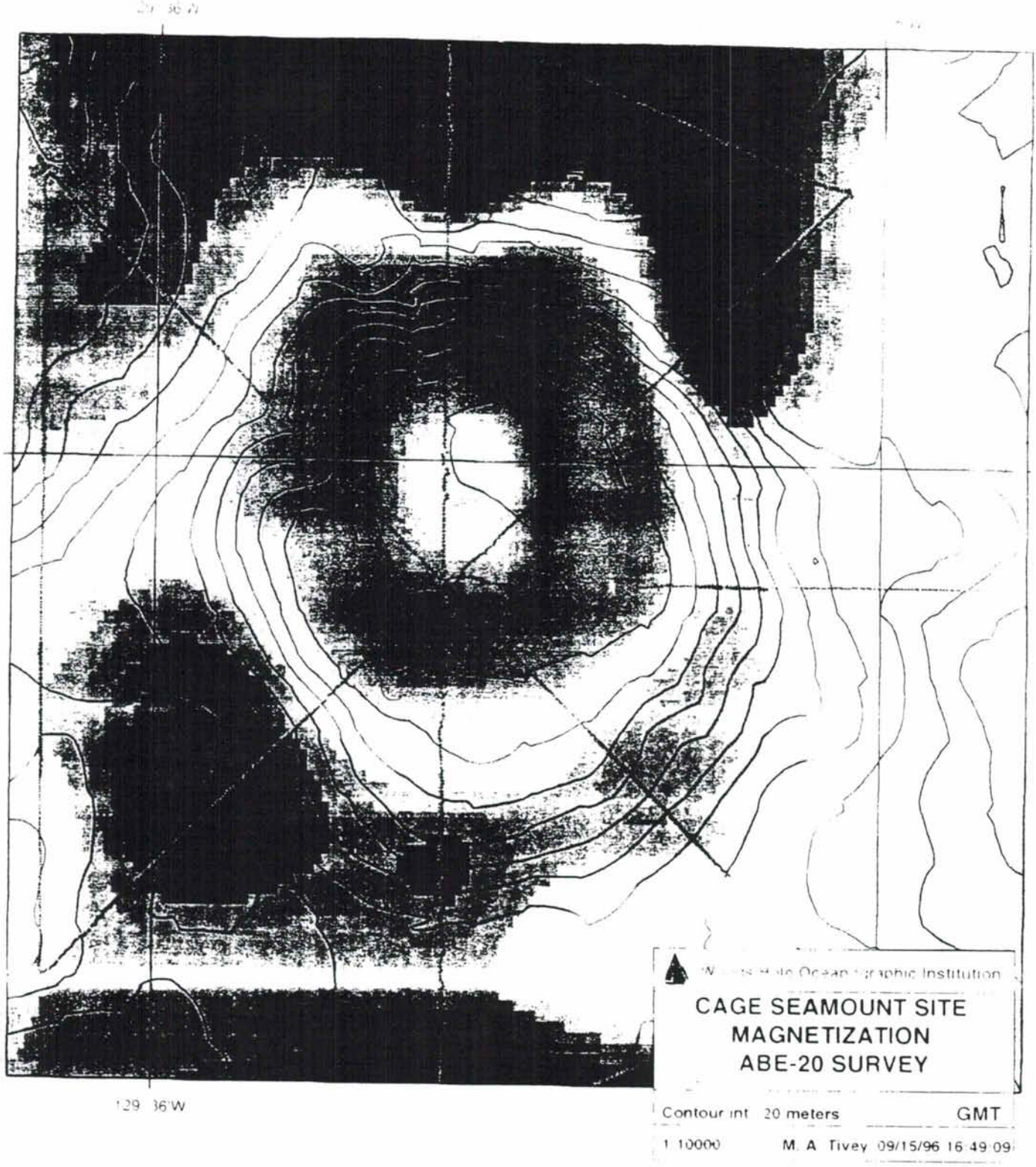
Summary of Gravity Data from New Flow Site

	density	porosity
Flow Site, Average	2.63	17%
Old Flows, Only	2.62	18%
New Flow, Only	2.42	29%

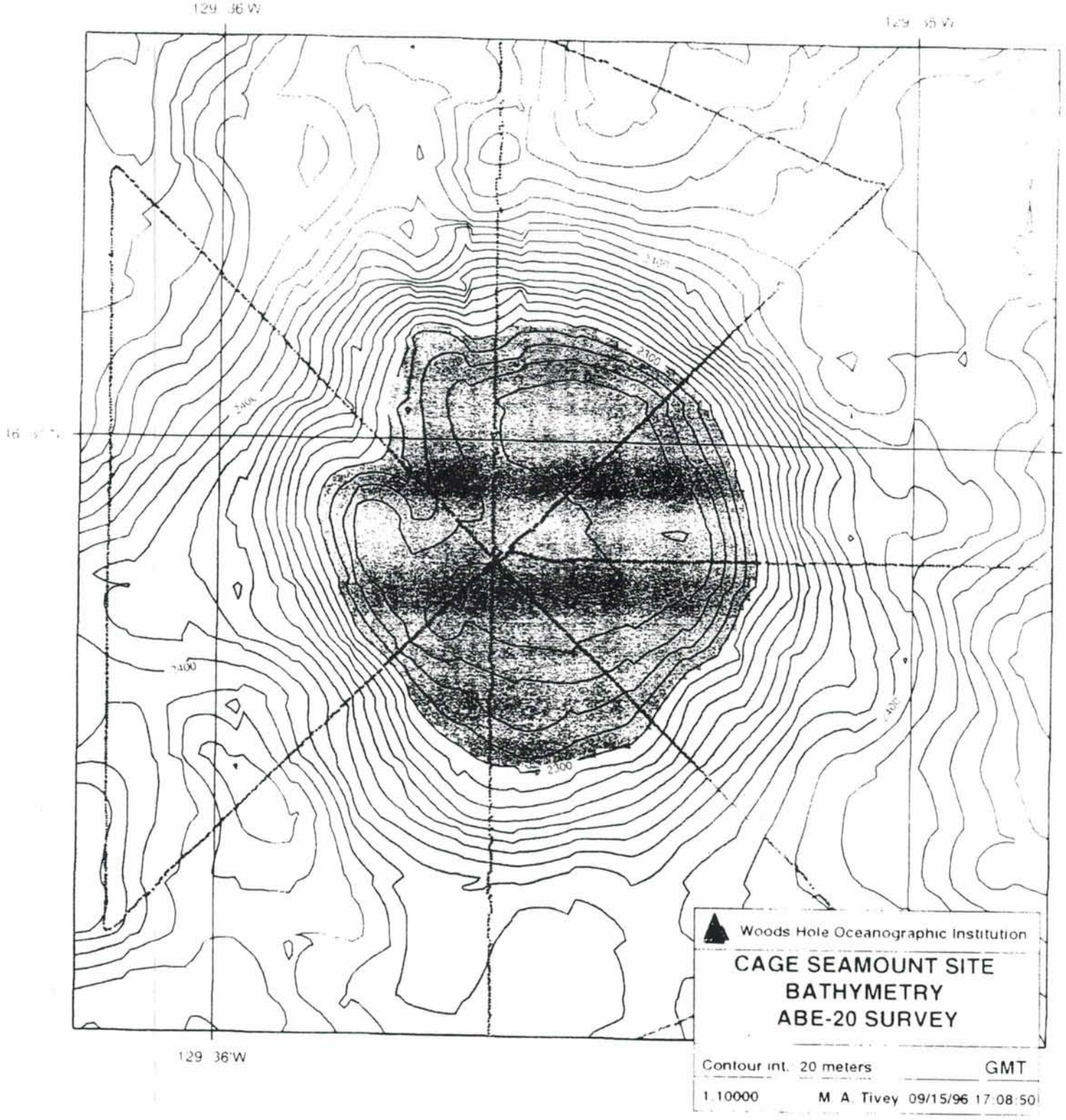
Cage Seamount

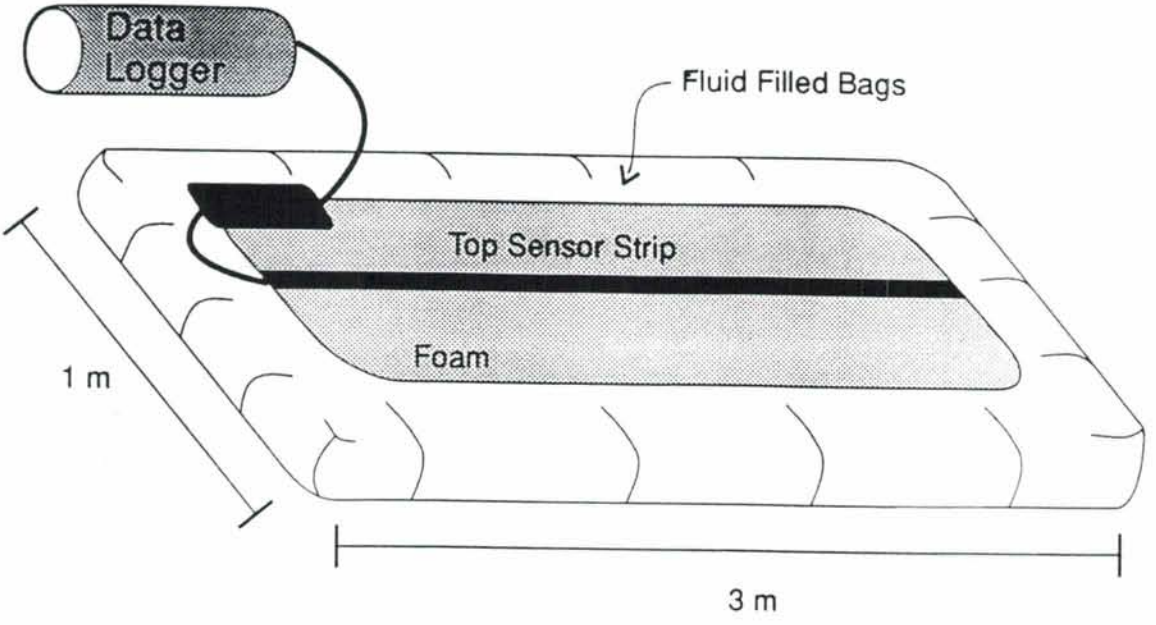


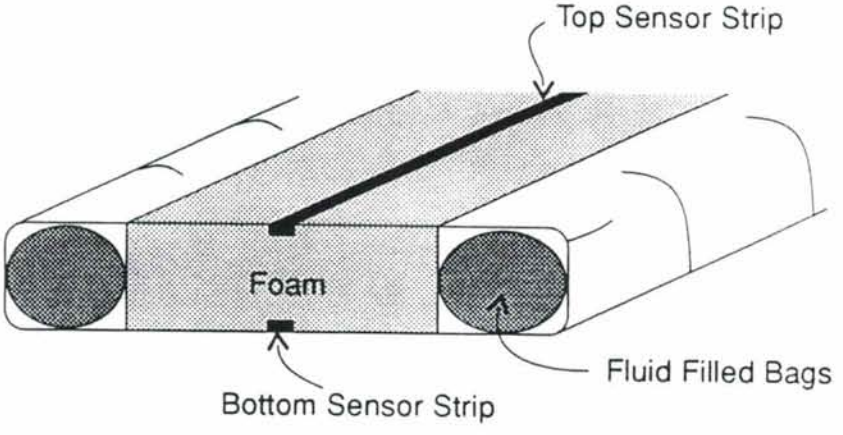
Cage Seamount



Cage Seamount

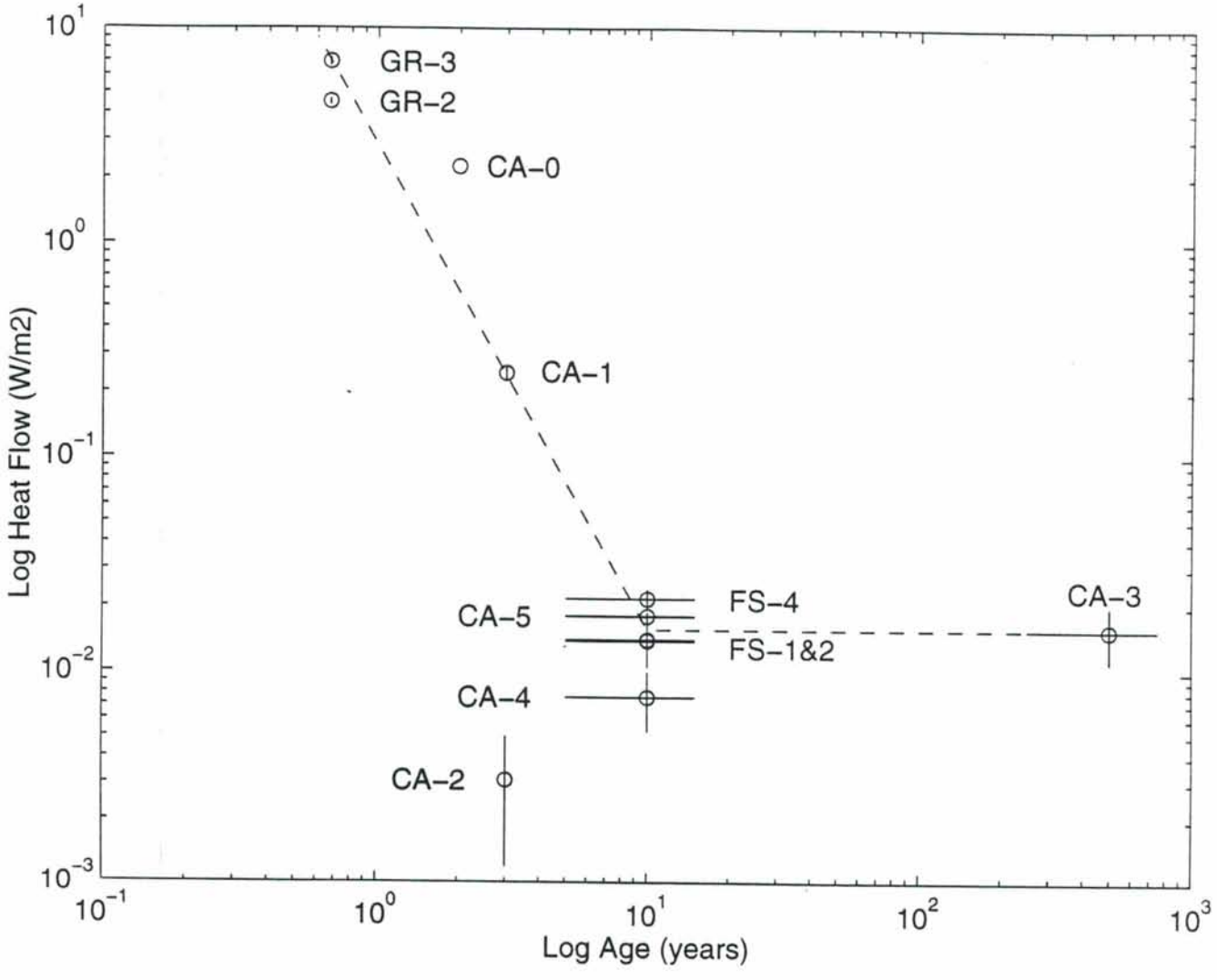



Data Logger
Fluid Filled Bags
Top Sensor Strip
Foam
1 m
3 m


Top Sensor Strip
Foam
Fluid Filled Bags
Bottom Sensor Strip

CONDUCTIVE HEAT FLOW AS A FUNCTION OF CRUSTAL AGE

measurements using the bare rock heat flow pad



THREE METER DRILL

* Built by Williamson for University of Washington, in 1990; successfully deployed on Juan de Fuca Ridge, and off-Hawaii

* lost on EPR at 9° 30' N (wrapped around ODP guidebase)

* developed the technology for diamond drilling on the sea floor. power and data transfer over long cables.

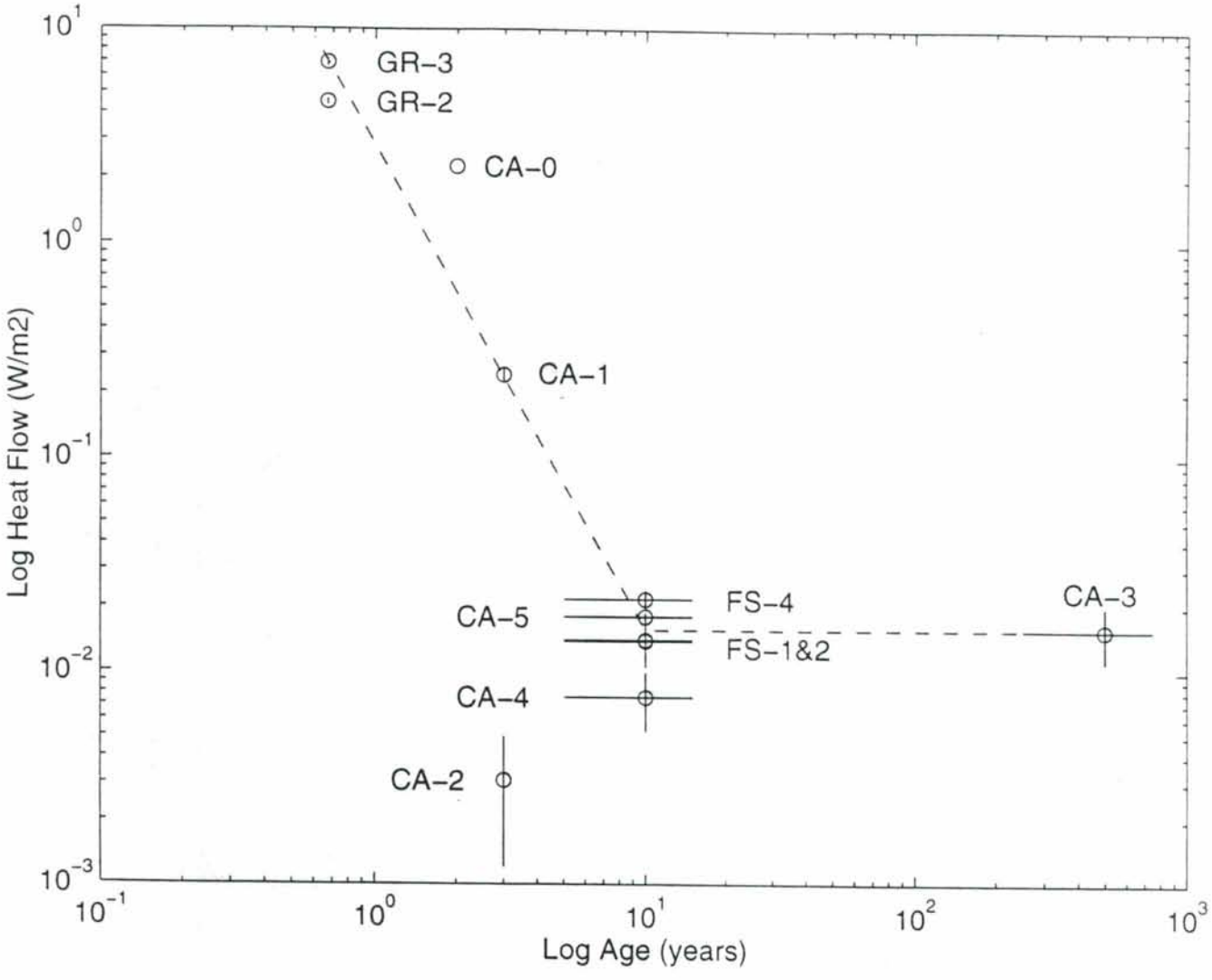
Alternative Drilling Platforms

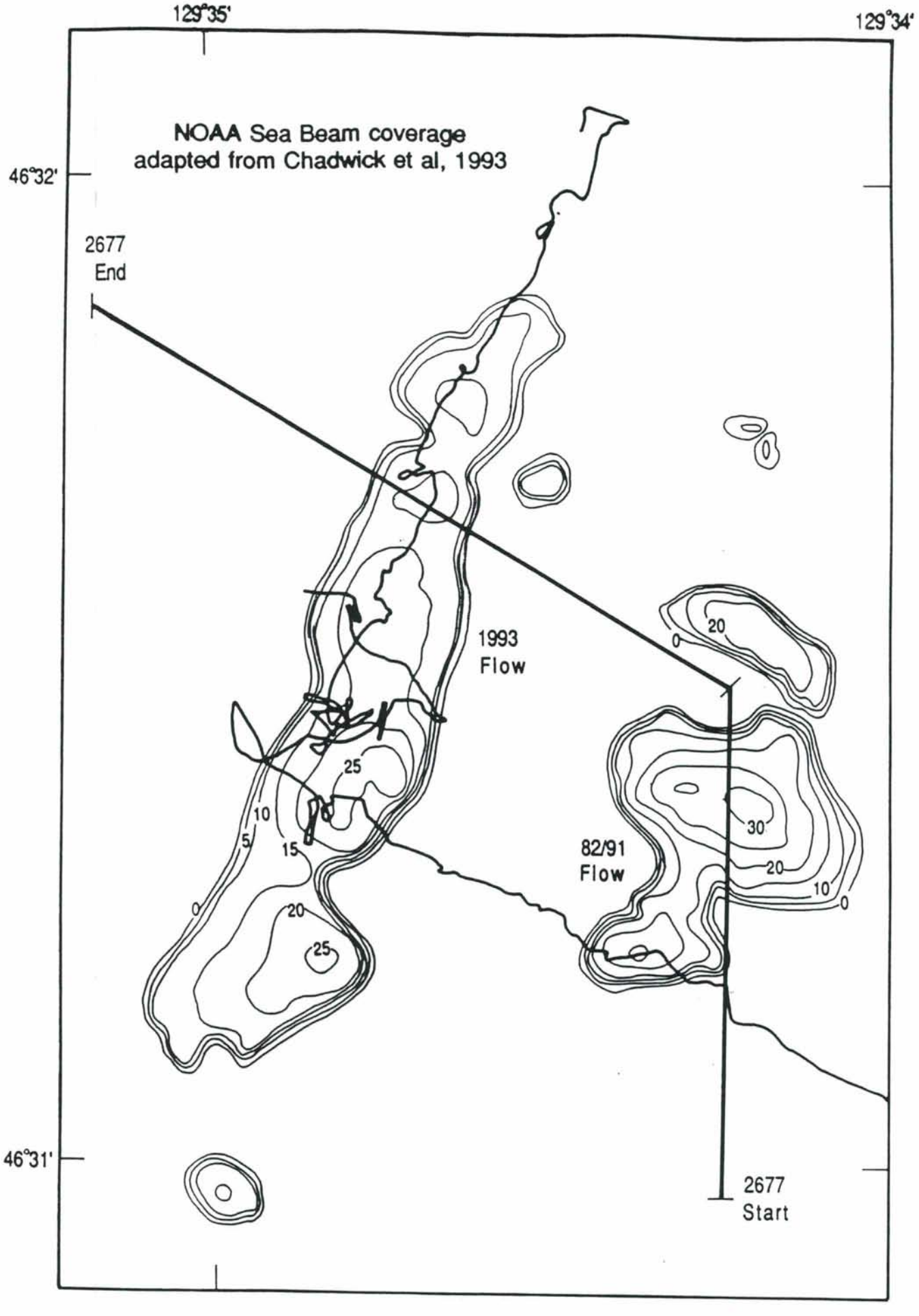
SMALL, OVER-THE-SIDE ROCK DRILLS

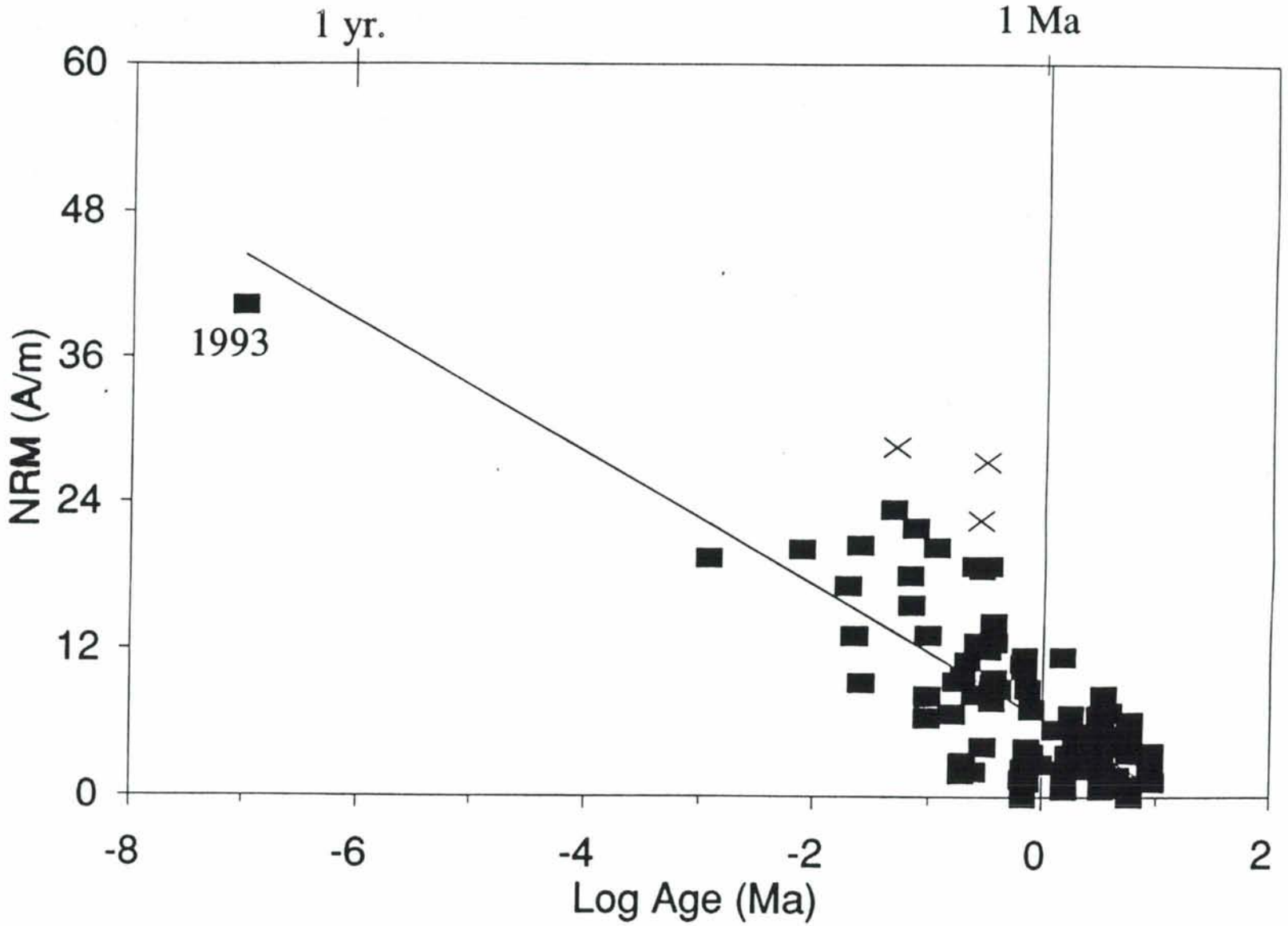
[at least the ones built by Williamson and Associates, Seattle]

CONDUCTIVE HEAT FLOW AS A FUNCTION OF CRUSTAL AGE

measurements using the bare rock heat flow pad




129°35'
129°34'
46°32'
46°31'
NOAA Sea Beam coverage
adapted from Chadwick et al, 1993
2677
End
2677
Start
1993
Flow
82/91
Flow
0
5
10
15
20
25
30



Plot of NRM of Juan de Fuca rocks vs LOG (age)

ADVANTAGES

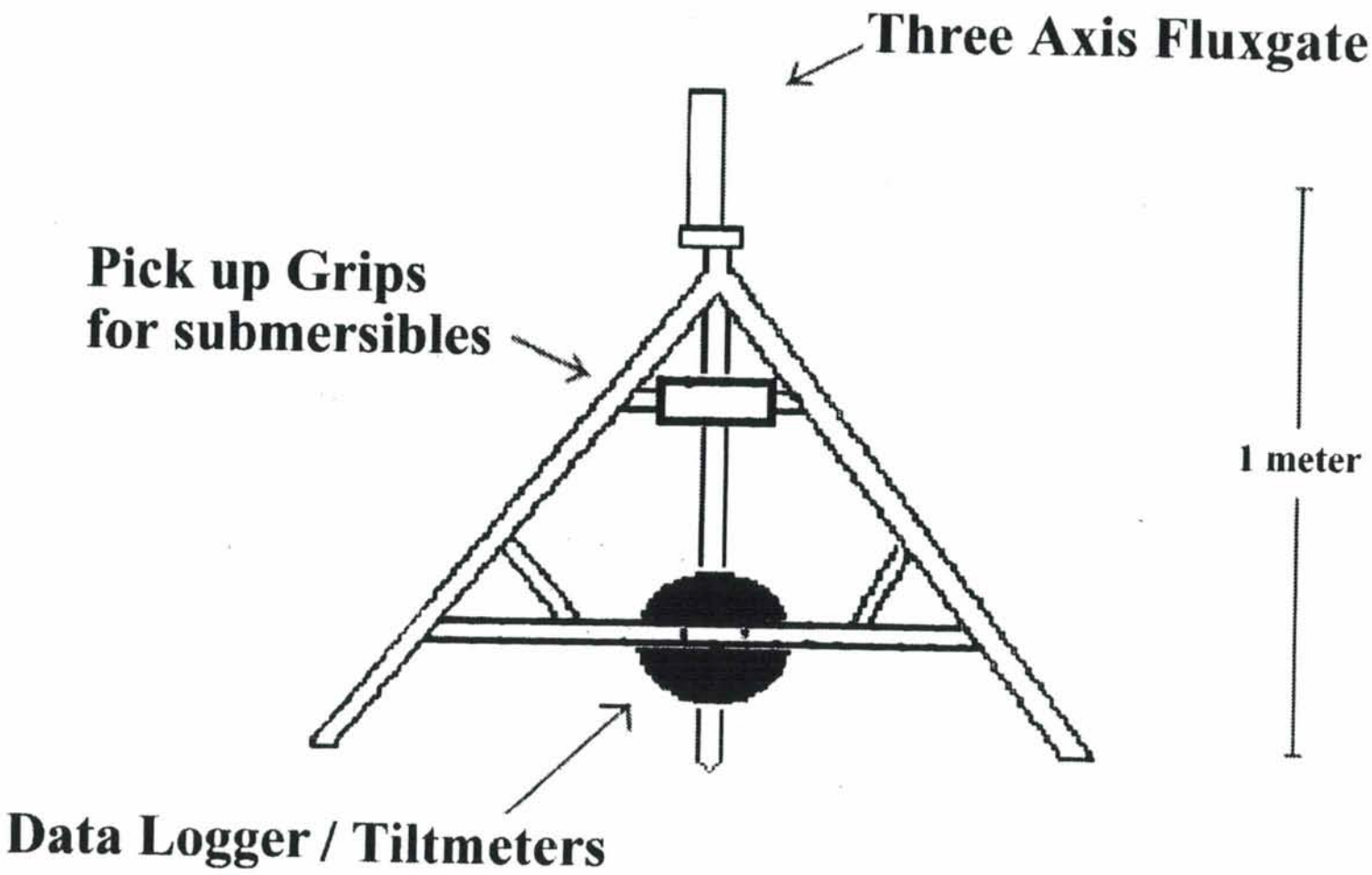
* can drill bare rock

* diamond bit (100% recovery)

* deployable from UNOLS fleet

* less in demand than RESOLUTION

* potentially shorter time constants than ODP proposals


Three Axis Fluxgate
Pick up Grips
for submersibles
1 meter
Data Logger / Tiltmeters

APPENDIX IV

Date: 04 Jun 96 17:07:17 EDT
From: Rachel Haymon <102332.3430@CompuServe.COM>
To: "dufour, rose" <shipsked@ucsd.edu>
Subject: Cruise Plan

HAYMON/MACDONALD CRUISE PLAN SUMMARY

We primary propose is to survey the narrow axial zone of the ultrafast-spreading
EPR at 17*18'-42'S using the fiber-optic ARGO II near-bottom optical/acoustic system and the AMS-120 sonar system. Our purpose is to test the hypothesis (based on ARGO data from EPR 9-10*N) that along-strike thermal gradients set up
by the segmented pattern of magma supply to fast-spreading MOR's exert primary control on the distribution and types of hydrothermal vents and vent biota, as well as on variations in fine-scale volcanotectonic characteristics along the axial zone. On the 4th order scale at EPR 9-10N, this magmatic control of hydrothermal discharge is manifested by the concentration of high-temperature vents along eruptive fissures. EPR 17*18'-42'S is a superb area for further investigation of relationships between magmatic processes and other axial processes. Along a segment of ridge only 45 kms long, seismic data show that the axial magma chamber (AMC) changes along strike from a flat-topped body at relatively constant depth to a peaked cupola ("spike") that intrudes to within 0.8 km of the seafloor at 17*27'S. This represents the most extreme along-srike
variations in thermal gradients that we know of on the MOR, and contrasts with the flat-topped AMC at EPR 9-10N. The survey we propose is designed (and will be interpreted) within the context of seismic reflection/refraction data, SeaMARC II and MR1 imaging, SeaBeam bathymetry, gravity and magnetic data, submersible observations, and extensive petrologic/geochemical data that exist already for the proposed study area and adjacent ridge flanks. These data show
that this apparently unsegmented portion of the EPR is actually partitioned into
at least six 4th-order segments (our proposed survey may reveal more), and that
the axial zone exhibits along-strike changes in morphology and some extreme along-strike changes in axial lava compositions. Ridge morphology and some visual observations indicate recent eruptive activity in part of the proposed survey area. Beyond testing ideas about coupled magmatic/hydrothermal segmentation along the MOR, we will also observe how hydrothermal and other axial zone processes are affected by ultrafast spreading rates and extreme along-strike thermal/magmatic gradients. We will determine the nature of the axial troughs found along portions of the axial zone in the proposed study area
(axial summit caldera or graben?) and investigate the development of these important axial features. To this end, we will carry out a secondary Argo survey of a hydrothermally-active portion of the axial summit graben on the segment south of the main survey area (at approx. 18.5S. Finally, we will provide a baseline survey of the fine-scale segmentation and distribution of vents and biota along a ridge segment destined for future seismic and submersible studies.

We propose to carry out a 36 day cruise that consists of: 2 days of AMS-120 surveying, 19 days of ARGO-II surveying; 2 days for ARGO II maintenance checks (required every three days, with a turnaround time of 6 hours); 2 days for deployment/surveying/ recovery of acoustic transponders used in navigation; and
11 days of transit (from Tahiti to the survey area, and then to Easter Island).
We are not proposing any ship time for additional dredge sampling of basalts or
hydrothermal deposits (beyond that of Sinton et al., 1991) because the length of

the cruise would be prohibitively long.

SeaMARC II records indicate that the axial zone is relatively narrow (<400 m) throughout the survey area. To achieve sufficient density of coverage, we plan to drive fourteen 45 km-long, axis-parallel lines through the axial zone with line spacings of 10-30 m. This will provide us with 100% saturation coverage where the axial zone is <100 m wide, ranging down to a minimum coverage of 45% where the axial zone widens to 400 m. [For the 83-km long ARGO survey at EPR 9-10*N, we achieved a maximum of 80% coverage where the axis was narrowly defined by an ASC <200 m wide, and 40% coverage for the southern third of the survey area where the location of the ridge axis was less well-defined by the structure of the axial zone].

Accurate navigation is absolutely necessary to achieve the close line spacings required for our proposed survey and to determine the relative locations of fine-scale features with respect to each other. For the proposed survey we will follow the procedures that we established for our 1989 ARGO I survey to attain a navigational precision of +5 m throughout the survey area. At the outset of the survey we will lay out a line of 11 bottom-moored acoustic transponders spaced 1 km west (or east) of the ridge axis and ~5 km apart. These will be surveyed in using GPS navigation and accurate depths at the drop points. Navigation of the ARGO II vehicle can then be acquired by ranging off successive pairs of transponder as the vehicle travels along strike.

For the proposed program, Haymon will be chief scientist at sea, and Macdonald will be co-chief scientist. The PI's will share responsibility for data acquisition and analysis. ARGO II watches require 5 people. DSOG provides 2 people per watch and the science party must supply 3 per watch. One of the watchstanders is designated as a datalogger. This person watches the real-time video and logs observations digitally in real time. In this way we can manage the huge visual dataset. The datalogger files are subsequently edited by going back to the tapes to review and verify the logged observations. By this means the classification of features is standardized and erroneous data are deleted from the files. The end product is a set of digitized and categorized GIS/ArcInfo files that can be plotted in any combination (for example, black smokers and fissures; vent communities and Age 1 lavas; etc.). This is a very powerful approach to data management that has worked beautifully for the EPR 9-10N ARGO I dataset.

Dan Scheirer has been separately funded by NSF to carry out an ancillary study of magnetics measured with a magnetometer mounted on the Argo, and to analyze high resolution bathymetry collected with a Mesotech sonar that will also be incorporated on to the Argo sled.

We will also collect CTD and transmissometer data using instruments mounted on the Argo sled and on the towing cable.

APPENDIX V

Benthic Fluxes and Sediment Irrigation on the Continental Margin, N.W. Atlantic

P.I. : Bill Martin (with Fred Sayles)

Cruise: AII 134, June / July 1996
On the NW Atlantic continental margin at 70°W,
water depths 1020 - 2500 m

Purpose: To use pore water and benthic flux measurements to estimate the recycling rates of organic and inorganic carbon and nitrogen at the sea floor; and to use the data to define the regional trend in benthic recycling rates vs. water column depth.

Use of Alvin: To deploy (1) the OSPRE, an in situ O_2 microelectrode profiling instrument, and
(2) the SQUIRTs, in situ benthic flux chambers, and
To collect cores for solid phase and pore water measurements

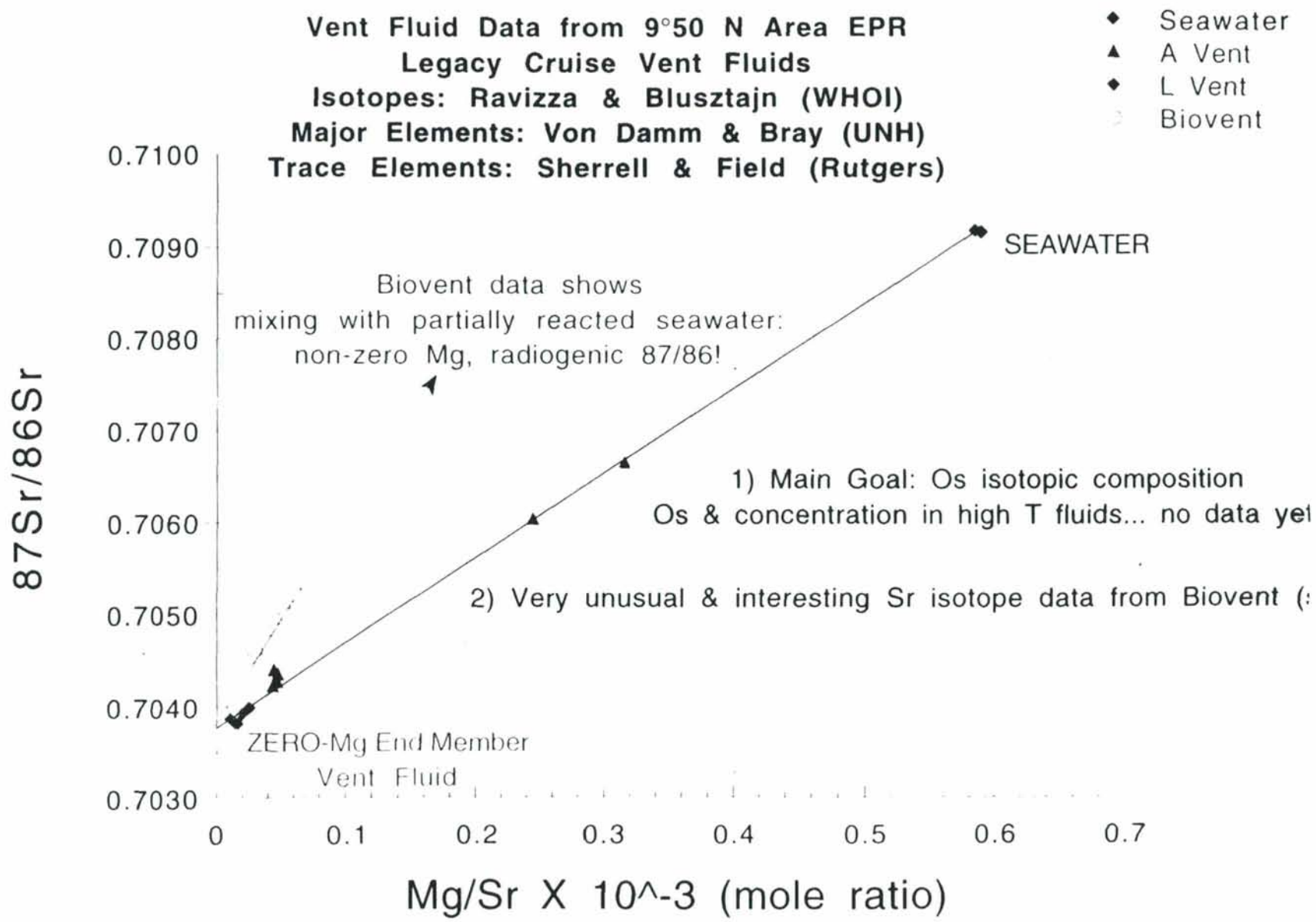
Alvin allowed us to:

- measure ~ 25 pore water O_2 profiles at each of 4 sites, an unprecedented degree of replication that will lead to strong conclusions about regional trends. We have found, contrary to prediction, that benthic oxygen consumption does not decrease over the water depth, 1020 - 2500 m.

- make our set of O_2 profile, flux, pore water, and solid phase measurements on small, well-defined spatial scales, allowing (1) analysis of scales of spatial variability, and (2) more confident combination of results from different techniques.

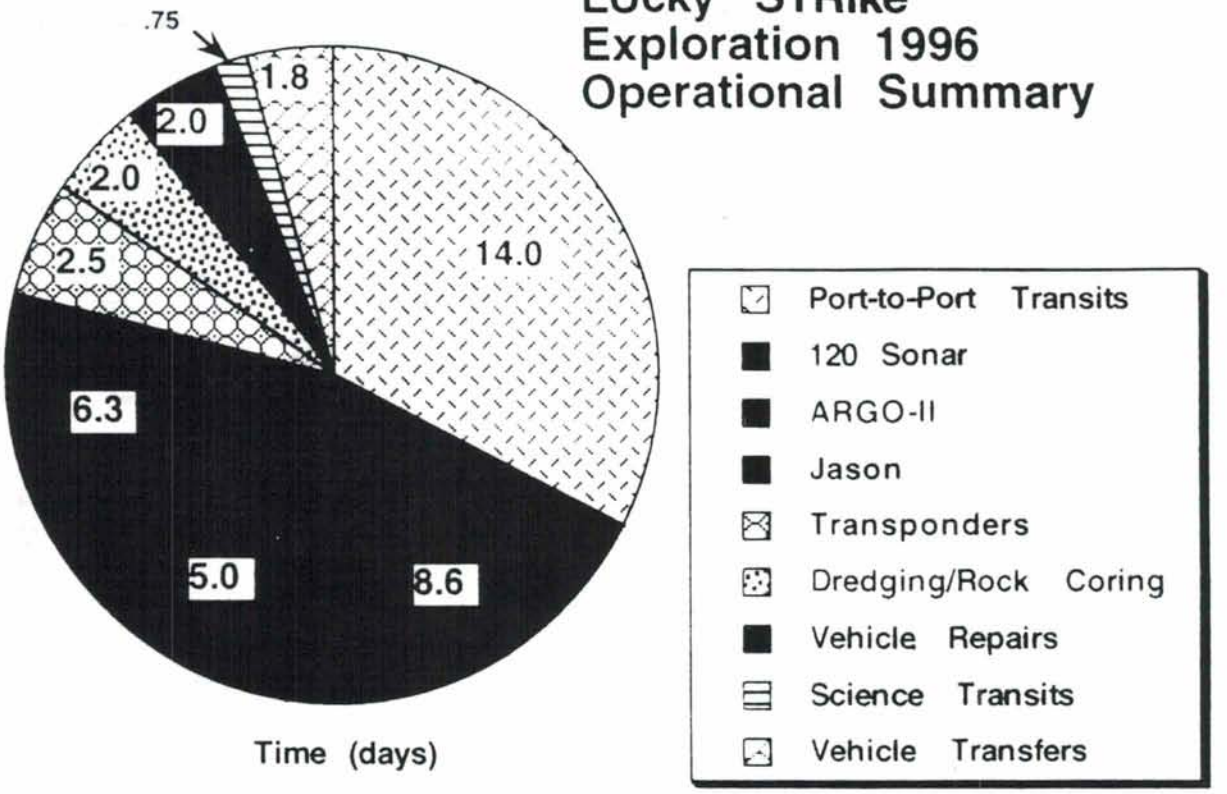
The results will ultimately be combined with a similar data set , to be collected in August 1997, from 100 - 1000 m water depth, and with previously collected data to define the regional benthic recycling vs. water depth trend from 100 - 4500 m water depth.

APPENDIX VI

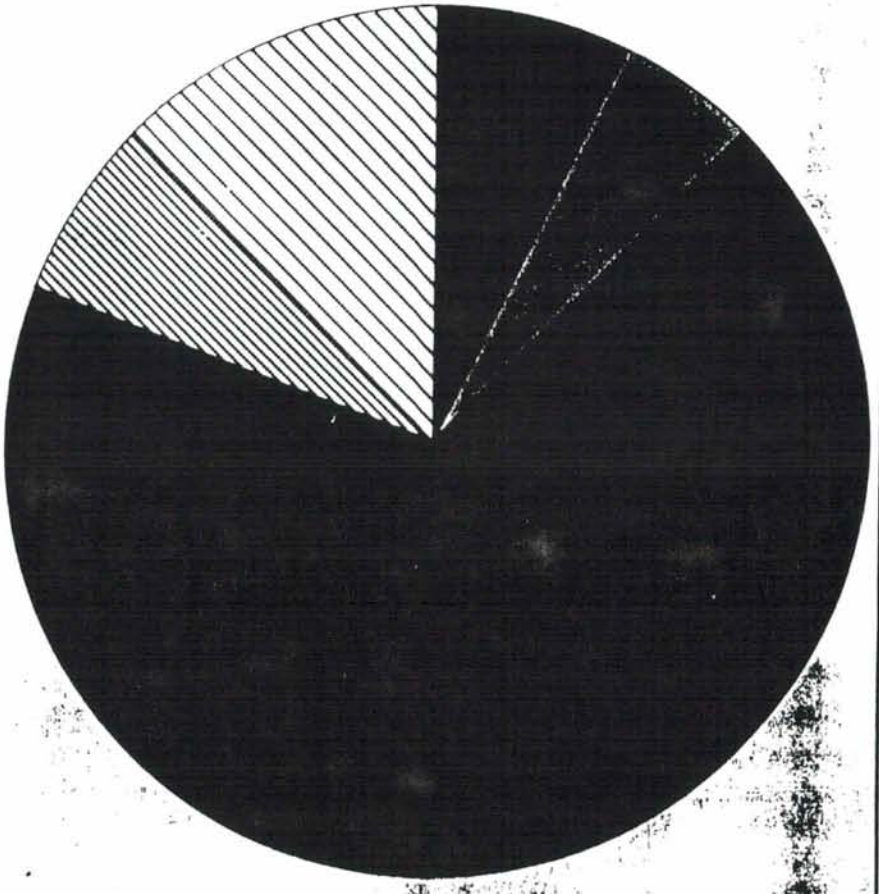

Vent Fluid Data from 9°50 N Area EPR
Legacy Cruise Vent Fluids
Isotopes: Ravizza & Blusztajn (WHOI)
Major Elements: Von Damm & Bray (UNH)
Trace Elements: Sherrell & Field (Rutgers)
Seawater
A Vent
L Vent
Biovent
87Sr/86Sr
0.7100
0.7090
0.7080
0.7070
0.7060
0.7050
0.7040
0.7030
SEAWATER
Biovent data shows
mixing with partially reacted seawater:
non-zero Mg, radiogenic 87/86!
1) Main Goal: Os isotopic composition
Os & concentration in high T fluids... no data yet
2) Very unusual & interesting Sr isotope data from Biovent (
ZERO-Mg End Member
Vent Fluid
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Mg/Sr X 10^-3 (mole ratio)

APPENDIX VII

LUSTRE '96
LUcky STRike
Exploration 1996
Operational Summary

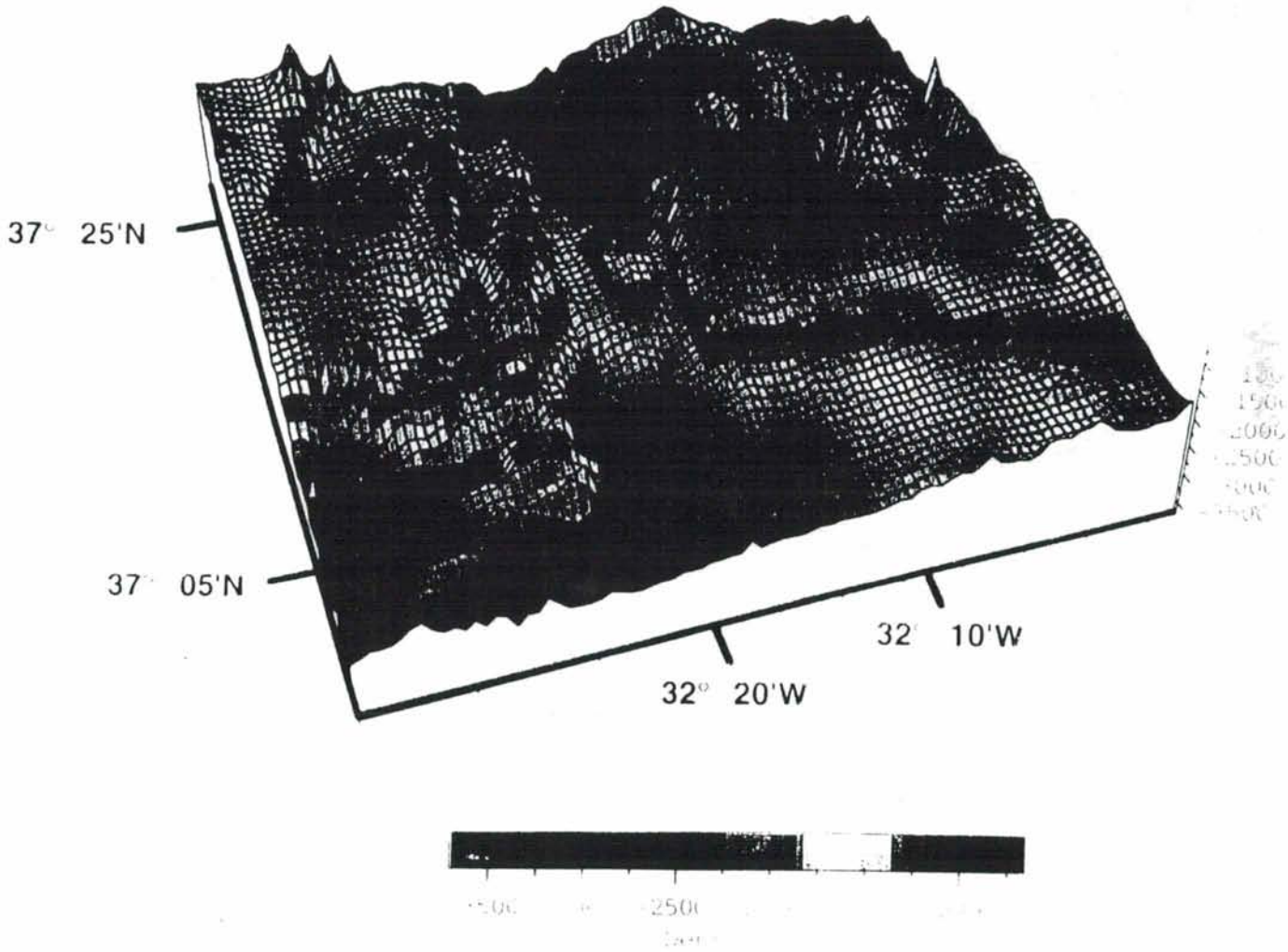


Summary of Science and Vehicle Operations
For All Jason Lowerings LUSTRE '96
Lucky Strike - 1996 R/V Knorr 145-19



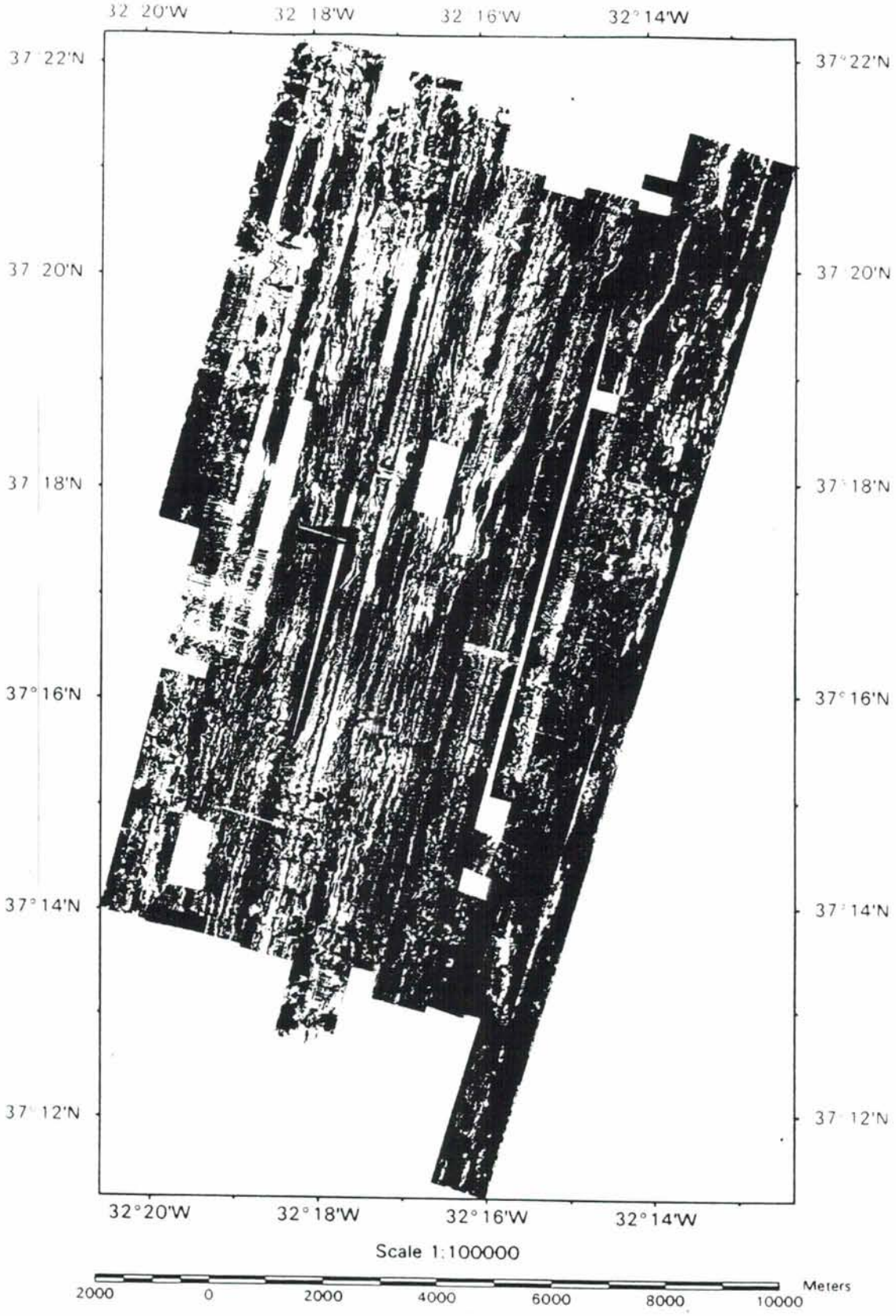
Total On-Bottom Time: 89hr 31min

- Water Sampling
- [illegible]
- Shrimp Slurping
- Sediment Push Coring
- Sulfide/Basalt Sampling
- Imaging/Exploration
- Troubleshooting
- Transits to Elevator
- Equipment Transfers at Elevator


37° 25'N
37° 05'N
32° 20'W
32° 10'W

LUSTRE '96

DSL120 Northern Survey - Along Axis



APPENDIX VIII

MOLECULAR CHARACTERIZATION AND REGULATION OF AMMONIA ASSIMILATION IN CHEMOAUTOTROPHIC PROKARYOTE-EUKARYOTE SYMBIOSES

ONR N00014-91-J-1489
NSF OCE - 9504257

Principal Investigator: Colleen M. Cavanaugh
Postdoctoral Fellow: Raymond Lee

Objectives

- Determine pathways and mechanisms of organic nitrogen synthesis by deep-sea hydrothermal vent communities
- Assess the influence of geochemical processes on the capacity for organic nitrogen synthesis.

Approach

- Characterize nitrogen assimilation pathways in vent symbioses by enzyme activity measurements and DNA and immunoblot analyses.

Results

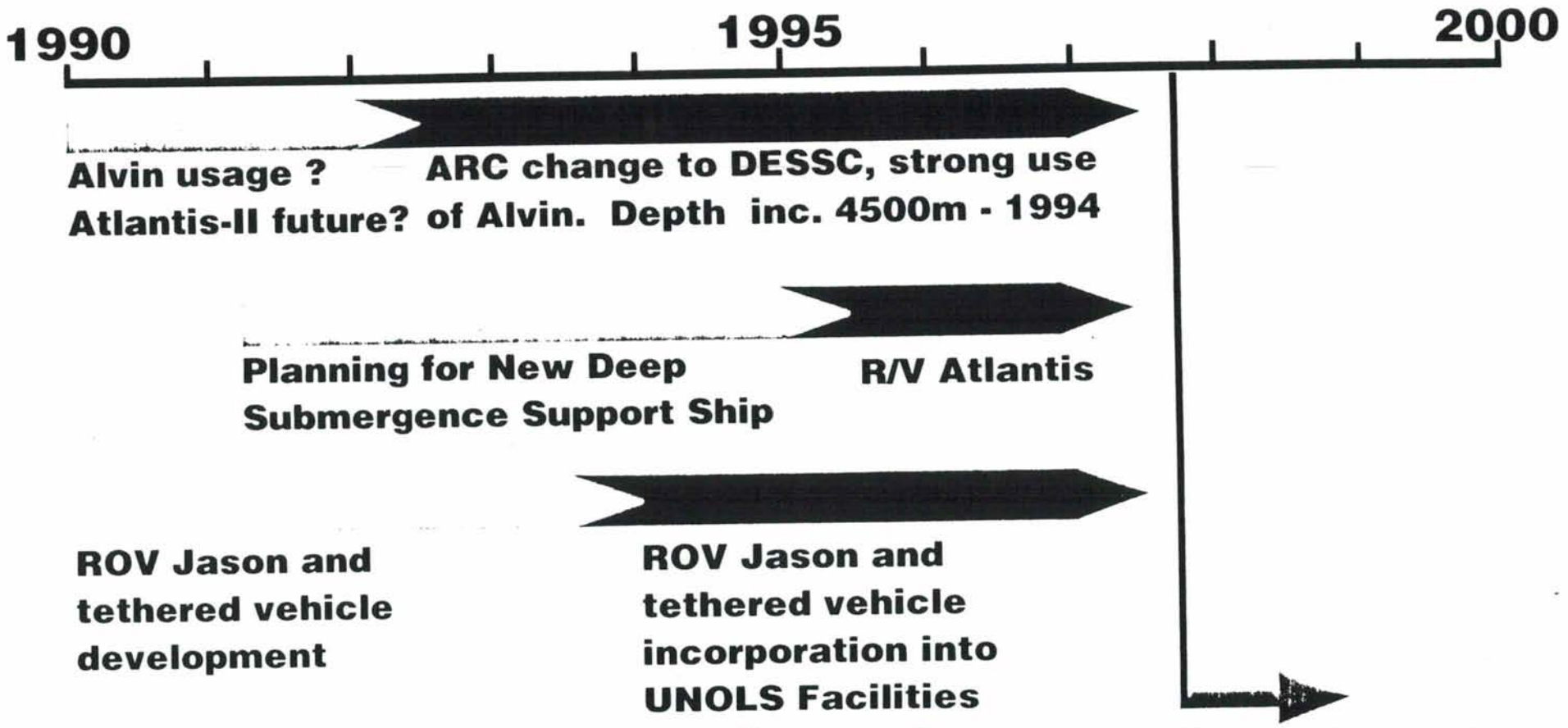
- Activities of key enzymes (glutamine synthetase (GS), glutamate dehydrogenase (GDH), and nitrate reductase (NR)) involved in ammonia and nitrate assimilation by free-living bacteria and other autotrophic organisms are present in vent symbioses.
- Differences between species in capacity for symbiont-based sulfur-oxidation and carbon fixation correlate with activities of GS, GDH, and NR.
- Based on Southern hybridizations and immunological detection, symbiont GS of all vent symbioses tested is a dodecameric type I form found in many species of free-living bacteria.
- The capacity for nitrogen assimilation in the vent tubeworm, *Riftia pachyptila*, is affected strongly by proximity to active venting. Worms collected at a low temperature site exhibited a drastic reduction in NR activity, GS activity in host tissue, and symbiont GS protein.

APPENDIX IX

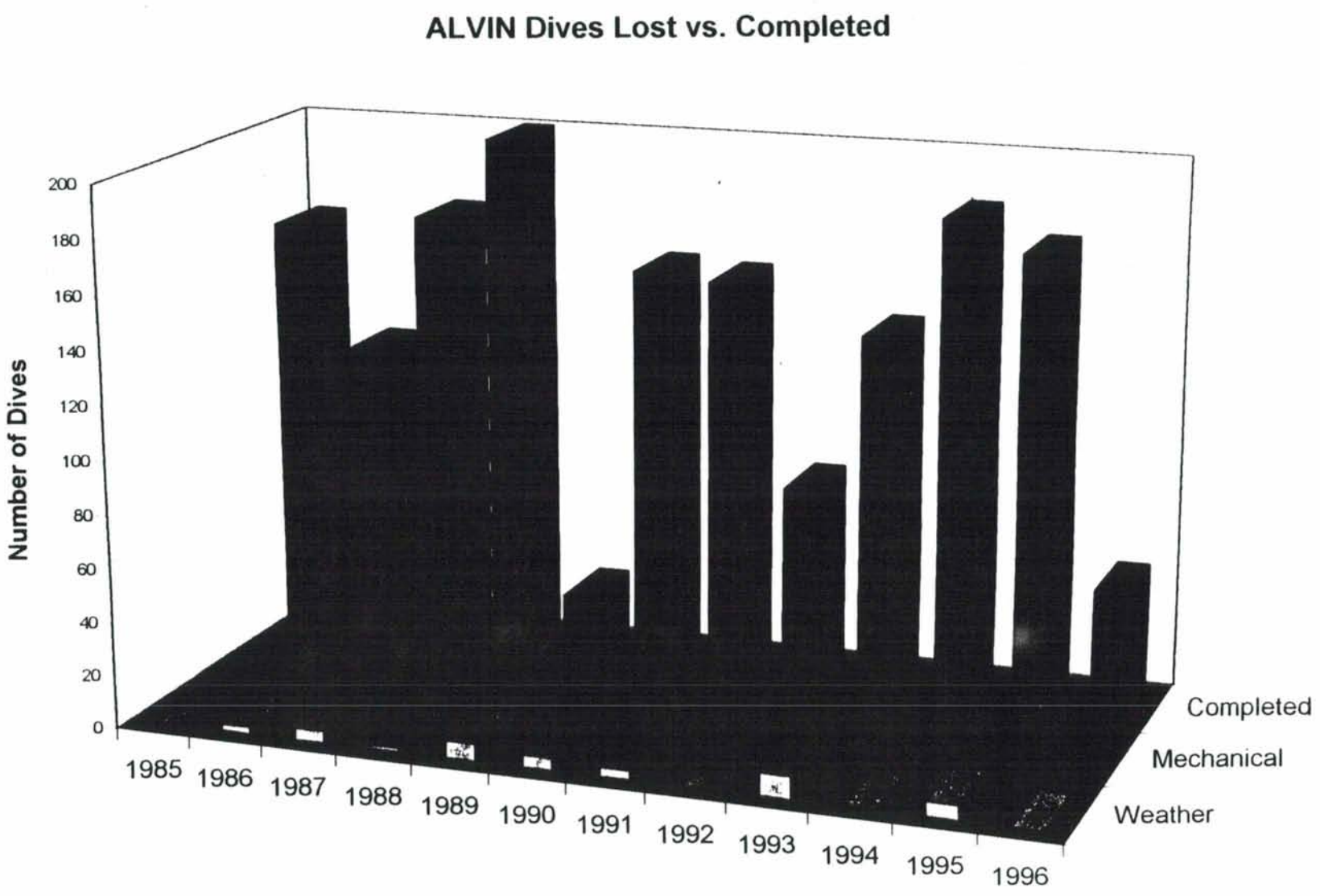
December 1996
DESSC Meeting

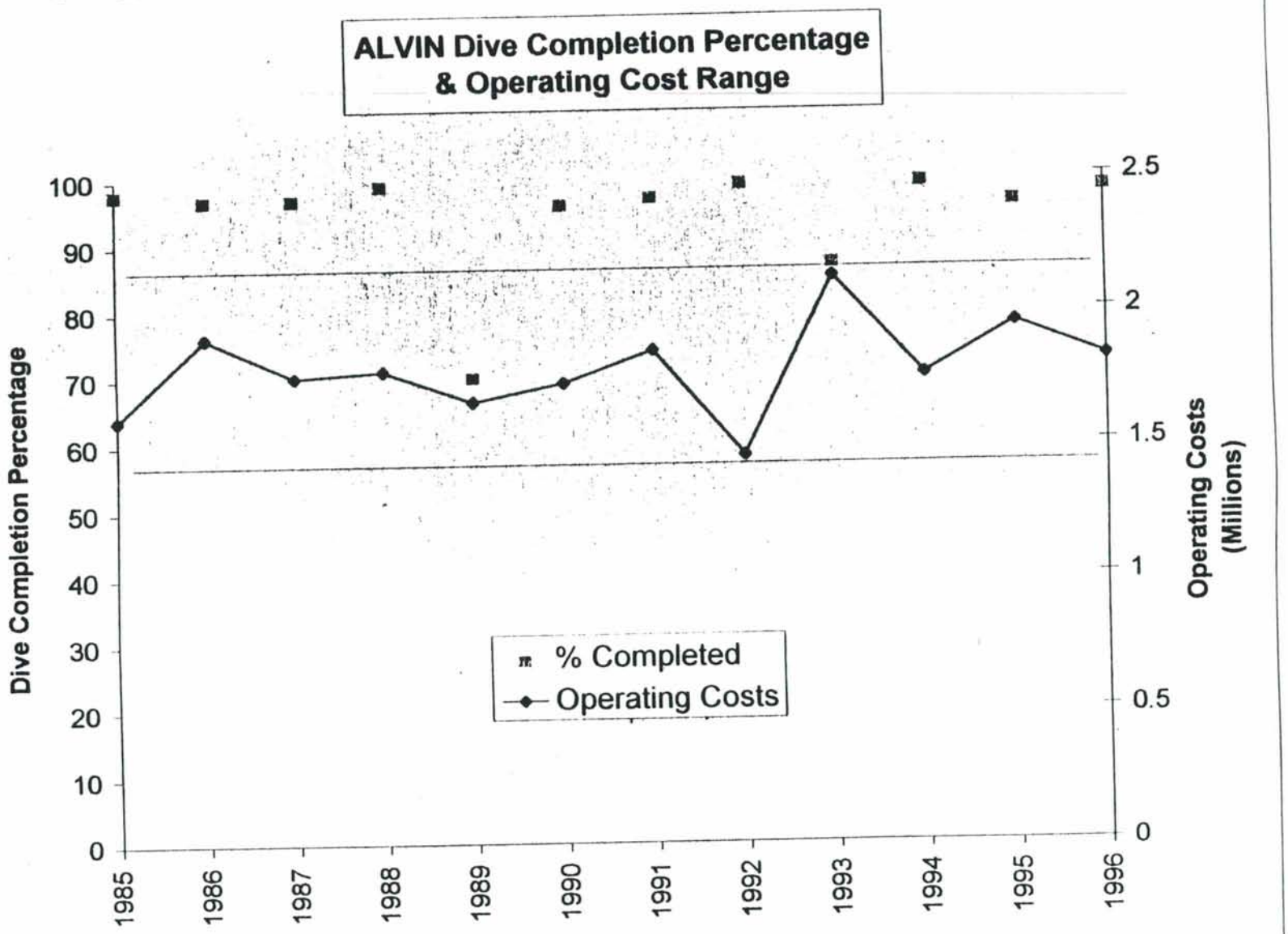
Deep Submergence Group

Woods Hole Oceanographic Institution



U.S. National Deep Submergence Facilities - Where we have been & Where we are going


ALVIN Dives Lost vs. Completed
Number of Dives
200
180
160
140
120
100
80
60
40
20
0
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
Completed
Mechanical
Weather



WHOI Marine Ops
9/96

ALVIN - 1996

- **Days at Sea:** **86**
- **Assigned Operating Days:** **78**
- **Scientific Cruises:** **5**
- **Dives Completed:** **49 of 50**
- **Average Dive Duration:** **7.2 hr**
- **Average Bottom Time:** **4.7 hr**
- **Reasons for Dive Termination (final 17 dives):**

  16 Work Complete
  1 Ran Out of Time

ROVs - 1996

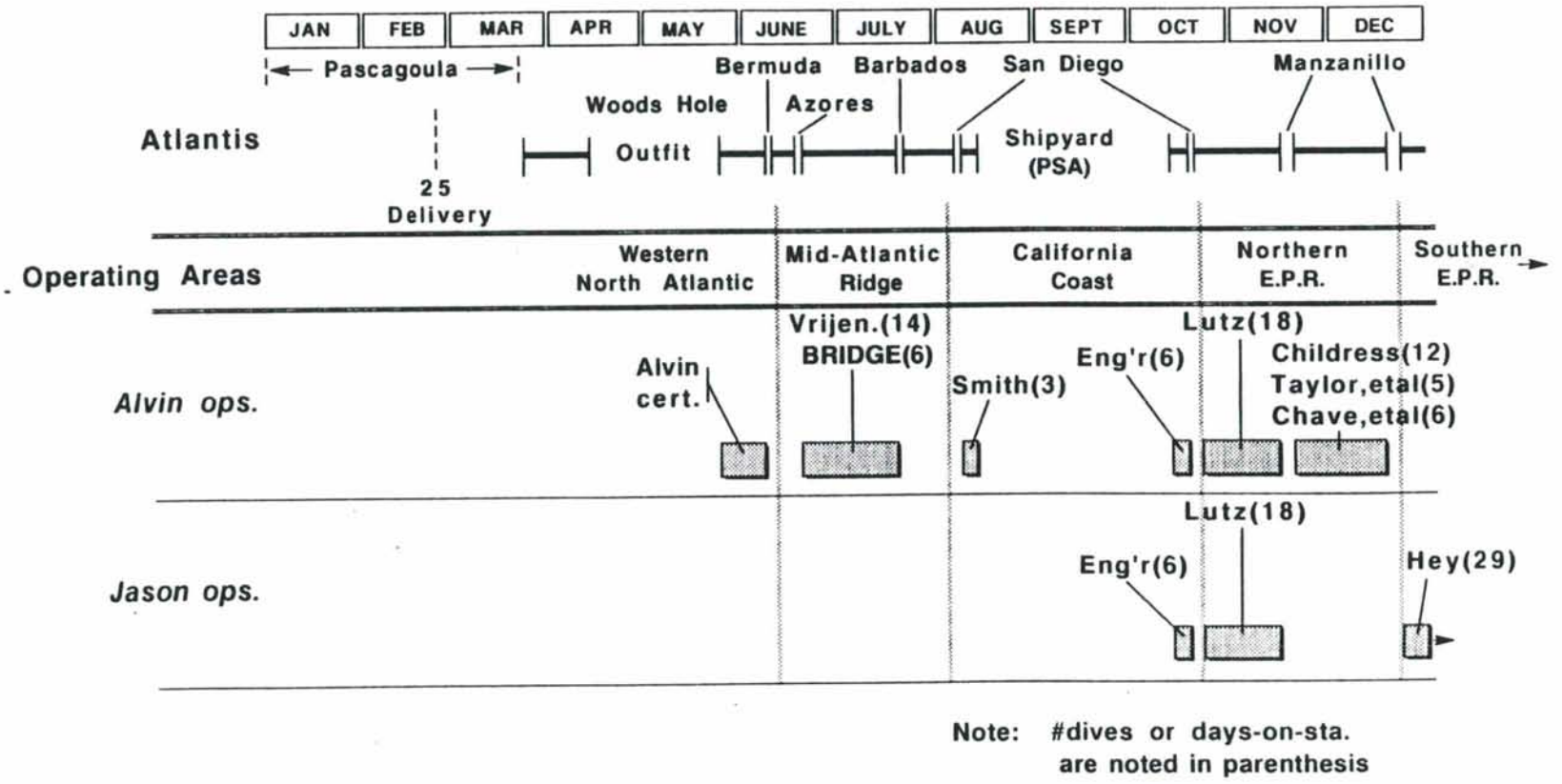
- **Luster '96 (Fornari/Humphris) R/V KNORR**
  - On Bottom:
    7.7 days of DSL120
    4.9 days of Argo-II
    4.7 days of Jason
  - Transponders launched/surveyed: **25**
    Hydrothermal water samples: **30**
    Biological sample containers: **11**

- **TN-064 (Johnson/Tivey) R/V THOMPSON**
  - On Bottom:
    8 days of Jason
  - Transponders launched/surveyed: **19**
    Magnetometers recovered/deployed: **5/4**
    Thermal blanket deployments: **13**
    Rock samples (kg): **118**

- **Sojourn (Haymon/Macdonald) R/V MELVILLE**
  - On Bottom:
    3 days of DSL120
    15 days of Argo-II
    0.4 days of Medea
  - Transponders launched/surveyed: **18**
    Length of ridge crest surveyed (km): **137**
    Electronic still images: **96,112**
    OBS recovered with Medea: **2**

1997 R/V ATLANTIS 1997

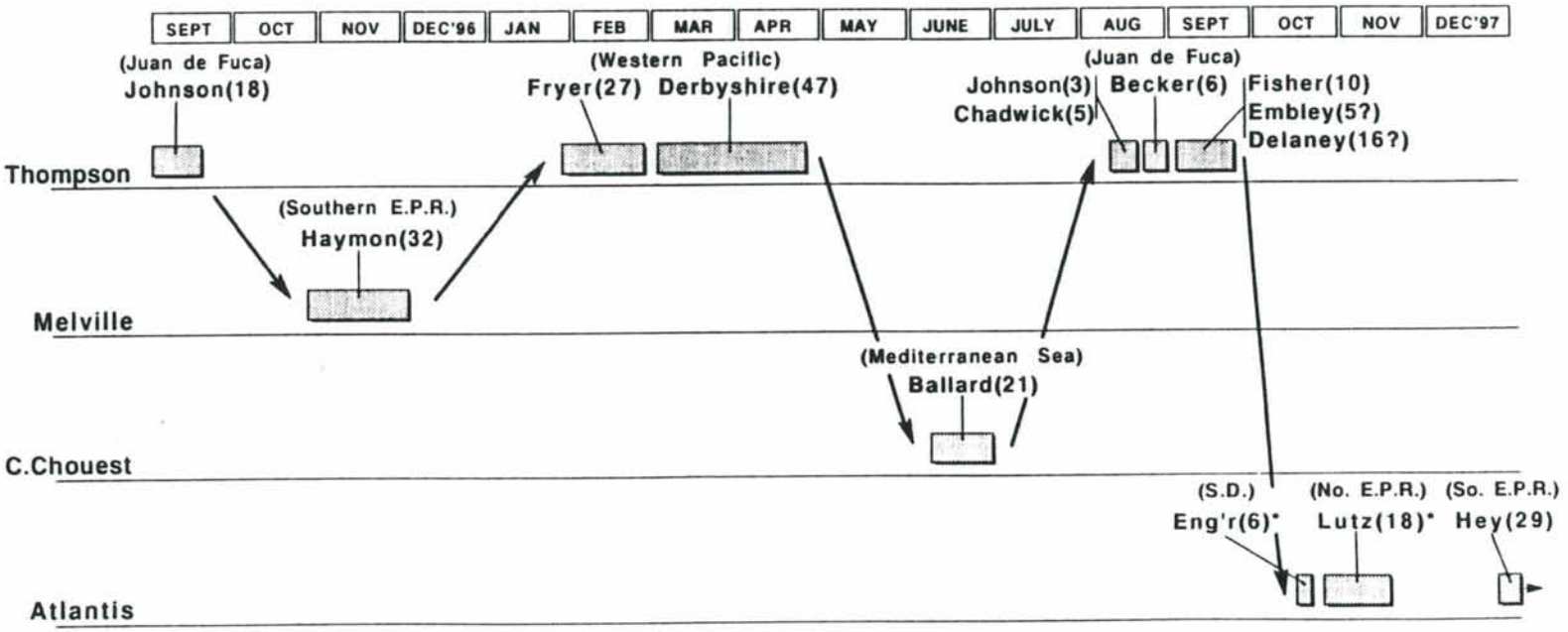
Proposed Ship Schedule



Note: #dives or days-on-sta.
are noted in parenthesis

DAM-12/10/96

1996 & 1997
Jason/Argo/DSL-120



* Potential joint *Alvin* ops.

Note: #dives or days-on-sta. are noted in parenthesis

1998
R/V ATLANTIS
Funded Alvin/ROV Dive Requests

Southern East Pacific Rise

P.I.	# sci.days	Vehicles
R. Hey, UH	29	DSL-120
J. Sinton, UH	25	Alvin + DSL-120
M. Lilley, UW	27	Alvin
R. Vrijenhoek, Rutgers	14	Alvin
J. Lupton, PMEL *	20	Alvin + Jason
T. Urabe, JGS **	7	Alvin
Other ***	85	Alvin + Jason + 120

* Pending proposal to NOAA

** Pending proposal to SAR, Japan

*** Total pending science days proposed to NSF

Northern East Pacific Rise

P.I.	# sci.days	Vehicles
vanDover/Chave. UA (2nd of 2 yrs)	6	Alvin
R. Lutz, Rutgers (2nd of 3 yrs)	23	Jason

Equatorial Pacific (Hess Deep)

P.I.	# sci.days	Vehicles
J. Karson/Duke	20	Alvin + Jason

DAM -12/10/96

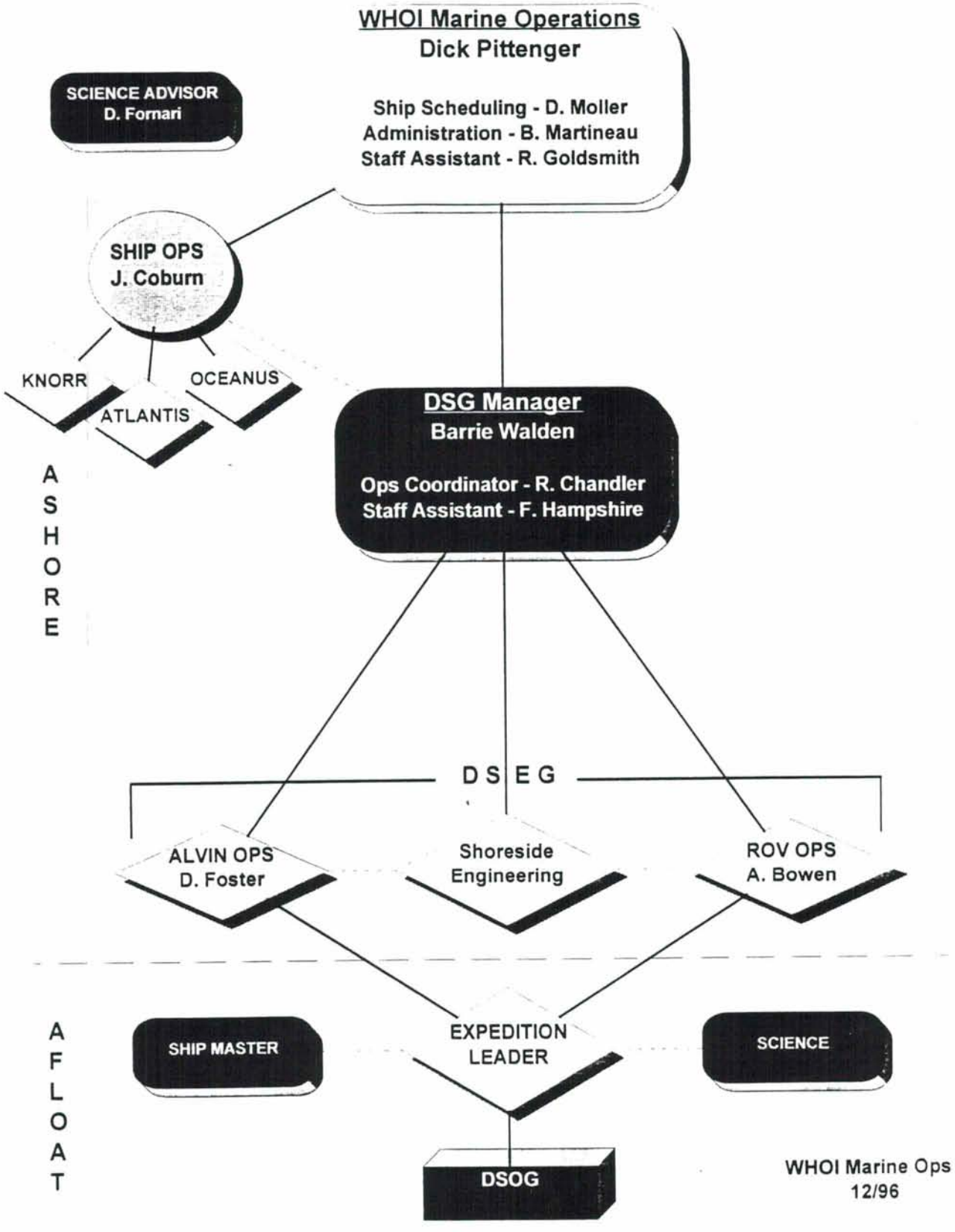
APPENDIX X

Integrated Deep Submergence Plan

- *Integration of ALVIN and ROV Programs*
- *Plan for Shore Based and Shipboard Operations Draft*
- *Ops Scenarios for Combined and/or Fly-away Use*
- *DSG Communications*

NATIONAL DEEP SUBMERGENCE FACILITY

Personnel

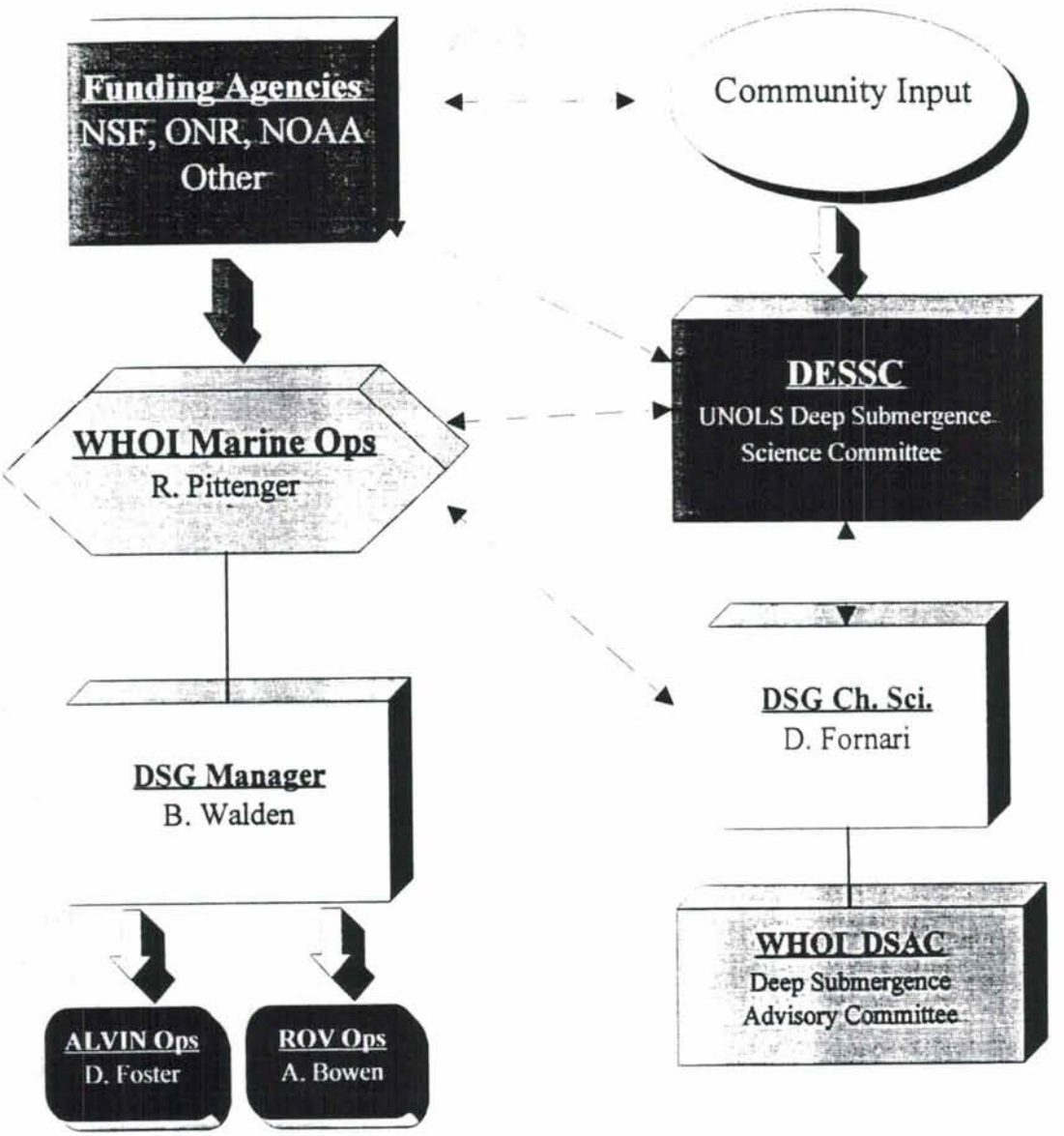


WHOI Marine Ops
12/96

DEEP SUBMERGENCE FACILITY

Functional Relationships

DESSC / WHOI / Funding Agencies



WHOI Marine Ops
12/96

Integrated Deep Submergence Facility

Management Issues

- Advance planning and scheduling of deep submergence science programs are necessary for cost-effective, integrated facility operations and efficient management of personnel.
- Synergistic- and cost-benefits accrue from operating all the National Facility deep submergence vehicles from R/V ATLANTIS, however, maintaining a "fly-away" capability for ROV and tethered vehicles ensures flexibility to accommodate science programs in diverse geographic settings.
- Projected operational models, facility costs and scheduling impacts require well-established protocols between federal funding agencies, UNOLS and WHOI. Updating and revision of the Memorandum of Understanding between the federal supporting agencies should accommodate the new integrated nature of the U.S. Deep Submergence Facility and projected future operations.
- Adequate personnel and engineering support and long-range planning for vehicle and equipment upgrades should be factored into the continued support structure for the National Deep Submergence Facility.

Integrated Deep Submergence Facility

Operational Issues

Joint Vehicle Operations & Safety
Initial Recommended Guidelines

- To ensure safety of Alvin and ROV/tethered vehicle personnel and systems, a 24-hour switch-over period should be factored into joint-vehicle science/operational plans. As personnel gain experience with joint operations, we hope to reduce, somewhat, this initial period.
- Switch-over times for ROV and tethered vehicles will depend on various operational and logistical circumstances during a cruise, but for general science planning the following numbers may be used: Jason to Argo-II and vice versa - 12-18 hrs, DSL-120 sonar to either Jason or Argo-II and vice versa - 6-12 hrs. These times are based on shared use of vehicle sensors and telemetry systems for Jason and Argo, and experience during 1996 operations.
- It is important that PIs inform WHOI-DSG early of special requirements for their cruise so that they can be incorporated into facilities planning.

Integrated Deep Submergence Facility

Operational Issues

Joint Vehicle Operations & Safety
Initial Recommended Guidelines

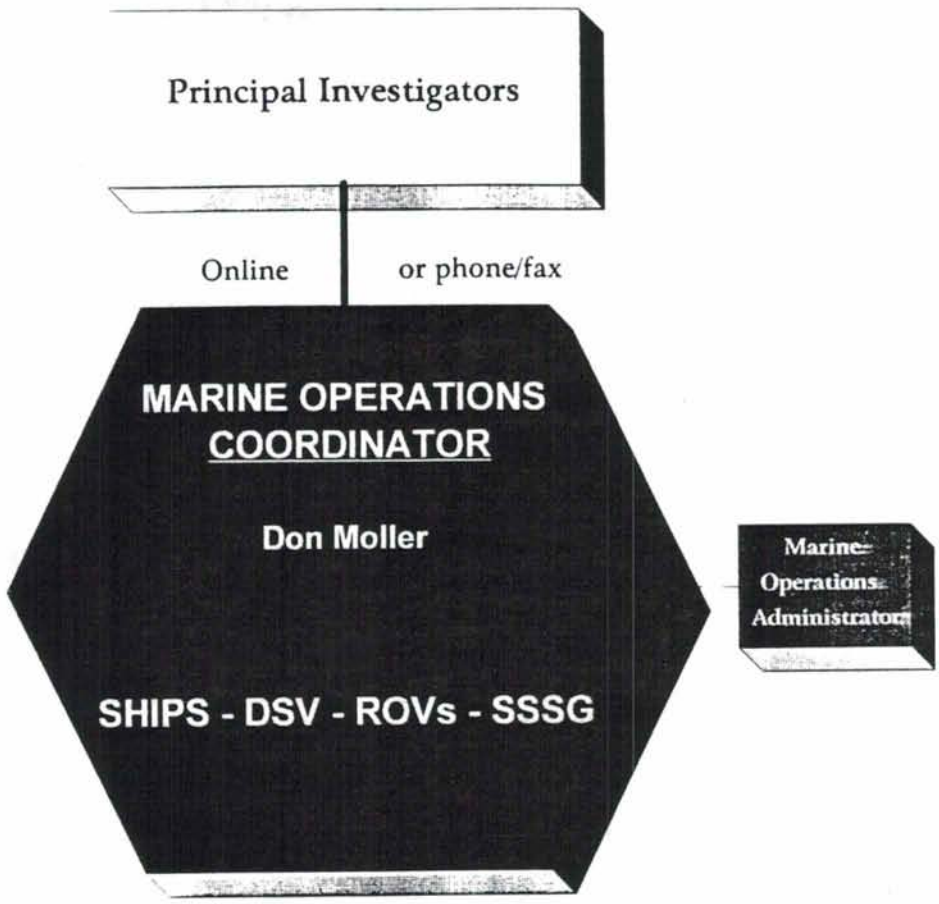
- The at-sea operations of deep submergence vehicle personnel and facilities will be planned in accordance with the proposed/funded vehicle complement requested by the PI. Under normal circumstances only those vehicles requested/funded will be available during a cruise. WHOI-DSG will do all possible to accommodate to exceptional contingency situations in consultation with the funding agencies.

- ROV Jason, Argo-II and the DSL-120 sonar <u>are not</u> "night-time" survey vehicles.

WHOI MARINE OPERATIONS

Centralized

Cruise Preparation and Science Liaison



- SINGLE POINT OF CONTACT
- NO HAND OFFS -- Coordination stays with this office through all stages

  -Planning
  -Scheduling
  -Mobilization
  -De-mobilzatio
  -Billing

WHOI Marine Ops Communication Path

Investigators browse
WHOI Marine Ops web site
www.marine.whoi.edu

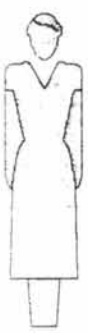
- On-line manuals, schedules and information
- Vessel/vehicle specifications
- Cruise planning questionnaire submission

Don Moller
Marine Operations Coordinator

- Collates PI requirements
- Distributes cruise prospectus
- Responds to questions/problems

Information Flow

Scientists



Shipboard Ops Groups

Shoreside Engineers

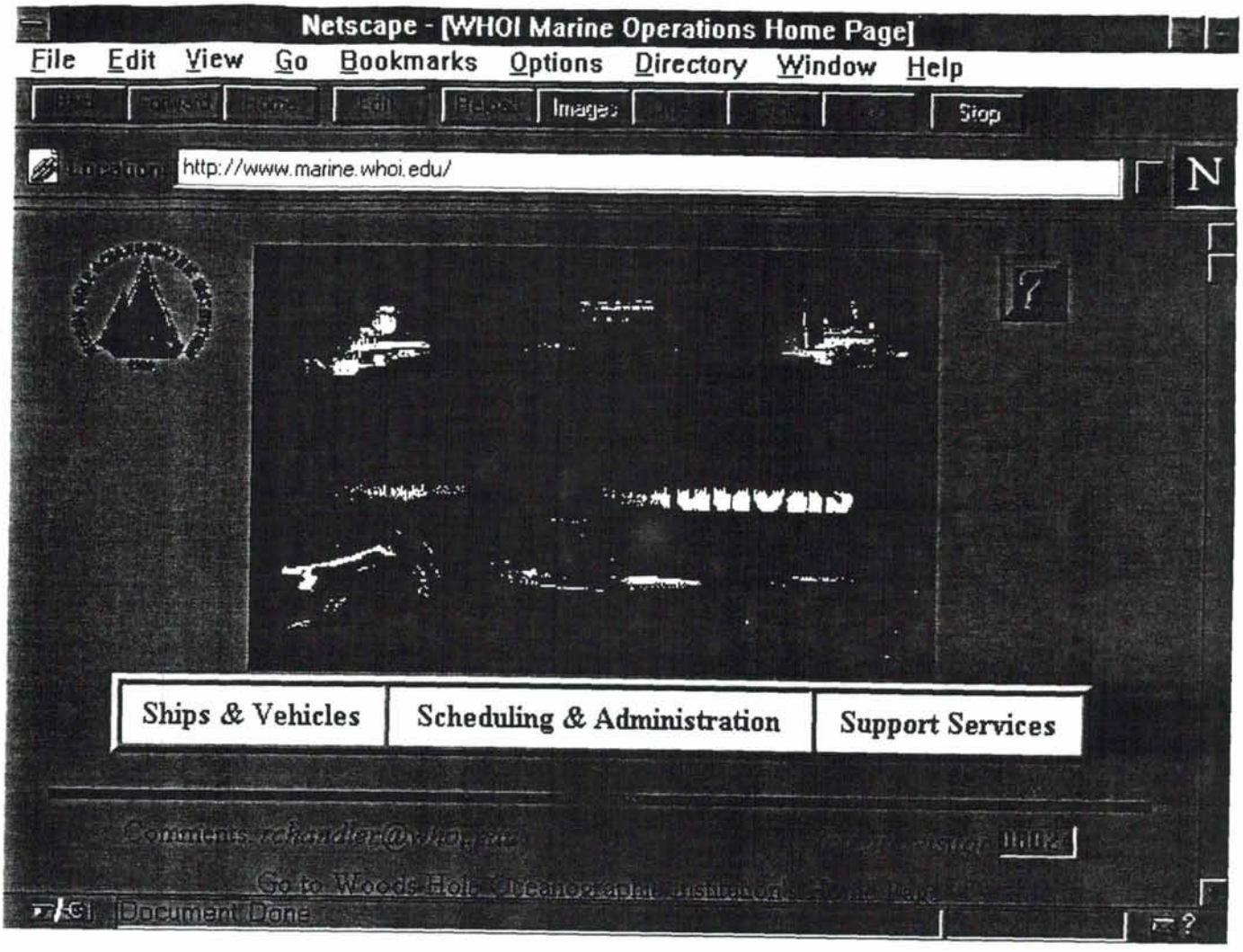
Communication Tools

WWW

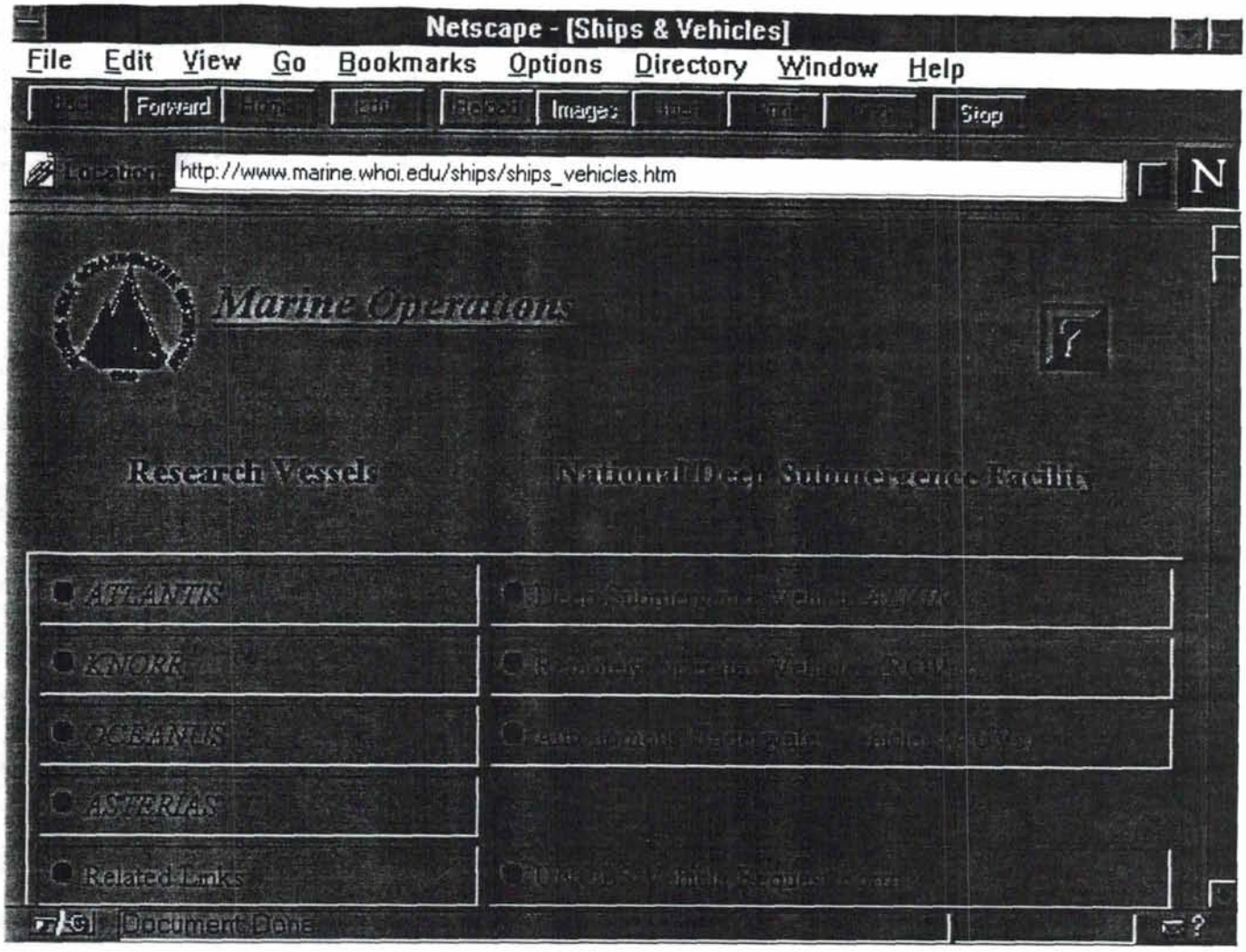
- Electronic editions of all reference material
- Instant submission/receipt of requirements
- Timely publishing of all cruise-related data

Lotus Notes

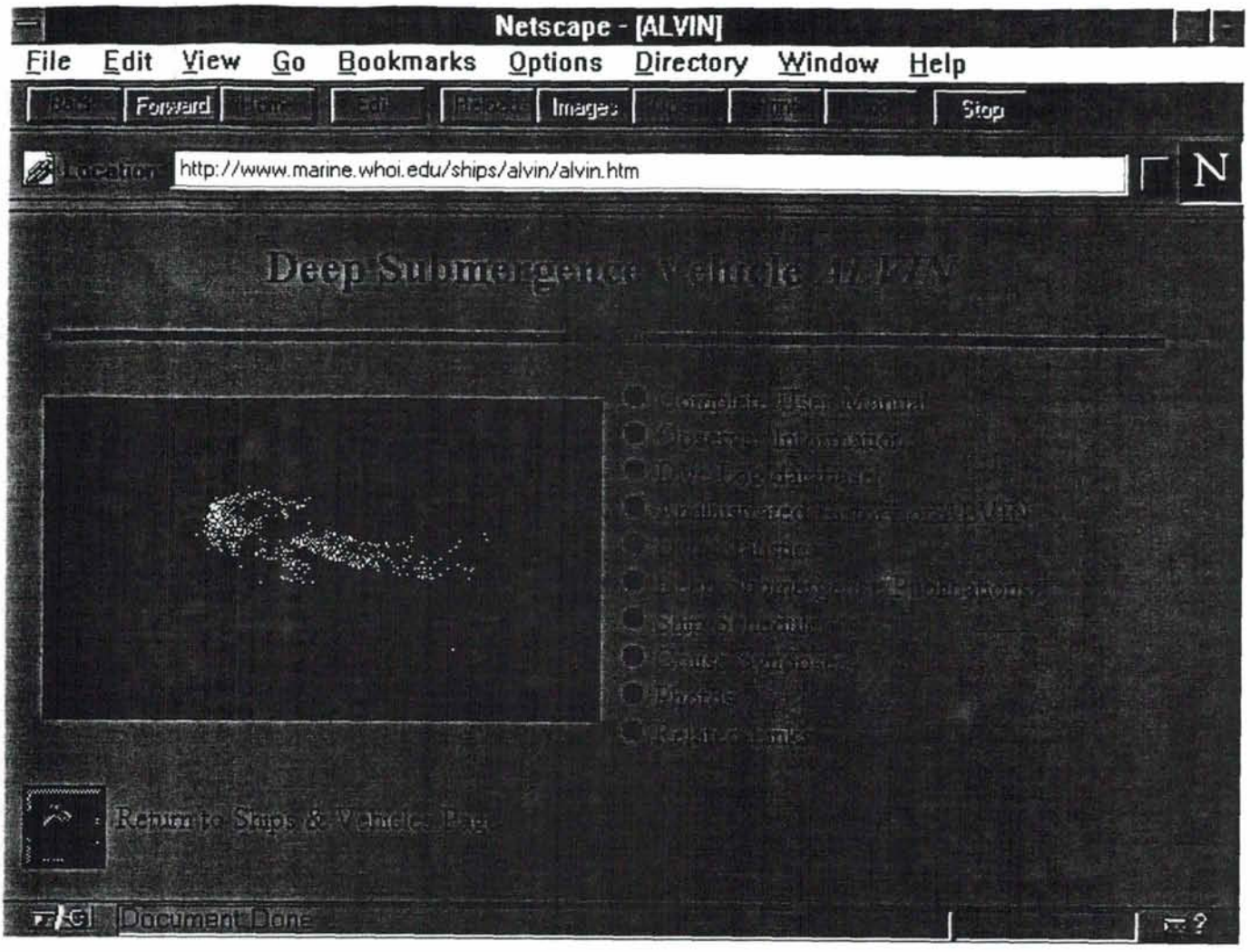
- Groupware allows sharing of information among various WHOI technical centers
- Multiple databases contain all cruise details
- All parties see current information -- no impediments to planning process
- Data easily published to WWW for viewing by investigators



http://www.marine.whoi.edu



http://www.marine.whoi.edu



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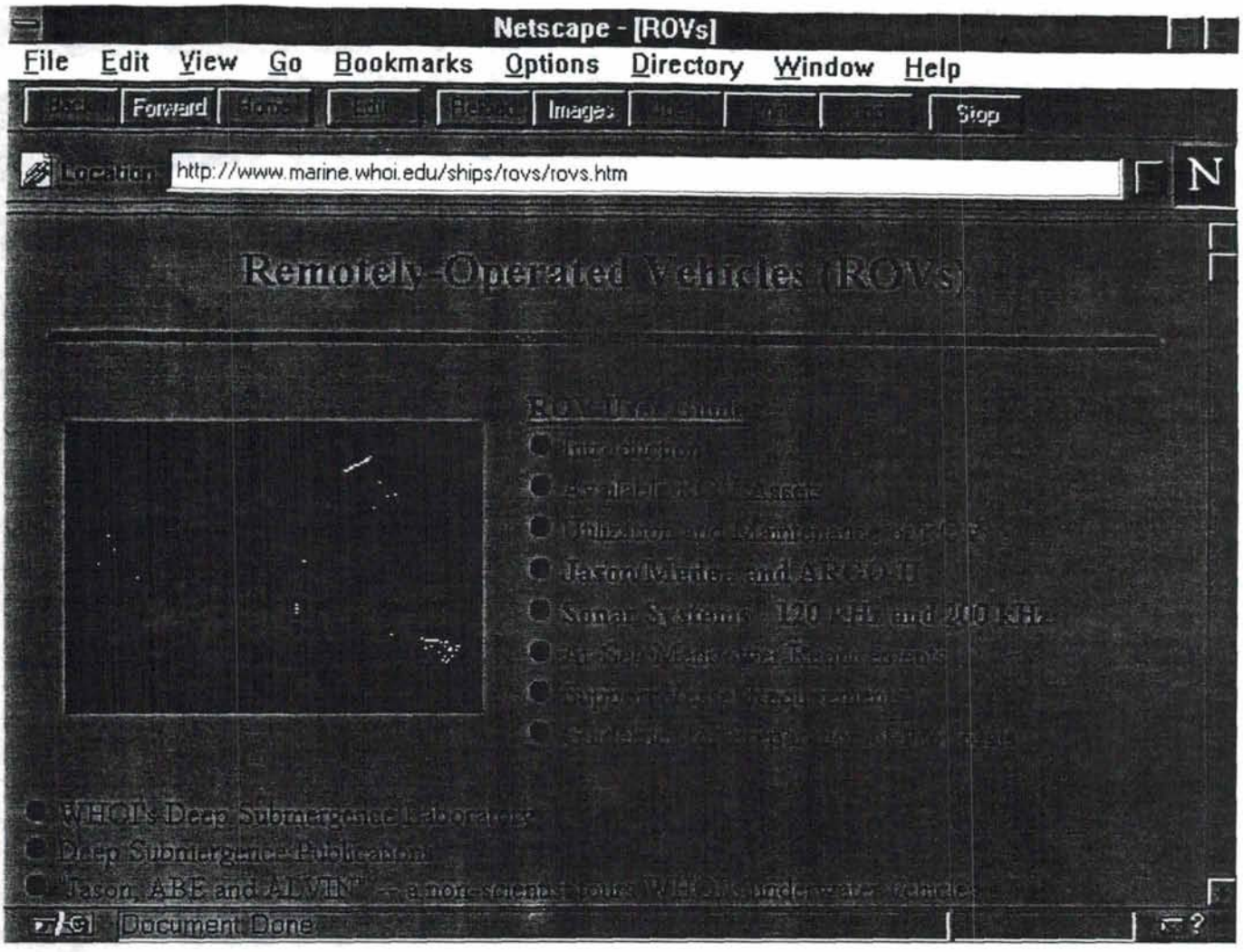

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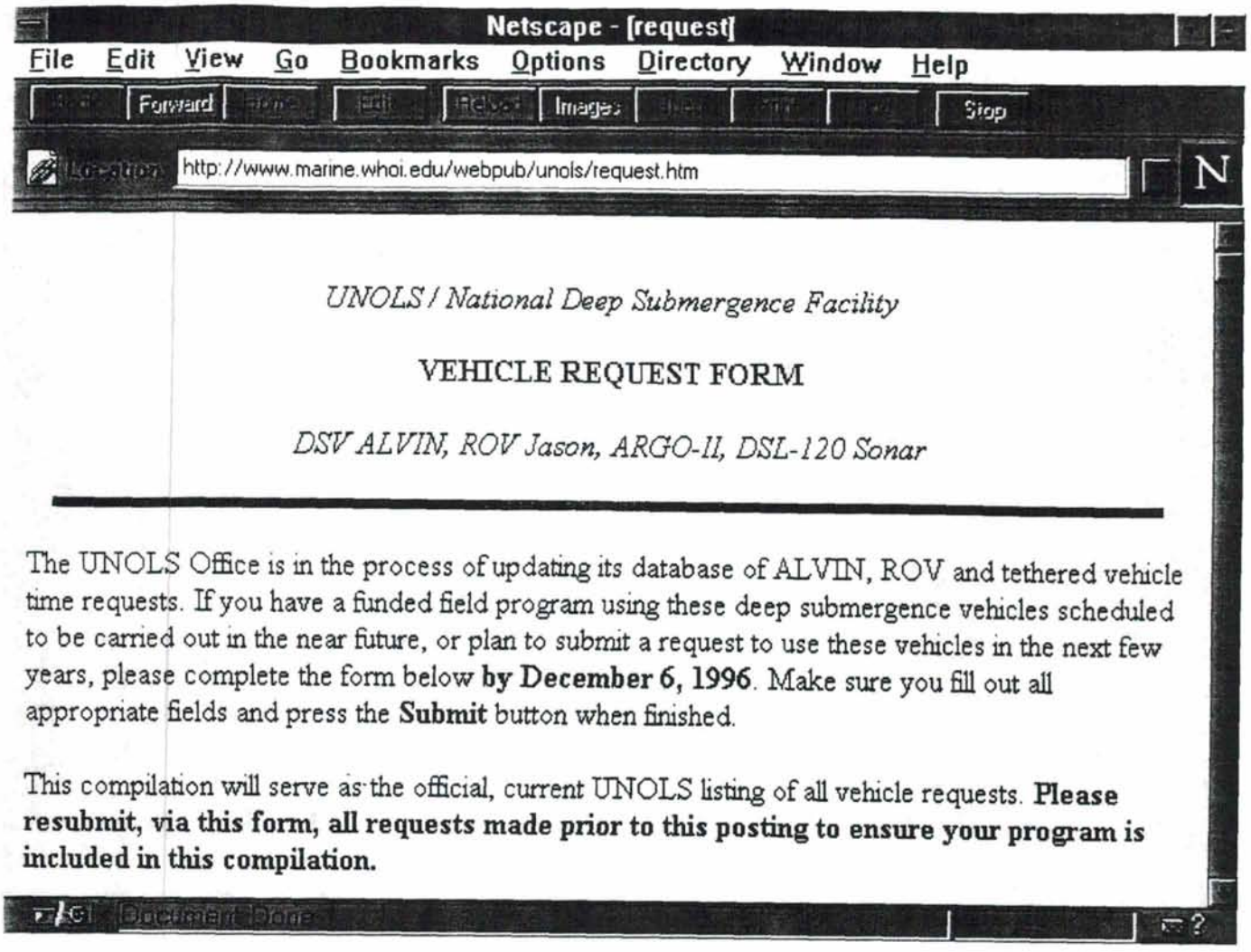
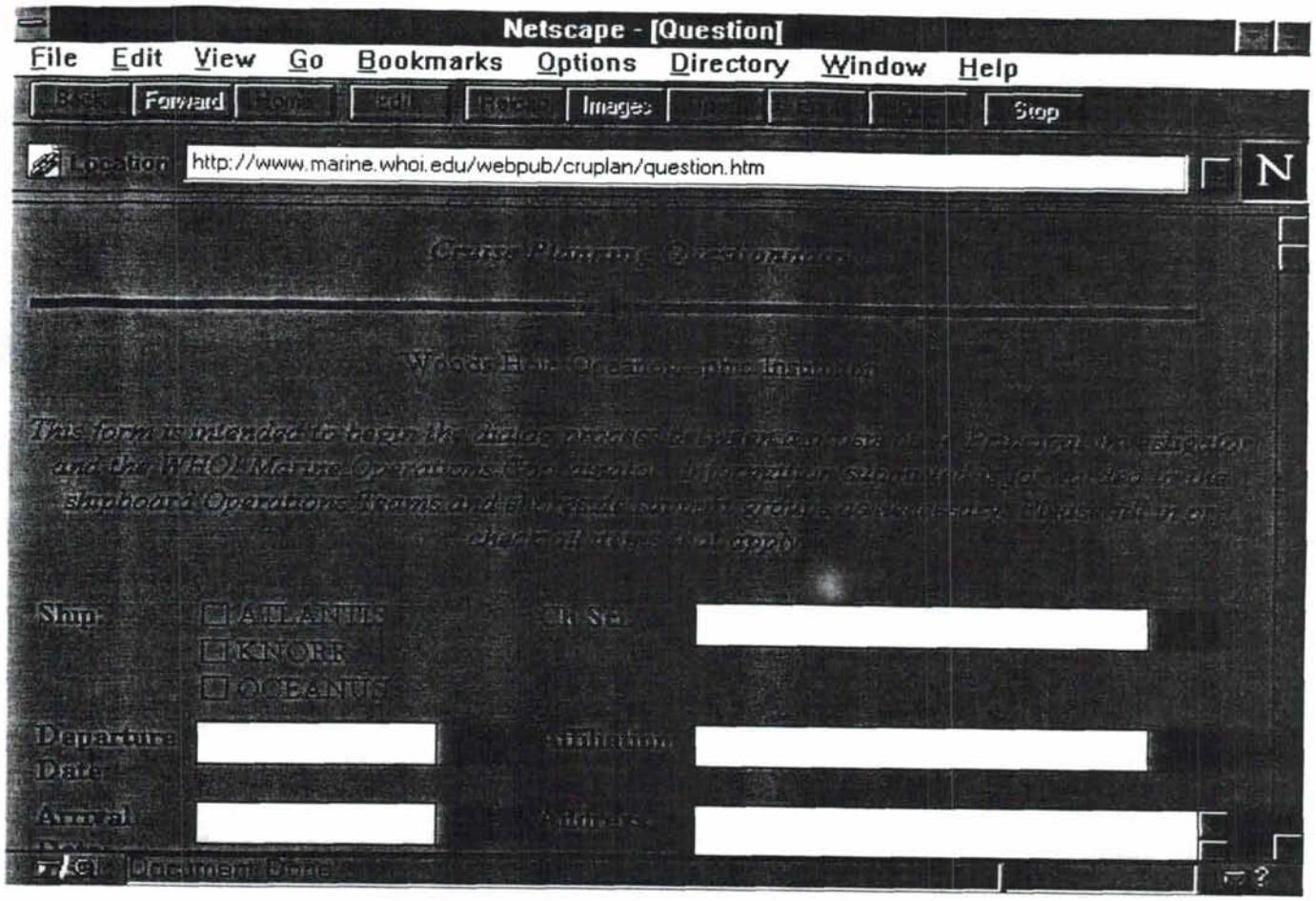
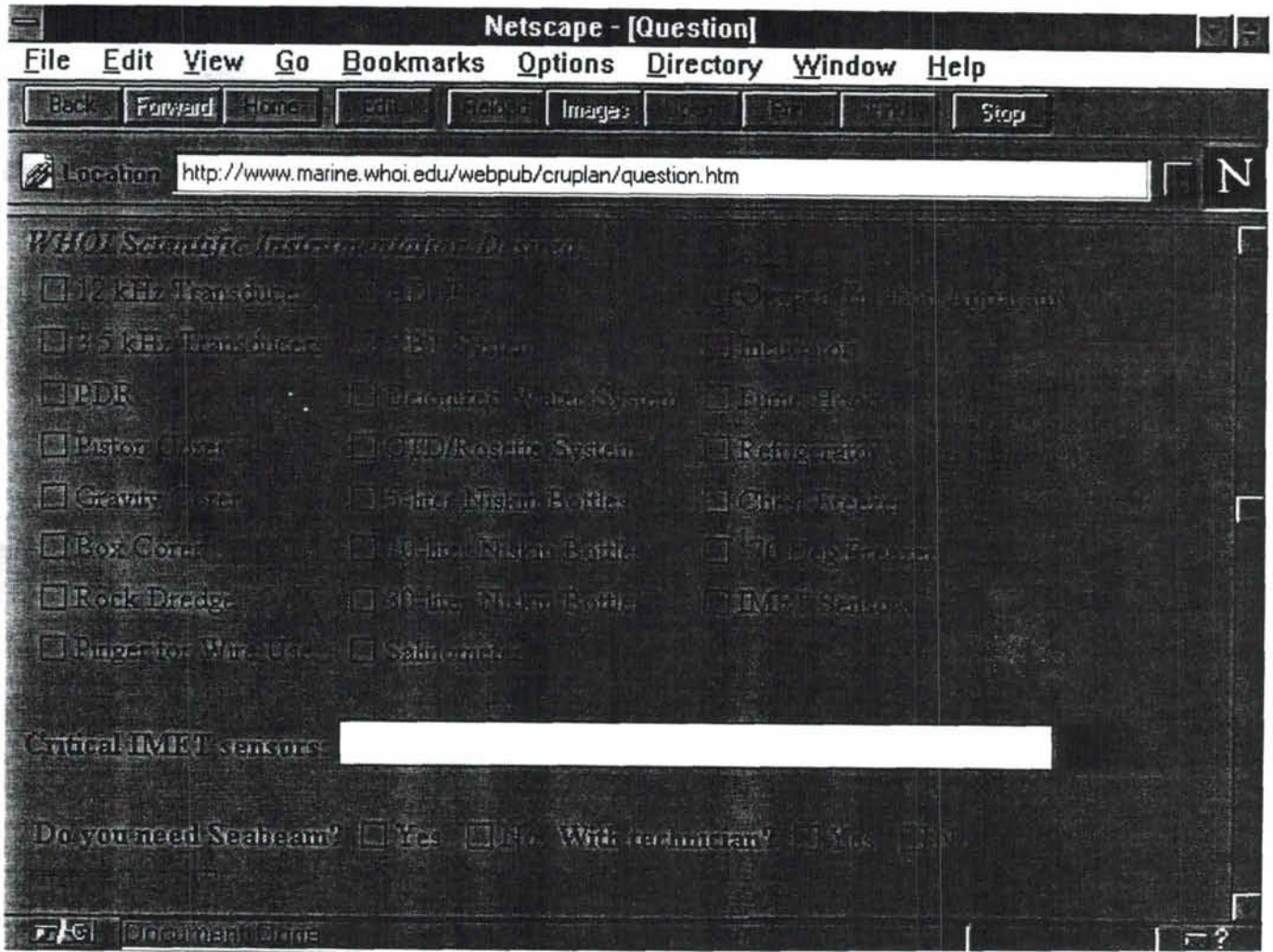
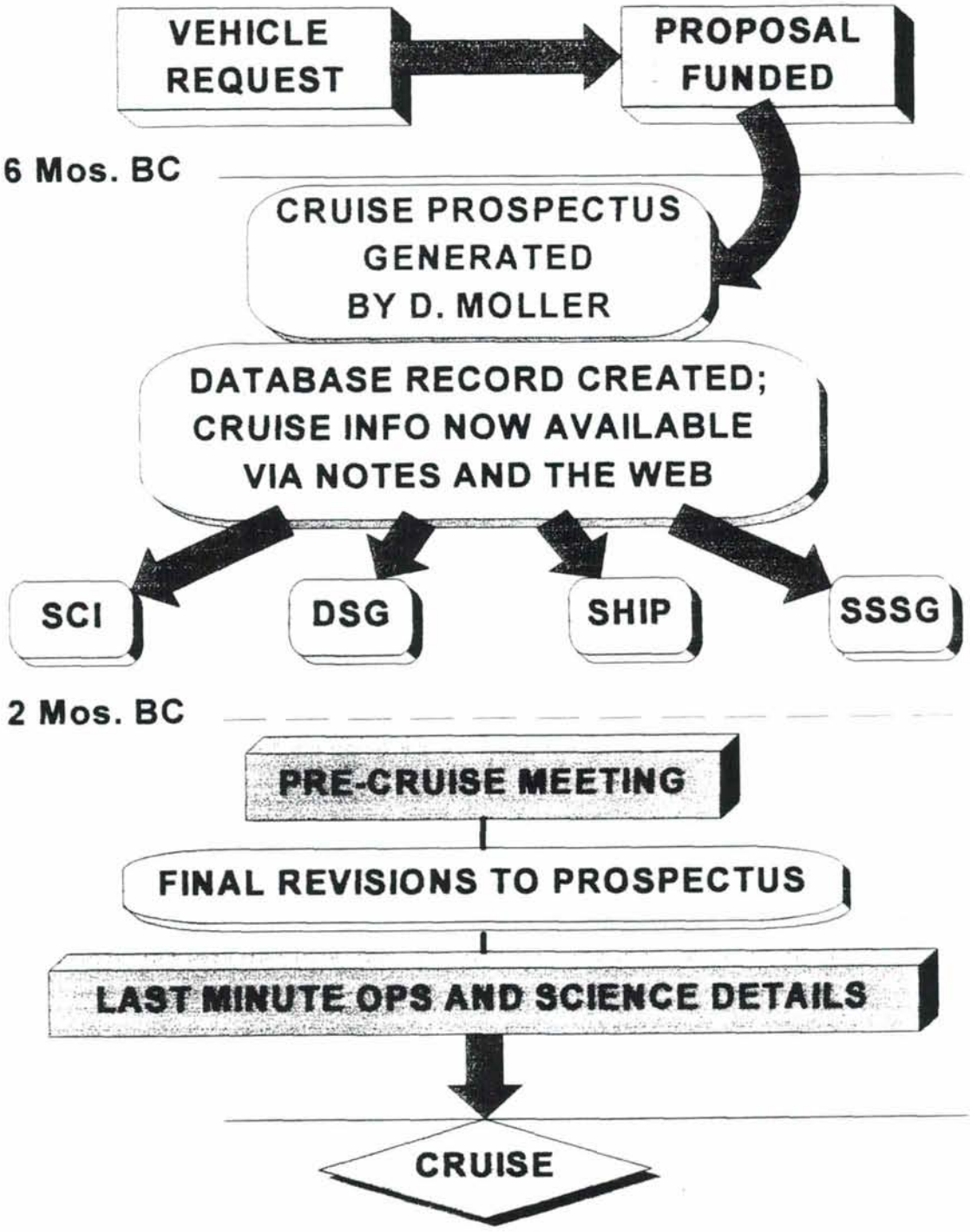


http://www.marine.whoi.edu/webpub/unols/request.htm


Netscape - [Question]
File Edit View Go Bookmarks Options Directory Window Help
Back Forward Home Edit Reload Images Open Print Find Stop
Location http://www.marine.whoi.edu/webpub/cruplan/question.htm
Ship:
ATLANTIS
KNORR
OCEANUS
Departure Date
Arrival


Netscape - [Question]
File Edit View Go Bookmarks Options Directory Window Help
Back Forward Home Edit Reload Images Open Print Find Stop
Location http://www.marine.whoi.edu/webpub/cruplan/question.htm
PDR
Critical IMET sensors:
Do you need Seabeam?

Cruise Prep Sequence



APPENDIX XI

WHOI Archives

Preservation Program

Goal: Preserve and digitize DSOG media and make electronic retrieval of the information useful to the scientific community

Projects:

Digitize and repair media collected by:

ALVIN	1964 - present -----	(begin Jan. 1, 1997)
ANGUS	1972 -1987 -----	future
ARGO	1984 - present -----	future
JASON	1988 - present -----	future

WHOI Archives

Alvin Launch 1964

16mm Film
110,000 Feet

WHOI Archives

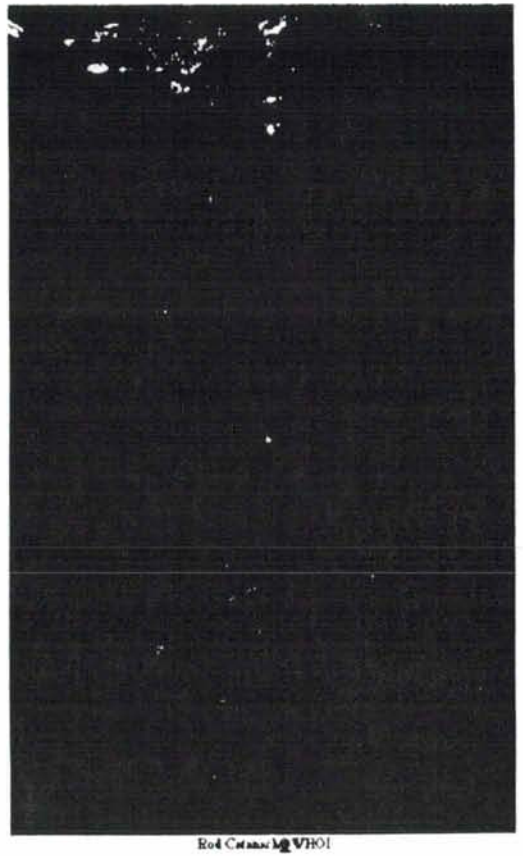
ALVIN

BULK FILM ROLLS

Pre - 1980 Dives - 994
(820 Reels)
Post - 1980 Dives 2,103
(3,340 Reels)

VIDEO IMAGERY

Pre - 1988 Dives -1,951
(1,822 Tapes)
Post - 1988 Dives - 1146
(3,411 Tapes)



Rod Catanach © WHOI

WHOI Archives

Project- Alvin Archives

Repair Pre - 1980 Media

bulk rolls films, 35 mm still imagery and slides

Digitize and Index

SONY CRV Video Laser Disc

Index using Library image server software

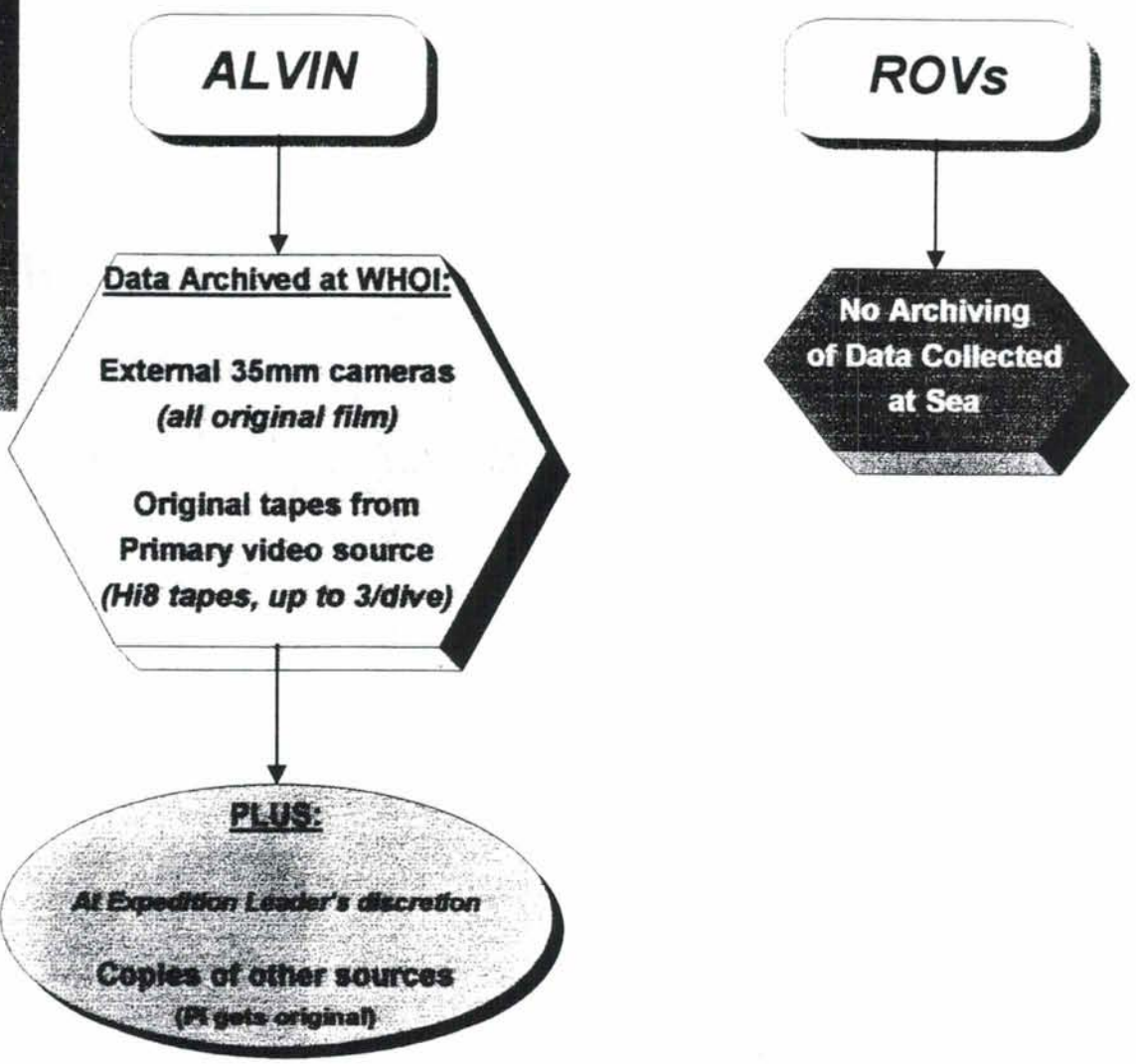
Retrieval

Mount on Institutional Server for Representative Retrieval of Information via WWW

Test Pattern recognition software for better retrieval hits.

Same process for Post - 1980 Media

Current WHOI Data Archive Policy



NOTE: WHOI Archives will accept any additional film or tapes provided by the scientific party

Future WHOI DSG Archive Policy

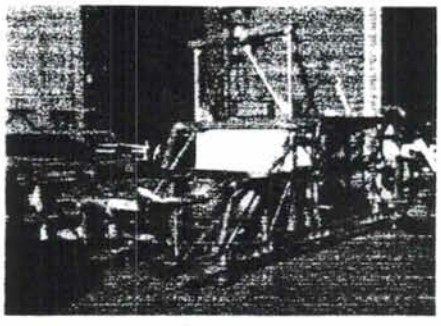
Recommended Action:

WHOI, DESSC and Funding Agencies review current policies and draft revisions.

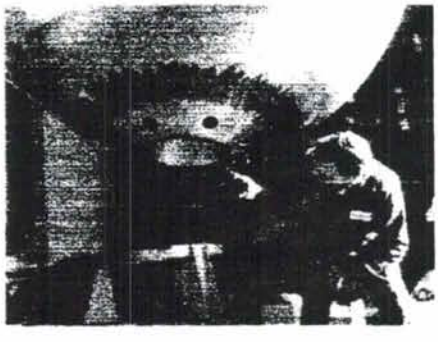
APPENDIX XII

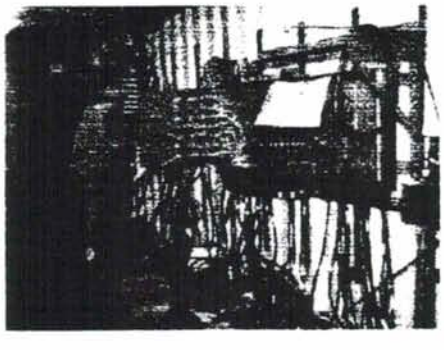
ALVIN Overhaul Status

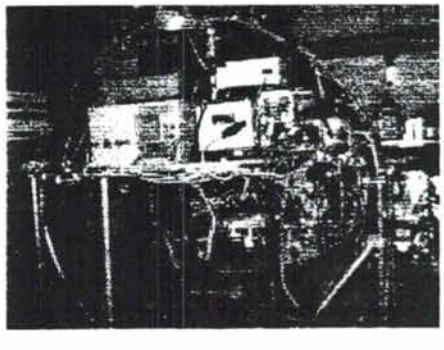
- Some personnel on ROV ops
- Frame repaired..100%
- Variable ballast rebuilt..70%
- Manipulators rebuilt..90%
- Electronic Equip maint..75%



- Personnel/VB/HP spheres insp..100%
- Pressure test implodables..50%
- Hydraulic system rebuild..80%
- Electrical J-boxes rebuild..75%
- Explosive bolts..20%
- Battery Boxes..10%
- Foam repairs..50%
- Blow/vent system.. 100%
- Internal panels/wiring.. 75%
- Skin repairs/painting..5%
- Component re-installations started..5%







ALVIN Upgrades

- Wiring for 3rd battery
- Pan/Tilt installation
- New single chip video camera
- New motor controllers
- Pelagic pump motors
- New in-hull Nikon cameras

APPENDIX XIII

ROV Status

M/V Derbyshire Preparations

- 47 day survey requiring deployment of DSL-120, Argo-II and Jason vehicles from R/V Thompson
- Installation of HDTV camera and associated telemetry, display and recording subsystems
- Installation of digital high resolution color video camera including enhanced telemetry and recording
- Installation of stereo video system
- Upgrade to existing mosaicking capability
- Refinement of DSG data reduction and processing capabilities

ROV Upgrade Plans

- DSL-120 real-time display and processing
- Jason ascent/descent weight dropper
- "Smart" elevator
- Video telemetry upgrade for Jason and Argo-II
- Jason payload increase
- Enhancement to Jason's auxiliary hydraulic system
- Replacement of Jason neutral tether cable

APPENDIX XIV

NSF Ocean Sciences Division

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

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

Nov 96

Ocean Sciences Division Budget (in $M)

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

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

*** unofficial estimate.**

Nov 96

1997 UNOLS Ship Classification (Heinrichs Model)

Large Ships

- THOMPSON
- KNORR
- MELVILLE
- EWING
- ATLANTIS
- REVELLE

Local

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

Intermediate Ships

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

Regional

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

Nov 96

UNOLS Operations Support Trends 1993-1997 ($K)

	ACTUAL 1993	ACTUAL 1994	ACTUAL 1995	PRELIM 1996	REQUEST* 1997
NSF	30,558	33,336	36,022	30,786	32,815
ONR/NRL	6,484	3,588	6,455	4,530	4,358
NOAA	1,981	1,956	2,209	1,143	3,509
OTHER	2,982	2,479	2,280	2,796	7,634
INST/STATE	3,074	2,591	1,563	3,112	2,536
	$45,079	$43,950	$48,629	$42,366	$50,852
	ENDEAVOR midlife	OCEANUS, WECOMA, and S. JOHNSON midlife	ISELIN retired	CAPE HATTERAS layup PT. SUR overhaul N. HORIZON midlife, ATLANTIS II retired	REVELLE and URRACA added ATLANTIS replaces ATLANTIS II

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

Nov 96

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

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

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

Nov 96

"Other Support" - UNOLS Ship Classes 1994-1997

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

1997 DETAIL

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

Nov 96

UNOLS Operations Support Trends Summary

Ships

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

Funds

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

Future

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

Nov 96

"Oceanography in the Next Decade" Building New Partnerships

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

(Ocean Studies Board, NAS, 1992)

Nov 96

APPENDIX XV

NOAA/NURP statement to the DESSC meeting on
14 December 1996

It is a NURP priority to continue our support of deep submersible science, the National Deep Submergence Facility, and other Navy deep submergence assets and I apologize for not being present to deliver this message. However, as some of you are aware, NURP is undergoing reinvention and a critical part of that process is happening this week. While the reinvention underway will be transparent to most scientists who participate in the program, the changes are nonetheless significant, particularly in the way resources will be allocated in the future. Through its peer review process, NURP has always sought to support the highest quality science, but has lacked the mechanisms to ensure that NOAA's research needs are factored into the selection of research projects. Changes in the organizational structure and internal procedures are being developed to integrate better NURP's research priorities with NOAA's research and management needs while building upon interagency cooperation to achieve national benefit.

Key to the reinvention is the addition of a NURP National Advisory Council with its working arm, the National Review Panel. Through these bodies recommendations regarding resource allocations will be made. While not fully in place at the present time, portions of the reinvented program have already been implemented, and the first meeting of the National Review Panel will take place on the 19th of December. We believe these changes will strengthen NURP's position in the undersea research community by ensuring an open and competitive process designed to facilitate research that supports NOAA, National, Regional and International needs.

NOAA's views on current items have been expressed during recent meetings with ONR and NSF and I am confident Dolly and Sujata will include them in their discussions at this meeting.

Best regards to all and

Merry Christmas and Happy New Year

APPENDIX XVI

1997-1999 Upgrade Plans
Deep Submergence

DESSC Upgrade Priority List

- Datalogger/video upgrades
- Additional foam
- ALVIN power management
- Wiring for 3rd battery
- Slurp pumps
- Dual head scanning sonar
- Laser ring gyro
- Imaging infrastructure
- 35mm inhull cameras and auto strobes
- Pencil cameras
- Homer probes

1997-1999 Upgrade Plans Deep Submergence

Additional Upgrade Priorities

- VB System- planned '97-'98 engineering proposal
- Navigation
- Digital imaging for ALVIN/Jason/ARGO
- Remote data and temperature logging via inductive coupling
- ALVIN thermistor probes

1997-1999 Upgrade Plans
Deep Submergence

1997-1999 WHOI-DSG Upgrade Proposal
In Priority Order Based on DESSC/Community Input

Category	Equipment/ Hardware	Personnel w/OH	Total
Datalogger	$36,000	$69,700	$105,700
Video	$64,000	$22,000	$86,000
Alvin Floatation	$32,000	$5,000	$37,000
Jason Floatation	$7,500	$2,000	$9,500
Alvin Power Mgmt. & Virtual Alvin *	$38,000		$38,000
Slurp Pumps	$5,000	$5,300	$10,300
Scanning Sonar (1)	$34,000	$12,000	$46,000
Ring Laser Gyro (1)	$31,000	$20,600	$51,600
In-Hull Digital Cams.	$4,500	$1,200	$5,700
Jason Wt. Dropper	$4,300	$6,800	$11,100
Inductive Couple Link T probes & RS-232 link	$37,000	$6,500	$43,500
4- 'Majors' Hot Water Samplers *	$24,000		$24,000
Majors Bottles & T-Handle Improve.	$6,500	$3,100	$9,600
Totals	$323,800	$154,200	$478,000
WHOI Cost-Share			$25,000
Total to be Requested from funding agencies			$453,000

* = outside vendor

NB - Jason "Smart" Elevator Upgrade — $29,000 - funded by WHOI internal award

APPENDIX XVII

		97	97	97	97	98	98	98	98	99+	99+	99+	99+
		ALVIN	ALVIN	ROV	ROV	ALVIN	ALVIN	ROV	ROV	ALVIN	ALVIN	ROV	ROV
#	PI	PROP	FUND	PROP	FUND	PROP	FUND	PROP	FUND	PROP	FUND	PROP	FUND
ATLANTIC													
1	BLACKMAN	14		15									
2	RONA	10											
3	VRIJENHOEK/BRIDGE		20										
4	TUCHOLKE					15		13					
		24	**20**	**15**	**0**	**15**	**0**	**13**	**0**	**0**	**0**	**0**	**0**
MEDITERRANEAN													
5	BALLARD				21								
		0	**0**	**0**	**21**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
GULF OF MEXICO													
6	ROBERTS					15							
7	AHARON					10		5					
8	MACDONALD										10		10
		0	**0**	**0**	**0**	**25**	**0**	**5**	**0**	**0**	**10**	**0**	**10**
JUAN DE FUCA													
9	EMBLEY			10									
10	BECKER				6								
11	KARSTEN	17											
12	COLLIER					20							
13	JOHNSON					12						5	
14	DELANEY			33				27					
-	CHADWICK				5								
-	JOHNSON				3								
		17	**0**	**43**	**14**	**32**	**0**	**27**	**0**	**0**	**0**	**5**	**0**
OFF CALIFORNIA													
15	ECKMAN					12							
16	C.R. SMITH		4										
		0	**4**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
NORTH EAST PACIFIC RISE													
17	FISHER				14								
18	FISHER						10						
19	CARBOTTE			36									
20	LUTZ		18										
21	LUTZ						11		12		11		12
22	FORNARI	2											
23	TAYLOR/WIRSEN		5										
24	BALLARD					21		21					
25	FORNARI			5									
26	MEG TIVEY					20							
27	TOLSTOY					8							
28	VON DAMM	10				10				10			
29	CHAVE		6										
30	MULLINEAUX					10				10			
31	MANAHAN					8				16			
32	CHILDRESS		12										
		12	**41**	**41**	**14**	**77**	**21**	**21**	**12**	**36**	**11**	**0**	**12**

GUAYMAS BASIN													
33	BALLARD					21		21					
		0	**0**	**0**	**0**	**21**	**0**	**21**	**0**	**0**	**0**	**0**	**0**
EQUATORIAL PACIFIC													
34	KARSON		15		5								
		0	**15**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
SOUTHERN EAST PACIFIC RISE													
35	KLEINROCK					6		21					
36	HEY				12								
37	LILLEY						25						
38	FORNARI					2		3					
39	LUPTON					20							
40	LUTZ						14						
41	NAAR					18		12					
42	URABE						5						
43	SINTON		20		3								
44	VAN DOVER					3		7					
		0	**20**	**0**	**15**	**49**	**44**	**43**	**0**	**0**	**0**	**0**	**0**
HAWAII													
45	D.K. SMITH							25					
46	GARCIA					10							
47	CHAVE								10				
		0	**0**	**0**	**0**	**10**	**0**	**25**	**10**	**0**	**0**	**0**	**0**
WESTERN PACIFIC													
48	PERFIT					15		5					
49	TBA					6							
50	CLEFT					25							
51	FRYER				27								
-	DERBYSHIRE				47								
		0	**0**	**0**	**74**	**46**	**0**	**5**	**0**	**0**	**0**	**0**	**0**
INDIAN OCEAN													
52	FORNARI									15		15	
		0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**15**	**0**
		97	**97**	**97**	**97**	**98**	**98**	**98**	**98**	**99+**	**99+**	**99+**	**99+**
		ALVIN	**ALVIN**	**ROV**	**ROV**	**ALVIN**	**ALVIN**	**ROV**	**ROV**	**ALVIN**	**ALVIN**	**ROV**	**ROV**
#		**PROP**	**FUND**	**PROP**	**FUND**	**PROP**	**FUND**	**PROP**	**FUND**	**PROP**	**FUND**	**PROP**	**FUND**
	TOTALS	**53**	**100**	**99**	**143**	**287**	**65**	**160**	**22**	**51**	**21**	**20**	**22**

ALVIN/ROV Letters of Interest - Summary 1997 - 1999

#	Source	Investigator	Area	Title	Sponsor	Date	Alternate	Dives	Platform/Remarks	Disc.
ATLANTIC:										
1	web 12/6/96	D.K. Blackman, UCSD J. Karson, Duke D. Kelly, UW M. Zumberge, SIO	Atlantic Transform 30 N, 42 W	Structural mapping of the eastern Atlantis ridge-transform intersection high: an oceanic analog to continental core complexes?	NSF 8/15/96 9618213	1997	1998	14 10 5	ALVIN Jason DSL-120	G&G
2	web 11/21/96	P. Rona, Rutgers Kleinrock, Vanderbilt M.A. Tivey, WHOI M. Hannington, GSC P. Herzig, Germany C. Lalou, CFR R. Lowell, GIT	TAG 26N, 45 W	Evolution of a Volcanic-hosted Hydrothermal System on a Slow-spreading Ocean Ridge: Relict , Zones of TAG Hydrothermal Field	NSF Aug-96 9618981	except Sept 97/98		10	ALVIN	G&G
3	web 12/2/96	R.C. Vrijenhoek, Rutge R.A. Lutz, Rutgers P. Rona, Rutgers P. Tyler Southhampton Alan & Eve Southward, Plymouth Marine Lab	between 38N and 14 deg 44' Menez Gwen, Lucky Strike, Rainbow, TAG, Broken Spur Snake Pit	Gene Flow and Species Diversity in Deep-Sea Hydrothermal Vent Communities(NSF) Shrimp Nutrition/Lupid Biomarker Studies (BRIDGE)	NSF 9633131 BRIDGE **funded** **scheduled**	Jun-Jul 97	Jul-Aug 97	20	ALVIN	Biol.
4	web 12/6/96	B. Tucholke, WHOI H. Dick, S. Allerton, G. Hirth, C. MacLeod, M. Tivey, J. Cann, J. Lin, J. Escartin	MAR 23N 45W and 27N, 44W	Geological-geophysical investigation of metamorphic core complexes on the Mid-Atlantic Ridge	NSF Feb-97	May to Jul 1998	April or Aug-Sep 1998	15 5 8	ALVIN Argo-II DSL-120	G&G
MEDITERRANEAN										
5	paper form 11/29/95	R.D. Ballard, Inst. for E D. Yoerger, WHOI D. Mindell, MIT	Straits of Sicily north of Skerki Bank	Exploration of the Straits of Sicily	ONR **funded**	Jun/Jul 1997		21	MEDEA-JASON	Other
GULF OF MEXICO										
6	WEB 12/3/96	H. Roberts, LSU R. Carney	Gulf of Mexico 28 deg 10'N, 15W 26 deg 22'N, 30 W	A test of Salt Tectonics Cold-Seep Model: Comprehensive sampling at seepage stratified sites in the Gulf of Mexico	NSF MMS Industry Feb/Mar 97	Jun-98	Jul/Aug 98	15	ALVIN	G&G

ALVIN/ROV Letters of Interest - Summary 1997 - 1999

#	Source	Investigator	Area	Title	Sponsor	Date	Alternate	Dives	Platform/Remarks	Disc.
7	web 12/6/96	P. Aharon, LSU LSU: B.K. Sen Gupta, J.M. Larkin, H. Roberts M. Taviani, CNR H. Schwarcz, McMaster E. Aguayo-Camargo, UNAM	Gulf of Mexico central and northern	Reconstruction of the History of Hydrocarbon Seepage and Chemosymbiosis in the Deep Gulf of Mexico.	May/Jun 1997	Jul-Aug 1998	Oct-Nov 1998	10 5	ALVIN Jason	G&G
8	web 12/6/96	I. MacDonald, TAMU CR Fisher, WW Sager, D. Nelson, K Nelson, S. Nelson, J. Morse, RS Sassen, NL Guinasso	Green Canyon 27-27.5N, 92-91W Alaminos Canyon 26-26.5N, 95-94W	Stability and change in Gulf of Mexico Chemosynthetic Communities	MMS **FUNDED** 1435-01-96-CT	Jul-99	Jul-98	10 10	ALVIN Jason	G&G
JUAN DE FUCA										
9	web 11/27/96	R. Embley, NOAA/PME Chadwick Butterfield G. Massoth J. Lupton J. Baross R. Feely	JDF 46 N 130 W	Multidisciplinary Studies to Understand Changes in the Hydrothermal Systems at Axial Volcano Induced by Volcanic Events	NURP 9/1/96	Aug-ear Sep 1997	Jun-Jul or late Sep 1997	10	Jason	Multi
10	web 12/6/96	K. Becker, UM E. Davis, PGC	Middle Valley, 48 27N, 128 43 W; Endeavor Ridge, 47 50N, 127 40W	Instrumented borehole seals for 1996 ODP drilling on the Juan de Fuca Ridge Service 6 ODP borehole instruments in Middle Valley and east flank of Endeavor Ridge	NSF ODP **FUNDED** 9530426	late Aug/Sep 1997	June 1997	6	Jason	G&G
11	web 11/26/96	J. Karsten, UH J. Head, Brown V. Robigou-Nelson K. Rubin	Endeavor Seg. JDF 48 N, 129 W	ALVIN Submersible Investigation of Volcanic Processes at the Endeavor Segment, JDF Ridge: Consequesces of Magma suply variations at intermediate spreading rate ridges.	NSF 8/15/96 9618400	Summer 1997	summer 98	17	ALVIN	G&G
12	paper form 10/25/96	R. Collier, OSU G. Klinkhammer, OSU M. Tarres, OSU J. McManus, OSU	Off Newport, OR 50km 44 N, 125 W	Proposals to support dives for TECFLUX program. Continental Margin 50-100 km from Newport, OR	NSF 2/15/97	Jun/Jul 98 Aug/Sep 98		10 10	ALVIN ALVIN	
13	e-mail 12/6/96	P. Johnson, UW J. Cowen, UH	JDF	Study to sub-surface biosphere.	NSF submitted 9618294	summer 98 summer 99		12 5	ALVIN Jason	G&G
14	831 3/1/96	J.R. Delaney, UW	ROBE sites 44 N 130 W 44 N 129 W	Spatial Control for Temporal Variability Studies: 3-D Multiscalar Mapping of seafloor features and Water Column Plumes within the RIDGE observatory (ROBE) sites.	NSF	ul 15-Aug 1 1997 1998	Jul 15-Sep 15 1997 1998	 33 27	JASON, DSL 120	G&G

ALVIN/ROV Letters of Interest - Summary 1997 - 1999

#	Source	Investigator	Area	Title	Sponsor	Date	Alternate	Dives	Platform/Remarks	Disc.
SOUTHERN CALIFORNIA/SAN DIEGO TROUGH/MONTEREY CANYON										
15	web Nov-96	J. Eckman, Skid D. Thistle W. Burnett	San Diego Trough 32 deg 51' N, 117 deg 46'W	Evaluation impacts of predation by large, motile epifaun on macrofauna and meifauna in the deep sea: a test of cage performance	NSF 9616676 Jul-96	Jan-98 Apr-98	Jan-Apr 98 3-6 mo. later	6 6	ALVIN ALVIN	Biol
16	paper form 11/24/95	C. R. Smith, U.H. D. DeMaster, NCSU	S. California 32d 12'N, 118d 30' W	Age dependent bioturbation of deep-sea sediments: tests at three bathyal sites.	NSF **FUNDED** OCE 9022116 **scheduled**	Jul-Dec 1997	Jan - Mar 1998	4	ALVIN (MEDEA-JASON if ALVIN not available)	Biol
NORTH EAST PACIFIC RISE										
17	Web 11/18/96	C. Fisher, Penn K. Juniper V. Tunnicliffe	Endeavor Seg JDF Ridge 44 N, 130 W	Primary production and nutritional interactions in vestimentiferan aggregations on the Juan de Fuca Ridge	NSF **FUNDED** 9633105	Aug-97	Sep-97	14	Jason	Biol
18	Web 11/18/96	C. Fisher, Penn K. Juniper V. Tunnicliffe D. Nelson	Endeavor Seg JDF Ridge 44 N, 130 W	Primary production and nutritional interactions in vestimentiferan aggregations on the Juan de Fuca Ridge	NSF **FUNDED** 9633105	Jul. Aug 98/99	Jun, Sep 98/99	10	Alvin	Biol
19	Web Nov-96	S. Carbotte, LDEO W. Ryan, LDEO D. Fornari, WHOI C. Keeley, UNH P. Cowie,Edinburg	EPR 9 deg 30' N and 10 deg 35' N	DSL 120 sonar survey of two contrasting segments of the EPR crest and flanks near 9 deg 30' N and 10 de and ROV Jason surveys along transects across the crest and flanks in both survey areas.	NSF RIDGE Aug-96	Nov-Dec 97	Jan-May 98	6 30	Jason DSL-120	G&G
20	web 12/3/96	R.A. Lutz, Rutger T. Shanks, Rutgers	9 51'N EPR	Temporal Chasnges in Biological Community Structure at Nascent Hydrothermal Vents on the EPR Crest	NSF **FUNDED** 9529819	Oct-97	Nov-97	18	ALVIN	Biol
21	web 12/3/96	R.A. Lutz, Rutger T. Shanks, Rutgers	9 50'N EPR	Temporal Chasnges in Biological Community Structure at Nascent Hydrothermal Vents on the EPR Crest	NSF **FUNDED** 9529819	Oct-98 Oct-99	Nov-98 Nov-99	11/12 11/12	ALVIN/Jason ALVIN/Jason	Biol
22	web 11/13/96	D. Fornari, WHOI R. Lutz, Rutgers K. Von Damm, UNH M. Lilley, UW	EPR 9 deg 50'N	Redeployment of self-recording temperature probe arrays at high- and low-temperature vent sites in the Bio-Geologic Transect on the East Pacific Rise crest 9 deg 49'-51'N	NSF RIDGE Feb-97	Oct-Dec 97		2	ALVIN	G&G
23	web 11/19/96	C. D. Taylor, WHOI C.O. Wirsen, WHOI E. DeLong, UCSB	9 - 10 N NEPR	Microbiology and Ecology of filamentous sulphur formations	NSF IBN 9630054 **funded** **scheduled**	Nov-Dec 1997	Mar-Apr 1998	5 Dives	ALVIN	Biol.

ALVIN/ROV Letters of Interest - Summary 1997 - 1999

#	Source	Investigator	Area	Title	Sponsor	Date	Alternate	Dives	Platform/Remarks	Disc.
24	Web Nov-96	R. Ballard, IFE H. Jannasch R. Lutz Meg Tivey F. Grassle	Guaymas Basin and/or EPR 21 N	JASON Project - Inst for Exploration Exhibition Center Hydrothermal Vent Systems and Plate Tectonics	ONR Aug-96	Apr-98	Jan-Mar 1998	21 21	ALVIN Jason	Other
25	web 11/13/96	D. Fornari, WHOI R. Haymon, UCSB	EPR 9-10 N, 104 W	DSL-120 sonar imaging of the axial summit caldera of te EPR 9 - 10 N	NSF RIDGE Aug-96	Nov-Dec 97	Jan-May 98	5	DSL-120	G&G
26	web 12/2/96	Meg Tivey, WHOI D. Kadko, U.Miami A. Schultz, UK D. Butterfield, NOAA	Endeavor 48N, 129W	Monitoring Short-term Variability of Fluid Flow from the ROBE site	NSF RIDGE 9618262 Aug-96	Jun-98 Sep-98	Jul-98 Oct-98	12 8	ALVIN ALVIN	G&G
27	web 12/6/96	M. Tolstoy, LDEO D. Fornari, WHOI J. Orcutt, SIO F. Wyatt, SIO	NEPR 9 50N, 104 17W	Installation of sea floor tilt meter arrays along and across the EPR axis over a known area of recent volcanism and hydrothermal activity	NSF Feb-97	Nov97 to Jun-98	Nov-98 Jun-99	8	ALVIN	G&G
28	831 9/9/96	K. Von Damm, UNH M. Lilley, UW	NEPR 9 50N, 104W	The Geochemical relationship between coupled high temperature and diffuse flow and related biological communities.	NSF RIDGE Sep-96 9618614	fall 97 fall 98 fall 99		10 10 10	ALVIN ALVIN ALVIN	Geo- chem
29	831 7/21/95	A. Chave, WHOI C. Van Dover, U.Alaska J. A. Tyson, AT&T	NEPR	ALISS: Ambient light Imaging and Spectral System	NSF **FUNDED** OCE 9407774 **SCHED**	Oct-Nov 1997	Jan-Feb 1998	6	ALVIN	Biol.
30	e-mail 12/10/96	L. Mullineaux, WHOI C.H. Peterson, UNC C.R. Fisher, Penn S	9 50N, 104W	Role of Larve Settlement, Species Interactions and Physiological Adaptations in colonization and Community Development of Hydrothermal Vents	NSF sub 2/97	1) win/spr 98 2) year later		10 10	ALVIN ALVIN	Biol
31	e-mail 12/10/96	D. Manahan, USCal L. Mullineaux, WHOI C. Young, HBOI	9 50N, 104W	Dispersal Potential Hydrothermal Vent Animals: Larval Energetics, Depth regulation and Field Distribution	NSF RIDGE Sub 2/96	1) feb 98 2) feb 99 3) oct 99		8 8 8	ALVIN ALVIN ALVIN	Biol.
32	e-mail 5/2/96	JJ. Childress UCSB	9 & 13 N EPR	Studies on the Ecological Physiology of Hydrothermal Vent chemoautrotrophic	NSF RIDGE 9632861	1997		12	ALVIN	Ecog.

ALVIN/ROV Letters of Interest - Summary 1997 - 1999

#	Source	Investigator	Area	Title	Sponsor	Date	Alternate	Dives	Platform/Remarks	Disc.
Guaymas Basin										
33	Web Nov-96	R. Ballard, IFE H. Jannasch R. Lutz Meg Tivey F. Grassle	Guaymas Basin and/or EPR 21 N	JASON Project - Inst for Exploration Exhibition Center Hydrothermal Vent Systems and Plate Tectonics	ONR Aug-96	Apr-98	Jan-Mar 1998	21 21	ALVIN Jason	Other
EQUATORIAL PACIFIC										
34	web 12/10/96	J.A. Karson, Duke E. Klein, Duke S. Hurst, Duke K. Gillis, U Vic. (Canada) C. Macleod, IOS (UK) J-L. Cheminee, U Vic (Canada)	Hess Deep 2 22' N, 101 17W	Jason/Media and ALVIN Investigation of the Uppermost Oceanic Crust of Hess Deep	NSF funded	May-97	May-Sep 1997	15 5	ALVIN Jason/Media	G&G
SOUTHERN EAST PACIFIC RISE:										
35	web 12/6/96	M. Kleinrock, Vandy several	Juan Fernandez Microplate, SEPR 32 S, 111W	Seafloor investigations of compression in young oceanic lithosphere: Thrust faulting at an oceanic microplate?	NSF Feb-97	Austral summer 97-98	Other Austral Summer ASAP	6 7 4 10	ALVIN Jason ARGO-II DSL-120	G&G
36	Web 11/20/96	R. Hey, UH E. Baker, PMEL, NOAA J. Lupton, PMEL	SEPR south of Easter Is 8-32 S, 112-113	Hydrothermal and structural investigations along the fastest spreading center: The 28-32 S EPR reorganizing plate boundary.	NSF **FUNDED** **scheduled**	southern summer 1997/1998	other Austral summers	12	DSL-120 sonar	G&G
37	web 11/22/96	M.D. Lilley, UW K.L. Von Damm, UNH L.E. Lupton, NOAA D. Fornari, WHOI R. Collier	17 S, 113 W 21 30 S, 113 W	Gas and fluid chemistry of hydrothermal systems on a superfast spreading center: Southern East Pacific Rise	NSF RIDGE **FUNDED** **9417121**	Jan-Mar 98		25	ALVIN	Chem
38	web 11/13/96	D. Fornari, WHOI T. Gregg, WHOI M. Perfit, UFL	SEPR 18 deg 34'S	Add-on survey using ALVIN and Jason to Lilley/ Von Damm/Lupton southern EPR diving program - focus on geological/volcanological maping around hydrothermal vent sites and detailed sampling and analysis of lava pillars as proxies for volcanic eruption processes.	NSF RIDGE Aug-96	Jan-May 98	Nov-Dec 98 early 99	2 3	ALVIN Jason	G&G

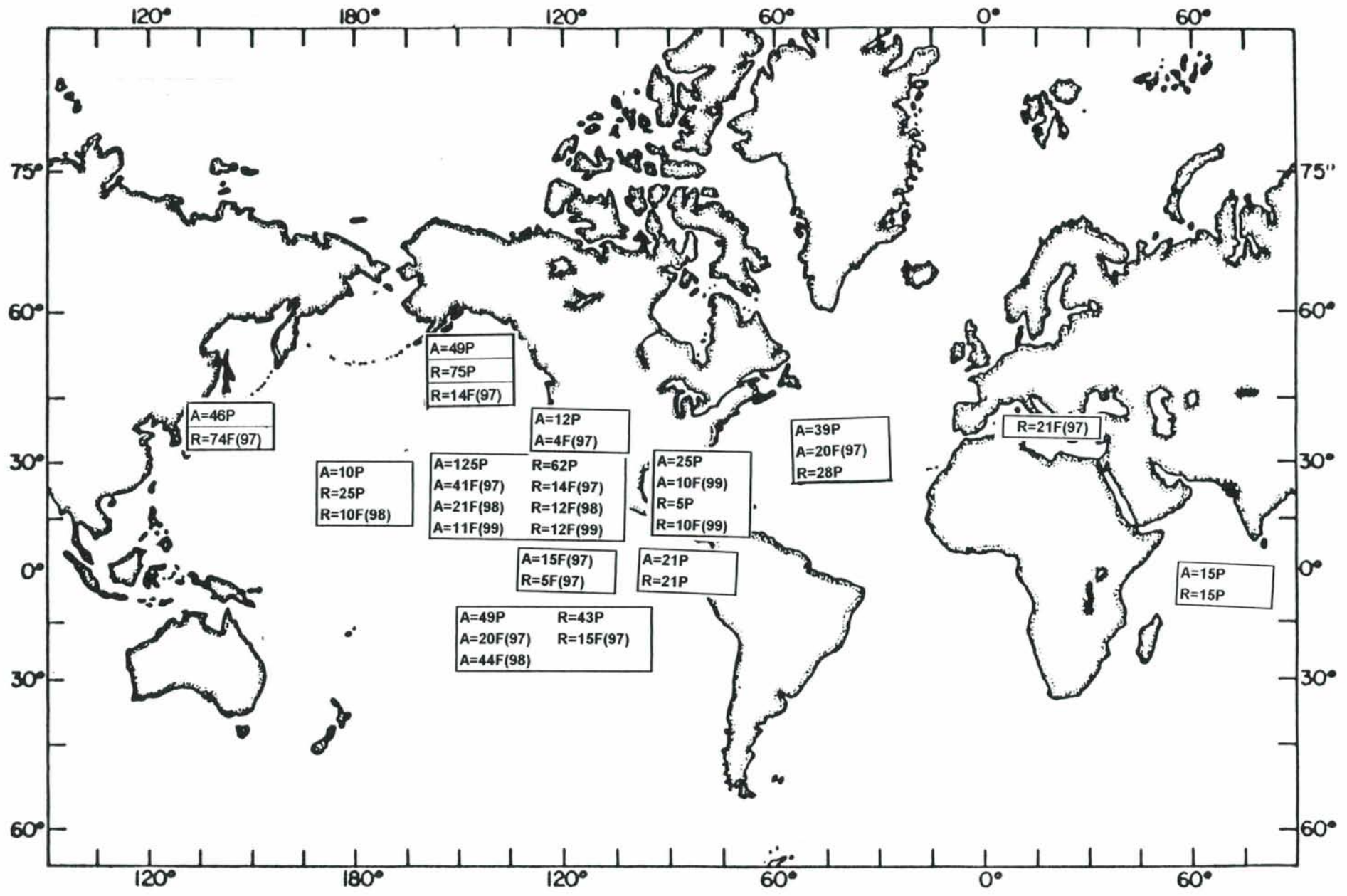
ALVIN/ROV Letters of Interest - Summary 1997 - 1999

#	Source	Investigator	Area	Title	Sponsor	Date	Alternate	Dives	Platform/Remarks	Disc.
39	Web 12/3/96	J. Lupton, NOAA NOAA: Butterfield, Massoth, Embley, Feely, Baker J. Tefry, FIT T. Urabe, GSJ Ishibashi, U. Tokyo UW: Baross, Summit U.Vic: V. Tunnicliffe EOS/NZ: Ronde	S. EPR .5 -20 S, 112-113	Investigation of hydrothermal systems on the Superfast-Spreadig EPR	NOAA NURP 10/31/96	early 1998	late 1997	20	ALVIN possible use of Jason	G&G
40	web 12/2/96	R. Lutz, Rutgers R. C. Vrijenhoek, Rutg	13 and 26 S	Gene Flow, Dispersal, and Systematics of Deep-Sea Hydrothermal Vent Organisms	NSF FUNDED 9633131	Jan-Feb 98	Feb-Mar 98	14	ALVIN	Biol
41	web 11/18/96	D. Naar, USF et al.	near Easter Is 22-27 S, 113 - 110 W	Collaborative Research: Ongoing Crustal Creation, Modification, and Overprinting near Easter Island	NSF 9619235 9/5/96	Austral Summer 97/98	other Austral Summers	18 12	ALVIN DSL-120 Sonar	G&G
42	web 11/19/96	T. Urabe, GS Japan K. Fujioka, JAMSTEC T. Yabuki, JHD H. Fujimoto, ORI	SEPR 7-19 S, 113-114	Ridge Flux Project of Science and Technology Agency (STA) of Japan to recover/redploy longterm monitoring instruments which are deployed during Shinkai 6500/Yokosuka cruise in July-August, 1997	STA Japan FUNDED	Jan-Feb 1998	none	5	ALVIN	G&G
43	web 12/9/96	J. Sinton, U of Hawaii K. Rubin R. Batiza	18 40'S 113 24' W 17 25'S 113 13"W SEPR	Volcanological investigation of a superfast spreading Mid-Ocean ridge	NSF- MGG funded 9633398	late 97	Early 1998	20 3	ALVIN DSL 120	G&G
44	831. 8/15/96 confirmed 12/10/96	C. L. Van Dover, UAF K. Rubin, UH J. Sinton, UH	17-18 S, 113 W SEPR	Chronoseres Study of Hydrothermal Vents on the SEPR	NSF OCE 8/15/96	early 98		3 7	ALVIN Jason Add on to Sinton	Biol
HAWAII										
45	web 11/19/96	D.K. Smith, U of Hawa L.Kong, U of Hawaii E. Parfitt, U of Leeds (T. Gregg, WHOI K. Johnson, Bishop M J. Reynolds, Hawaii	Puna Ridge 19 50' N 154 10'W 19 30'N, 154 46"W	Understanding Volcancanic Processes at the Submarine Puna Ridge	NSF 8/15/96 9618226	Sep-Mar 97/98		18 7	DSL-120 AGRO-II	G&G
46	web 12/9/96	M. Garcia, U of Hawaii M. Rhodes, U of Mass M. Kurz, WHOI	SW flank of HI 19N, 156 W	Submarine geology of Moana Loa revealed by landslides: Implications for the geological evolution of Hawaiian volcanoes.	NSF Feb-96 9633404	summer 1998	anytime	10	ALVIN	G&G

ALVIN/ROV Letters of Interest - Summary 1997 - 1999

#	Source	Investigator	Area	Title	Sponsor	Date	Alternate	Dives	Platform/Remarks	Disc.
47	831 2/10/95	A. Chave, WHOI R. Butler, IRIS Duennebeir, U Hawaii D. Yoerger, WHOI J Catiporic	awaii 2 Observator 28 N, 140 W	Hawaii 2 Observatory - install a junction box and sensor on a submarine cable between Hawaii and California	NSF ARI FUNDED	Sep-98	Aug-98	10	JASON	EGR
WESTERN PACIFIC										
48	web 12/4/96	M/R. Perfit, U. Fla K. Farley, Cal Tech B. McInnes, CSIRO G. Massoth V. Tunnicliffe, U. Vic. I. Jonasson	Solomon Is., Papua New Guinea New Ireland Tabar-Feni Islands 9deg 30'S 160E 4 S 152 E	Submersible Investigation of Hydrothermally Active Submarine Volcanoes in the New Ireland and Soloman Island Fore-arcs, S.W. Pacific	NSF Feb-97	Sum-fall 1998	Sum-fall 1999	15 5	ALVIN Jason	G&G
49	web 11/18/96	TBA- American Pl R. Binns, CSIRO S. Scott, U. Toronto Geol Survey-New Guin	Eastern Manus Basin, Bismarch Sea, Papua New Guinea	Chemistry of subsurface phase separation affecting vent fluids at the dacite-hosted PACMANUS hydrotherma field, eastern Manus Basin, Western Pacific		Nov-Dec 1998	anytime 1998	6	ALVIN -with Jason between dives	Chem
50	Web Nov-96	P. Cleft, WHOI R. Stern, UT C. Van Dover, UAF D. Stuben, U. Karslruh K. Fujioka, JAMSTEC T. Ishii, ORI, U.Tokyo Ishibashi, U. Tokyo	Northern Marianas Trough 21 deg 30' N, 44 E to 23 deg 15'N 143 E	ALVIN investigations of propagating Backarc Rifting in the Northern Mariana Trough	NSF 9618169 Aug-96	1998		25	ALVIN avoid typhonn season Aug-Oct	G&G
51		P. Fryer,	Mariana Arc	Survey of Mariana Arc	NSF FUNDED	1997	1998	27 Days		G&G
INDIAN OCEAN										
52	WEB 12/6/96	D. Fornari, WHOI S. Humphris, WHOI K. Von Damm, UNH C. Van dover, UAF M. Lilley, UW R. Collier, OSU A.L. Reysenbach, Rutgers C. Cavanaugh, Harvard	Central Indian Ridge near 24 S and 69 E	Mapping and sampling of hydrothermal vents on the central Indian Ridge near 24S.	NSF Feb-97	Dec-99 to Mar 2000	avoid monsoon season	15 5 5 5	ALVIN Jason ARGO II DSL-120	multi

ALVIN AND ROV REQUEST SUMMARY: 1997 AND BEYOND



APPENDIX XVIII

DESSC Preliminary Response Regarding Long Range Scientific Objectives and Vehicle/Facility Requirements for Deep Submergence, and Transitioning of Sea Cliff for use by Academic Research

- **September**: DESSC/UNOLS meeting S. Millick announces plans to retire DSV Sea Cliff and Turtle
- **October 7**: Letter from ONR (F. Saalfeld) to M. Perfit requesting DESSC input regarding utilization of the Navy deep submergence assets and preliminary assessment of deep sea scientific research objectives for the next few decades. List of 8 options.
- DESSC forms Working Group to address future directions and facility requirements for deep submergence
- **October 11**: Navy/ONR/NAVSEA reps. meet with WHOI-DSOG to discuss options provided by ONR and initial assessment of cost and effort required to transition Sea Cliff into the National Facility
- **November:** Meeting of Working Group delayed until community input can be solicited and feasibility study done by WHOI is complete.
- **December**: Initial deliberations by DESSC and preliminary response to Saalfeld.
- **December 13:** DESSC meeting. Discussion/input from community.
- **Early February:** A more formal and comprehensive assessment of these issues will be carried out by a working group comprised of experienced users of deep submergence facilities.
- Report to ONR March 1997.

SUMMARY OF MEMO TO SAALFELD/ONR

• Future Directions in Deep Submergence Science

Most recent, comprehensive assessment of future deep sea research objectives for the coming decades presented *The Global Abyss* which presents a balanced, multidisciplinary view of deep sea research- present and future. Summarizes the important discoveries made by either remotely or by direct observation by manned submersibles.

Scales of investigations require a range of safe, reliable, multi-faceted, high-resolution vehicles, sensors and samplers. We must find a way to provide the right complement of deep submergence vehicles and versatile support ships, and the funding to cost-effectively operate those facilities.

• Present Status and Future Deep Submergence Vehicle and Facility Requirements

National Deep Submergence Facilities: Woods Hole Oceanographic Institution. Alvin which can dive to a depth of 4500 m, and the remotely operated vehicle (ROV) Jason, Argo II imaging system, and DSL-120 sonar can work at depths as great as 6000 m.

U.S. Navy submersibles Sea Cliff and Turtle, and ROV ATV have been made available for limited academic research through a cooperative arrangement between NOAA and the U.S. Navy's Submarine Development Group 1 in San Diego, CA. These vehicles expanded opportunities for science and permitted observations to depths ~6000 m which provides access to 37% more of the sea floor.

French, Japanese or Russian submersibles: Rather limited use and hampered by conflicting foreign national interests and differences in scheduling and funding processes.

- Three critical areas which must be addressed if the U.S. is going to continue to be a leader in deep ocean research.
- a focused, cost-effective, and technically capable national deep submergence facility and operator,
- an integrated mix of vehicle systems including submersible(s), ROV(s), tethered mapping systems and AUVs, and
- a stable, federal funding base to support science, technology and enabling vehicle and ship facilities in the deep ocean.

- ***A Single National Facility***

Adequate and long-term funding of a National Facility such as that currently at WHOI. Given the current federal funding constraints for both basic research and facilities support, and the level of technical knowledge and experience to operate deep diving submersibles, it would not be prudent at this time to consider developing additional National centers for operating deep submergence vehicle facilities.

- ***Vehicle Systems***

To meet present and future research and engineering objectives, particularly with a multidisciplinary approach, deep submergence science will require a mix of vehicle systems. Vehicle depth capability should be to ~6000 m to allow for research over the widest range of tectonic, sedimentologic and geographic environments that will be investigated in the decades to come.

The DESSC endorses the plan for WHOI to provide a technical assessment and costing of how to best integrate Sea Cliff into the National Deep Submergence Facility, and believes that the deep submergence technical expertise at WHOI and their operational knowledge of Navy DSV systems makes this the logical approach to evaluating the technical and cost issues.

The DESSC feels that of the options provided by ONR, combining the best attributes of Alvin and Sea Cliff to produce a cost-efficient and capable deep diving submersible with a depth range of ~6000 m. Ignoring, for the moment, the considerable technical and budgetary issues that must be addressed in accomplishing this integration, the committee notes that if such an option is considered, that it will be important for the resulting submersible to retain all of the excellent science capabilities and operational characteristics (safety, reliability, maneuverability, bottom time) which Alvin currently has.

- ***Funding Support***

Perhaps the most serious impediment to integrating Sea Cliff into the US deep submergence program is the lack of an adequate and stable funding base. The DESSC believes in order to successfully utilize and maximize the scientific assets of Sea Cliff, ONR, NSF and NOAA must work together with the community to ensure that adequate funding is provided. In this time of fiscal restraint, funding is clearly not available for an additional facility to maintain and operate Sea Cliff, nor is funding likely to increase to levels that could support science for parallel programs. Additional financial burdens on the funding agencies, without a clearly defined source of new or additional funding at this time would likely put the current successful deep submergence program at WHOI at risk.

The DESSC suggests that the federal agencies work together with the operators at WHOI and the DESSC to fully evaluate the feasibility of melding Sea Cliff and or its components into the National Deep Submergence Facility so that improved submersible facilities could be available to the science community as well as the Navy for operational and strategic needs.

APPENDIX XIX

UNIVERSITY-NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

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

MEMORANDUM

Date: December 5, 1996

To: Dr. F. E. Saalfeld, ONR

From: The DEep Submergence Science Committee
(M. Perfit- Chair, J. Bellingham, R. Collier, P. Fryer, M. Lilley, H. Milburn, D. Orange, C. Van Dover, C. Wirsen)

Subject: Preliminary Response from DESSC Regarding Long Range Scientific Objectives and Vehicle/Facility Requirements for Deep Submergence, and Transitioning of SEACLIFF for use by Academic Research

The following assessment is in response to your request for input from the DEep Submergence Science Committee (DESSC) regarding utilization of the U.S. Navy's deep submergence assets. The DESSC has deliberated via electronic mail and telephone to provide a preliminary assessment of deep sea scientific research objectives for the next few decades, and the projected requirements for deep submergence vehicle systems and facilities to meet those needs. In accordance with the DESSC's overall plan to include the perspectives and requirements of the deep submergence research community in this planning process, a more formal and comprehensive assessment of these issues will be carried out by a working group comprised of experienced users of deep submergence facilities. This ad hoc group will meet in early February and will submit a report to you in the Spring of 1997. In the interim, the DESSC considers it important to provide you and the agencies with a written statement concerning these matters that would help guide your policy decisions in the near-term.

We hope that this preliminary assessment is useful to you and welcome your comments. We will keep you appraised of our progress in getting community input on these important issues and plan for it to be an agenda item for discussion at the upcoming DESSC meeting at the San Francisco AGU.

Best Regards,

Michael Perfit

Mike Perfit, DESSC Chair

Copy to:
WHOI
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Preliminary Response from DESSC Regarding Long Range Scientific Objectives and Vehicle/Facility Requirements for Deep Submergence, and Transitioning of SEACLIFF for use by Academic Research

Future Directions in Deep Submergence Science

The most recent, comprehensive assessment of future deep sea research objectives for the coming decades was presented in a report titled, *The Global Abyss* (Fox et al., 1994), which was largely shaped by DESSC open forums and workshops prior to 1992. That report, which presents a balanced, multi-disciplinary view of deep sea research- present and future, identifies many important biological, chemical, geological, and engineering problems that require human presence, in situ or remotely, in the abyss. For example, relatively recent discoveries of deep ocean hydrothermal communities and hot ($>300^{\circ}C$) metal-rich vents on many segments of the mid-ocean ridge, documentation of the immediate after-effects of submarine eruptions on the northern East Pacific Rise, Gorda Ridge and CoAxial Segment of the Juan de Fuca Ridge, discoveries of extensive fluid flow and vent communities along continental margins and realizations regarding the extent of mid-water and deep crustal biomasses have revolutionized our concepts of deep ocean chemistry, biology, and geology. They also propelled deep submergence science, and the related fields of deep sea microbiology, sedimentology, biochemistry and biotechnology, to new research directions that will be the focus of concentrated investigations in the coming decades and have provided further impetus to investigate the processes which lead to the creation of 75% of the Earth's crust. In addition, tectonic and geotechnical research at oceanic trenches, structural studies in transform faults and microplates, and continental margin and oceanic island studies related to catastrophic slope failure and seismic/volcano hazards, all are important areas of science that will be the focus of fundamental deep submergence research into the 21st century.

The disciplines involved are varied and the scales of investigation range many orders of magnitude from molecules and micron-sized bacteria to segment-scales of the mid-ocean ridge (MOR) system, 10's to 100's of kilometers long at depths that range from 2500 m to 6000 m and greater in the deepest trenches. Clearly the spectrum of scientific problems and environments where they must be investigated require access to the deep ocean floor with a range of safe, reliable, multi-faceted, high-resolution vehicles, sensors and samplers, operated from support ships that have global reach and good station-keeping capabilities in rough weather. Providing the right complement of deep submergence vehicles and versatile support ships from which they can operate, and the funding to cost-effectively operate those facilities, is both a requirement and challenge for satisfying the objectives of deep sea research in the coming years and into the next century. The DESSC, with input from the research community via the working group, will provide additional details on the vitality and relevancy of deep submergence research in our final report on this topic.

Present Status and Future Deep Submergence Vehicle and Facility Requirements

The U.S. academic research community has routine, observational access to the deep ocean and sea floor down to 6000 m depth via the National Deep Submergence Facilities operated for UNOLS by the Woods Hole Oceanographic Institution. The vehicle systems of the National Facility currently include the submersible ALVIN which can dive to a depth of 4500 m, and the remotely operated vehicle (ROV) Jason, Argo II imaging system, and DSL-120 sonar which can work at depths as great as 6000 m.

Over the past 5-7 years the U.S. Navy submersibles SEACLIFF and TURTLE, and ROV ATV have been made available for limited academic research through a cooperative arrangement between NOAA and the U.S. Navy's Submarine Development Group 1 in San Diego, CA. These vehicles have expanded opportunities for peer-reviewed deep submergence research off the U.S. west coast. SEACLIFF and ATV have provided the science community with some additional access to the deep sea and permitted observations to depths ~6000 m, a depth range otherwise only available by using ROV Jason or the other tethered vehicles of the National Deep Submergence Facility. This increase of 1500 m over ALVIN's limits provides access to 37% more of the sea floor which represents an area that is greater than 90% of the surface area presently exposed on the continents.

A very limited amount of additional submersible diving by U.S. scientists to depths as great as 6000 m has been carried out in the southern East Pacific Rise, Mid-Atlantic Ridge, Hess Deep, and southwest Pacific using the French, Japanese or Russian submersibles Nautile, Shinkai-6500, and MIRs, respectively. Experience over the past few years has shown that the use of foreign submersible assets, while conceptually appealing, is hampered by conflicting foreign national interests and differences in scheduling and funding processes. Consequently, access by U.S. investigators to those facilities is limited and will likely remain so.

These facts, coupled with the Navy's decision to decommission SEACLIFF, provide an important opportunity to define and plan the future vehicle composition of the U.S. National Deep Submergence Facility to meet the projected scientific objectives of the coming decades. The DESSC believes that there are three critical areas which must be addressed if the U.S. is going to continue to be a leader in the science and technology of deep ocean research. They are:

- A focused, cost-effective, and technically capable national deep submergence facility and operator,
- An integrated mix of vehicle systems including submersible(s), ROV(s), tethered mapping systems and AUVs, and
- A stable, federal funding base to support science, technology and enabling vehicle and ship facilities in the deep ocean.

A Single National Facility

Adequate and long-term funding of a National Facility, such as the one now operated by WHOI, is essential and the DESSC believes that it is important to continue to have a primary National Deep Submergence Facility. The vehicles operated by WHOI for UNOLS have proved to be, overall, the most cost-effective and productive systems in the world and have accomplished more than 80% of the total deep submergence peer-reviewed research since these vehicles were developed in the mid 1960's. Given the current federal funding constraints for both basic research and facilities support, and the level of technical knowledge and experience to operate deep diving submersibles, it would not be prudent at this time to consider developing additional National centers for operating deep submergence vehicle facilities.

Clearly there are a few other U.S. organizations which have deep submergence vehicles (e.g. MBARI with the ROVs TIBURON and VENTANA which can go to 4500 m and 1500 m depth, respectively, and HURL at the Univ. of Hawaii which operates the Pisces-V submersible which can go to 2000 m depth), and institutions such as Harbor Branch Oceanographic Institute with shallow water (<2000 m) vehicles. Those systems have the potential to supplement some of the facilities requirements particularly in certain geographic areas off the US coasts and in the mid-Pacific. However, the DESSC notes that although MBARI intends to integrate its ROV systems into mainstream U.S. academic research, the extent of this integration is, at this time, unclear. The HURL facility does provide support largely for deep submergence research around the Hawaiian Islands which is important. However, in recent years the number of science dives carried out has been somewhat limited because of funding constraints and construction of their new support ship the KOK.

Vehicle Systems

To meet present and future research and engineering objectives, particularly with a multi-disciplinary approach, deep submergence science will require a mix of vehicle systems. Vehicle depth capability should be to ~6000 m to allow for research over the widest range of tectonic, sedimentologic and geographic environments that will be investigated in the decades to come. As deep submergence science investigations extend into previously unexplored portions of the southern East Pacific Rise, Indian Ocean ridges and southern Mid-Atlantic ridge, it is critical that we have the capability to dive to greater depths than is now possible with ALVIN. Submersibles, which provide the cognitive presence of humans and heavy payload capabilities will be critical to future observational, time-series and observatory-based research in the coming decades. ROVs and tethered systems, especially when used in closely-timed, nested investigations offer unparalleled maneuverability, mapping and sampling capabilities with long bottom times and without limitation to human/vehicle endurance. The combination of submersible, ROV and tethered systems on the new UNOLS deep submergence support ship ATLANTIS, and a nested survey approach, will permit cost-

effective exploration and detailed investigation and sampling of remote sea floor areas. AUVs, both smaller, faster designs like the MIT-Odyssey, and the slower more maneuverable type WHOI-ABE vehicle will provide unprecedented access to the deep ocean and sea floor without dedicated support of a surface ship. They will not, however for the near future, be able to complete the essential manipulative tasks that submersibles or ROVs effectively accomplish nor will they be able to operate at depths greater than ~6000 m.

The committee understands that the Navy and NAVSEA have requested WHOI to provide a technical assessment and costing of how to best integrate SEACLIFF into the National Deep Submergence Facility. The DESSC endorses this plan, and believes that the deep submergence technical expertise at WHOI and their operational knowledge of Navy DSV systems, and how they differ or are the same as ALVIN's, makes this the logical approach to evaluating the technical and cost issues. Based on scientific and programmatic considerations, the committee believes that only a few of the many options presented by Dr. Saalfeld in his letter to Dr. Perfit, could be viable. Probably the most cost-effective and advantageous of these options would entail combining the best attributes of ALVIN and SEACLIFF to produce a cost-efficient and capable deep diving submersible with a depth range of ~6000 m. Ignoring, for the moment, the considerable technical and budgetary issues that must be addressed in accomplishing this integration, the committee notes that if such an option is considered, that it will be important for the resulting submersible to retain all of the excellent science capabilities and operational characteristics (safety, reliability, maneuverability, bottom time) which ALVIN currently has. We say this because it is likely that the principal operating range for a majority of peer-reviewed deep submergence science will continue to be in the range of 2500-5000 m water depth.

The various options presented by Dr. Saalfeld as well as other options proposed by DESSC and the science community will be discussed and evaluated and reported on in the Working Group report.

Funding Support

Perhaps the most serious and biggest impediment to integrating SEACLIFF into the US deep submergence program is the lack of an adequate and stable funding base. To their credit, the federal agencies and WHOI were able, in this restricted funding climate, to bring to fruition a new deep submergence support ship - R/V ATLANTIS, which will provide integrated deep submergence vehicle operational capabilities that are unique in the world. However the DESSC believes in order to successfully utilize and maximize the scientific assets of SEACLIFF, ONR, NSF and NOAA must work together with the community to ensure that adequate funding is provided to support the operational, engineering and ship facilities required to carry out the science and engineering programs. NSF has largely shouldered the burden of support for the facilities and science programs in recent years. In this time of fiscal restraint, funding is clearly not available for an additional facility to maintain and operate SEACLIFF,

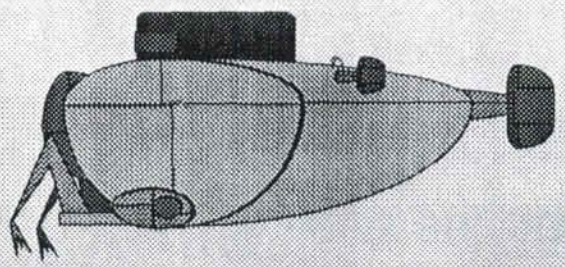
nor is funding likely to increase to levels that could support science for parallel programs. Placing additional financial burdens on the funding agencies, without a clearly defined source of new or additional funding at this time would likely put the current successful deep submergence program at WHOI at risk.

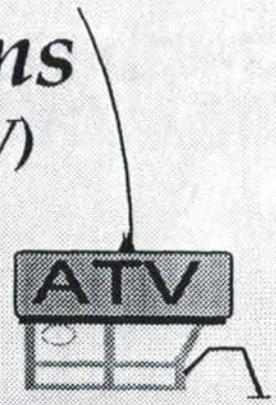
At present, the DESSC suggests that the federal agencies work together with the operators at WHOI and the DESSC to fully evaluate the feasibility of melding SEACLIFF and or its components into the National Deep Submergence Facility so that improved submersible facilities could be available to the science community as well as the Navy for operational and strategic needs. The DESSC views that consideration of this important topic now capitalizes on: 1] momentum provided by the new support ship, 2] recent upgrades of science sensors and imaging capabilities of vehicle systems funded by NSF, ONR and NOAA, and implemented by WHOI, and 3] the exciting new science problems and research initiatives to be addressed by deep submergence science, and the potential for them to be focal points for science education at all levels and public interest in the oceans. As mentioned above, DESSC has arranged for a one-time meeting of a UNOLS working group consisting of DESSC representatives and some experienced members of the oceanographic community. The charge to that working group, which will meet in early February 1997, when more information regarding funding and feasibility are available, will be to provide ONR and other relevant government funding agencies with a comprehensive evaluation of the issues in question, and the academic research community with an assessment of needs for deep submergence vehicles in the 21st century.

APPENDIX XX

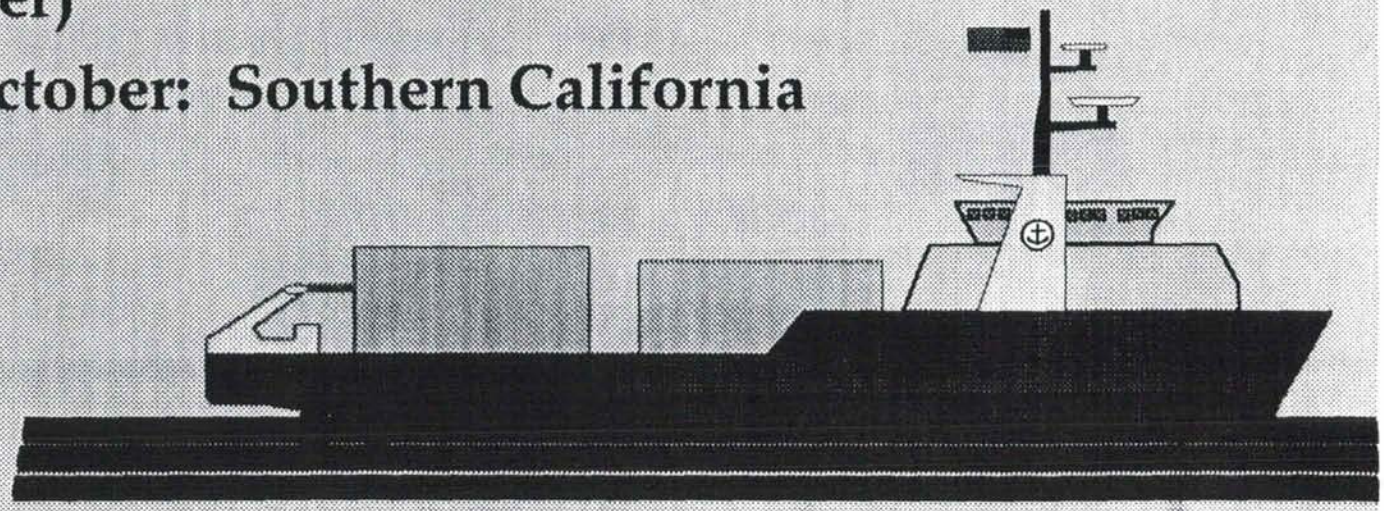
1996 Science Operations

Advanced Tethered Vehicle (ATV) and DSV SEA CLIFF



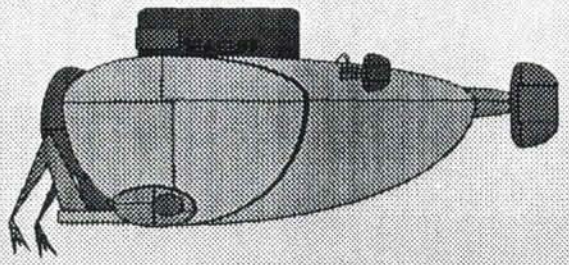


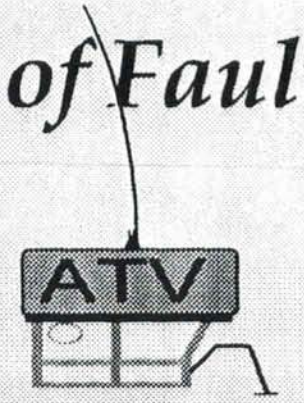
- **19 August to 2 September: Blanco and Gorda Ridges (Embley)**
- **3 to 15 September: Juan de Fuca Ridge (Rona)**
- **15 September to 1 October: Southern Oregon Margin (Goldfinger)**
- **21 to 28 October: Southern California (Smith)**



Structural Observations of Faults

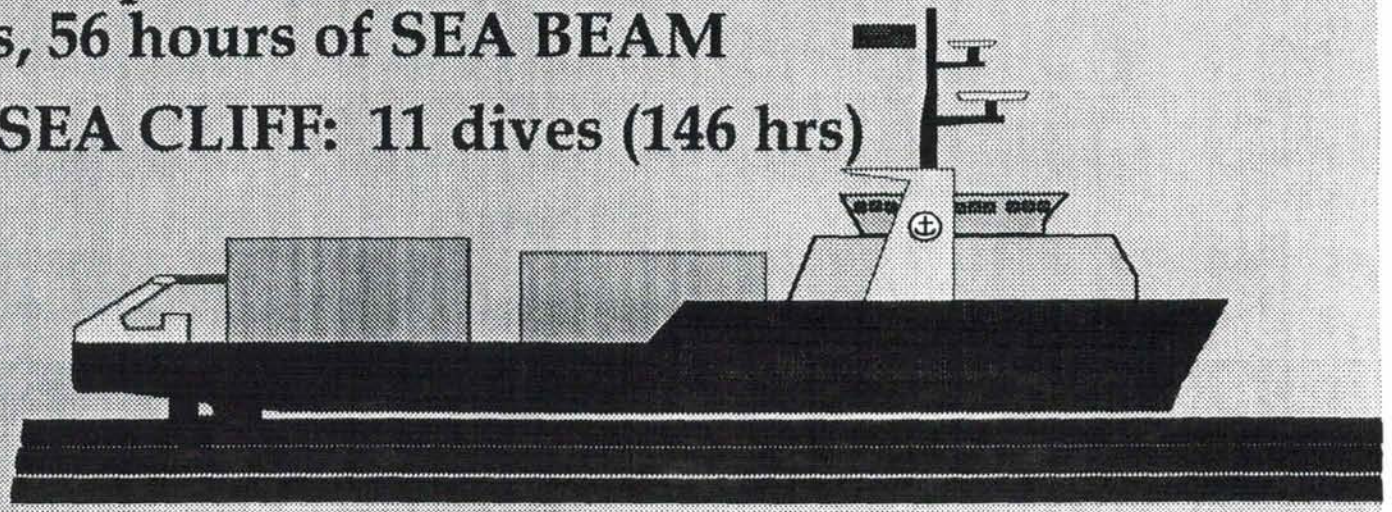
Southern Oregon Margin
15 September to 1 October





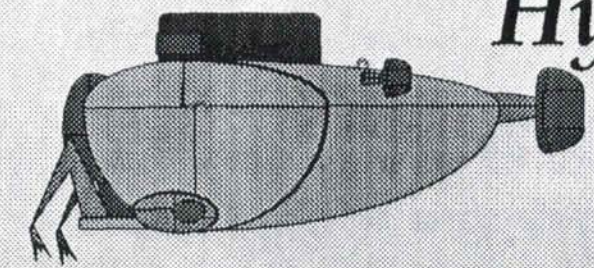
- **Dr Chris Goldfinger (Oregon State University)**
- **Investigation and documentation of strike-slip faulting mechanisms and super-scale slump processes.**
- **Recovered 46 specimens, 88 hours of video, 522 still frames, 56 hours of SEA BEAM**

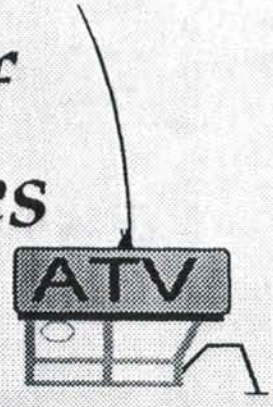
  -ATV and SEA CLIFF: 11 dives (146 hrs)



Acoustic Imaging of Hydrothermal Plumes

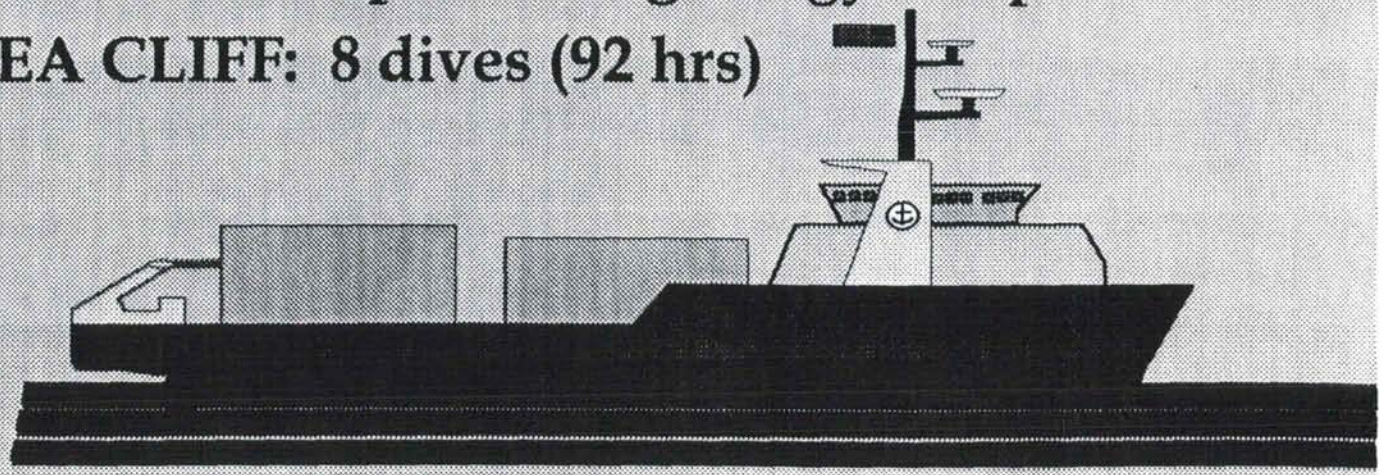
Juan de Fuca Ridge:
3 to 15 September

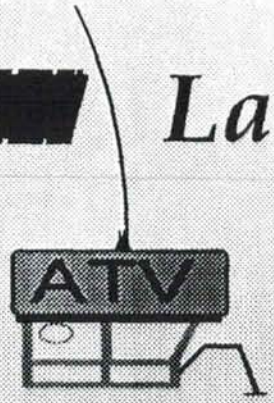




- **Dr Peter Rona (Rutgers University)**
- **Completed engineering testing of Mesotech 971 sonar; to measure flow rates and water temperature fluctuations of black smoker's buoyant plumes**
- **Conducted 8 hrs of vent plume imaging, collected 41 hours of video, 884 still photos, 4 geology samples.**

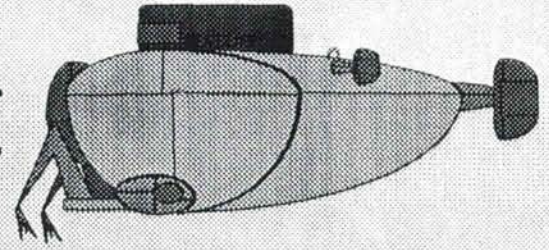
ATV and SEA CLIFF: 8 dives (92 hrs)





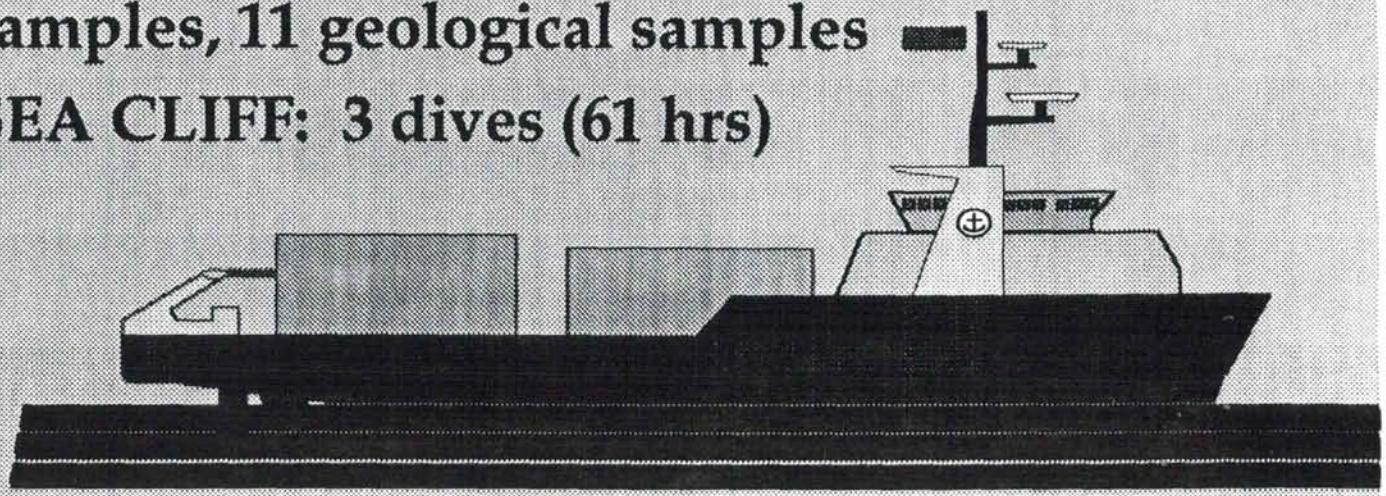
Lava Flow Mapping and Sampling

Blanco and Gorda Ridges:
19 August to 2 September



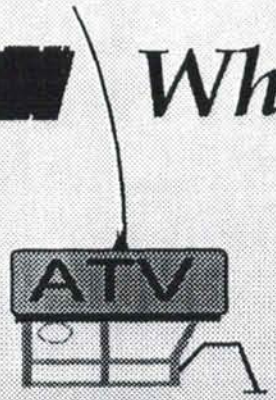
- **Dr Robert Embley (NOAA/PMEL)**
- **Investigate various processes at Blanco Depression; lava mapping at Gorda Ridge**
- **20 hrs of insitu heat flow and water chemical analysis (SUAVE), 32 still photos, 43 hrs video, 3 Niskin water samples, 3 titanium water samples, 6 tube core samples, 11 geological samples**

ATV and SEA CLIFF: 3 dives (61 hrs)

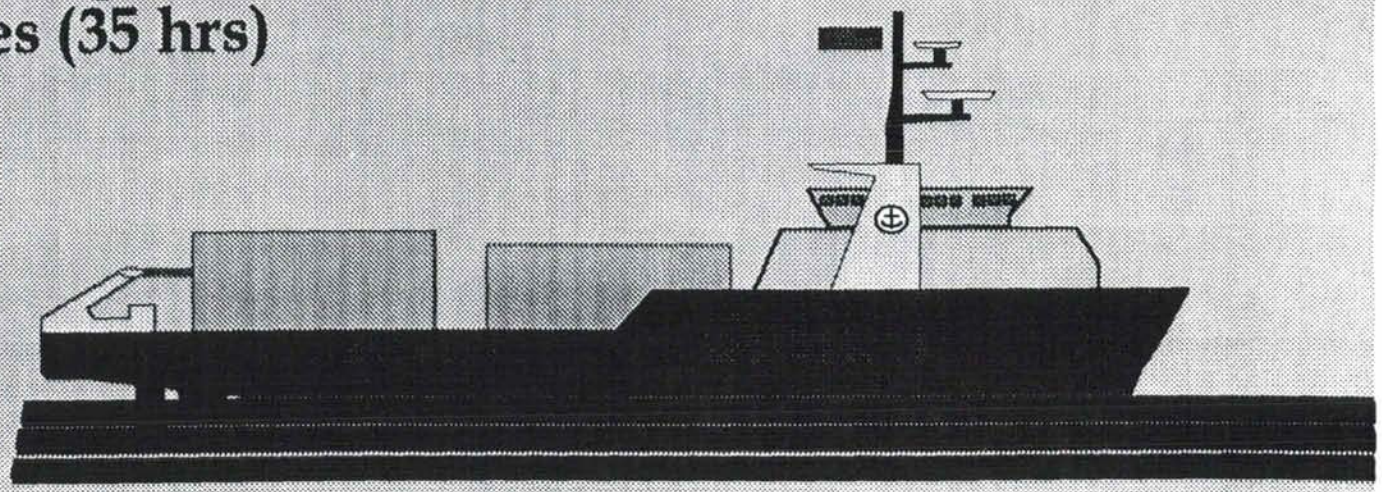


Whale-Fall Communities

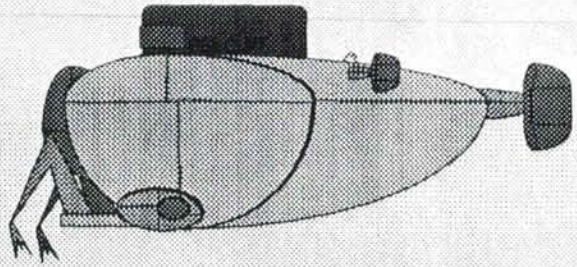
Catalina Basin:
21 to 28 October



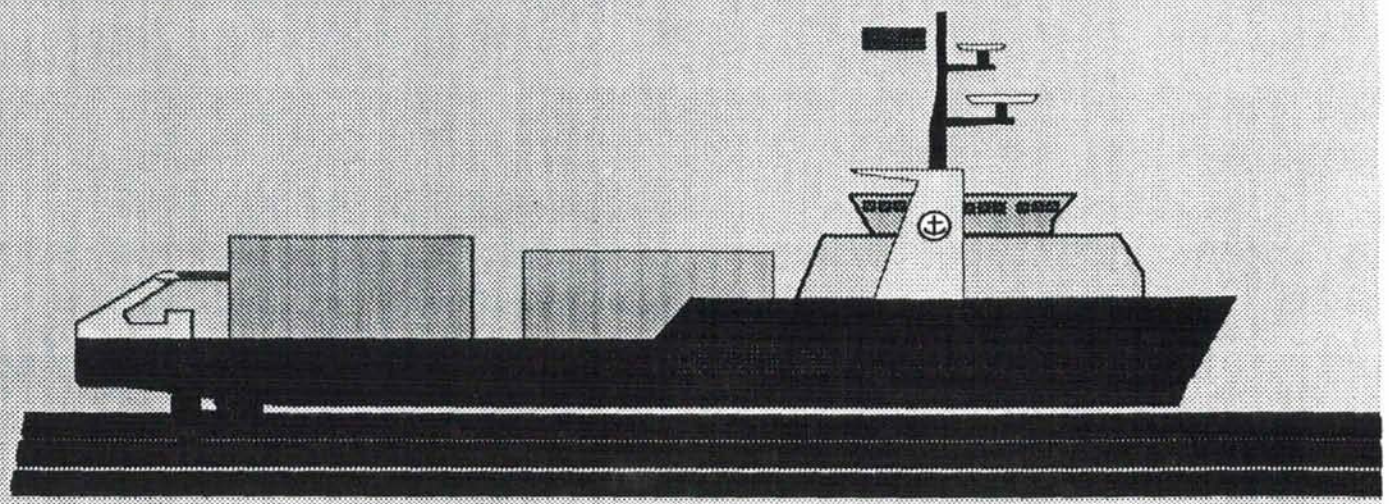
- **Dr Craig Smith (University of Hawaii)**
- **Evaluated the community and population genetic structure of invertebrates associated with whale skeletons.**
- **Recovered 4 whale bones, 60 core samples, 23 hours of video recordings, 983 still frames.**
  ATV: 4 dives (35 hrs)



Summary of Operations

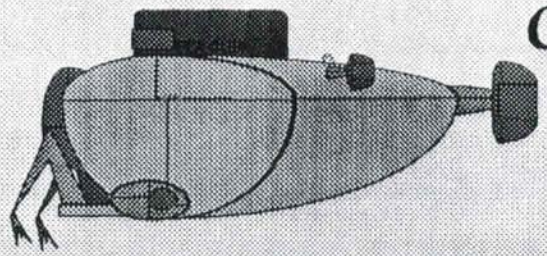


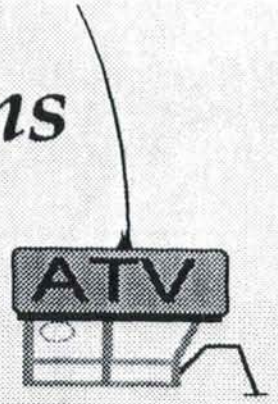
- **Total days on station: 25 days (9 lost to weather)**
- **Depth of operations: 2826 to 12,300 feet**
- **ATV and SEA CLIFF dives: 26 dives/333 hours**
- **Total hours of bottom time: 225 hours**



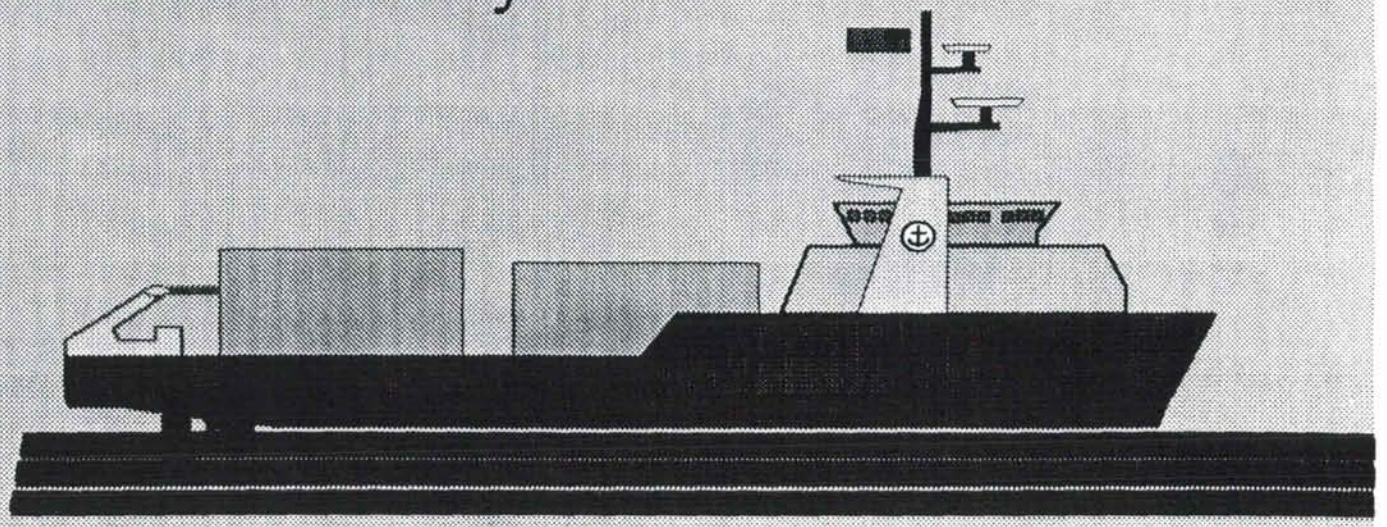
Recent Military Operations

Concurrent with Science Operations

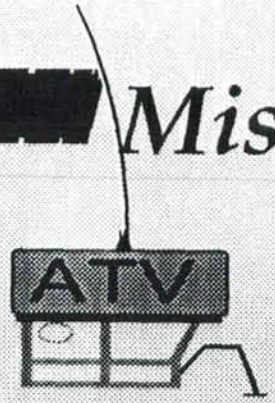


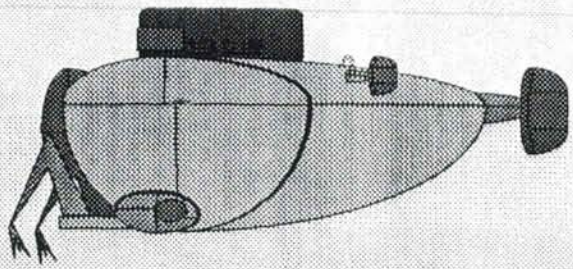


- **Coast Guard mishap investigation**
- **One high value R&D Recovery**
- **One air-mishap search (HC-130 in progress)**
- **International (NATO) DSRV Exercise: France Netherlands and Norway**

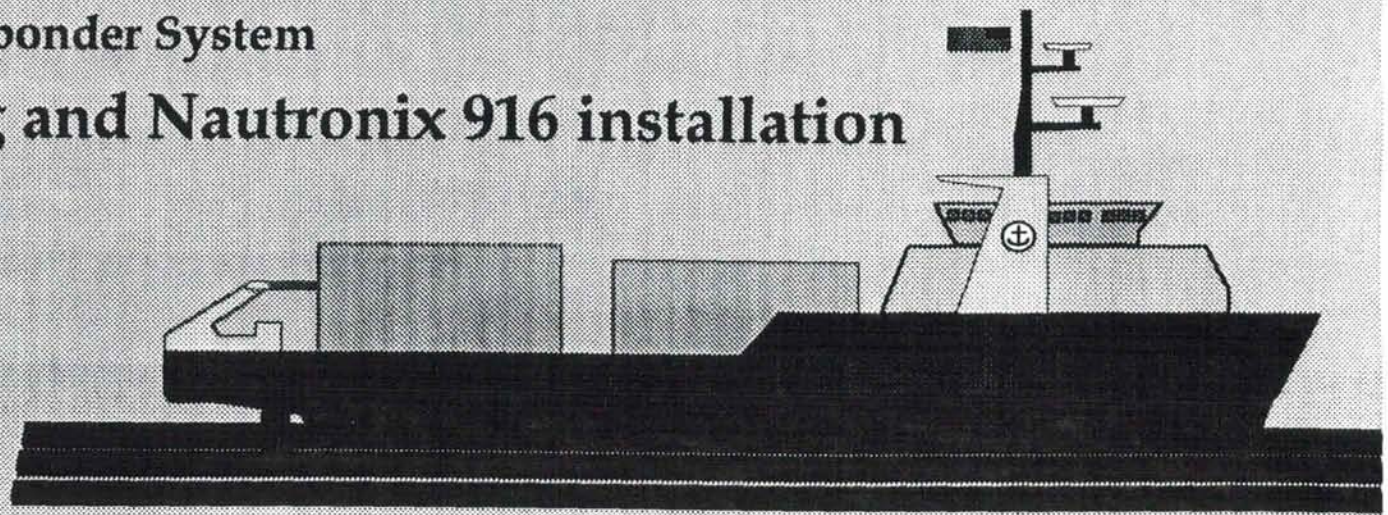


Miscellaneous Upgrades

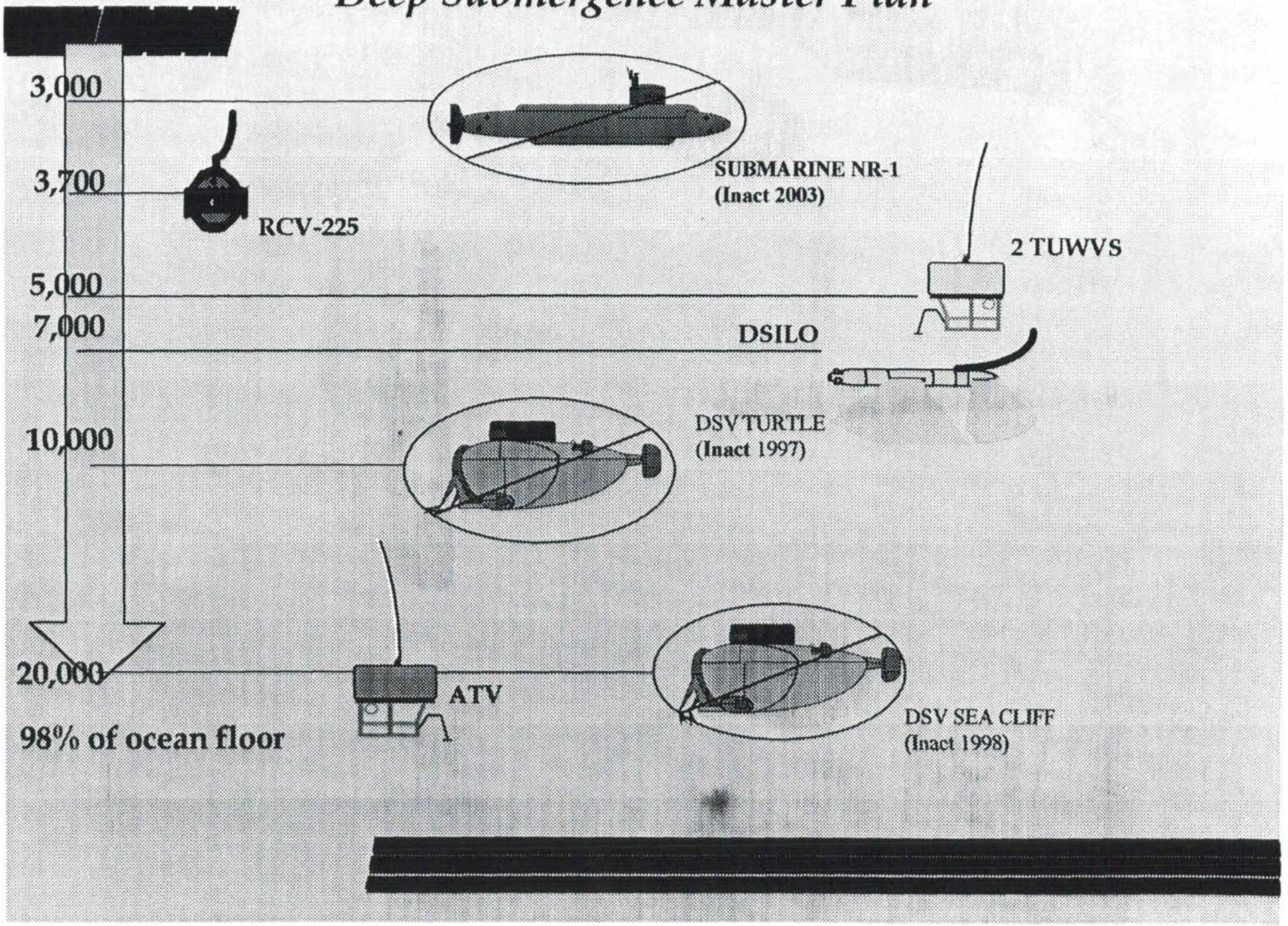




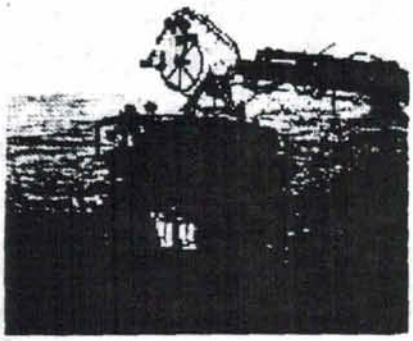
- **ATV Upgrades**
  - **Tether and Telemetry Upgrades**
  - **New Graphics Computer System**
  - **Tracking Improvements (dedicated channel)**
  - **Imaging Sonar (UDI: 200/500 Khz or 500/1000 Mhz)**
  - **2 Additional HMI lights**
  - **New Responder System**
- **Winphrog and Nautronix 916 installation**



Deep Submergence Master Plan



APPENDIX XXI



ROV Ventana

Structure & Ballast

Dry Weight 5150 lbs
Benthic Sled Dry 346 lbs
Coring Sled 700 lbs

Power & Propulsion

40 Hp Franklin Electric Motor 2300 VAC
1 Rexroth A10V-25 Hydraulic Pump
6 Thrusters, 2 Rexroth A2F/ISE Nozzle
4 Volvo F11-10/ISE Nozzle
2x5 Servo Valve Manifolds
8KW Hotel Power
2100 Meter Umbilical
8 Multimode Fibers

Navigation Instrumentation

Altimeter Mesotech Echo Sounder 807
Depth Sensor Paroscientific 8B2000

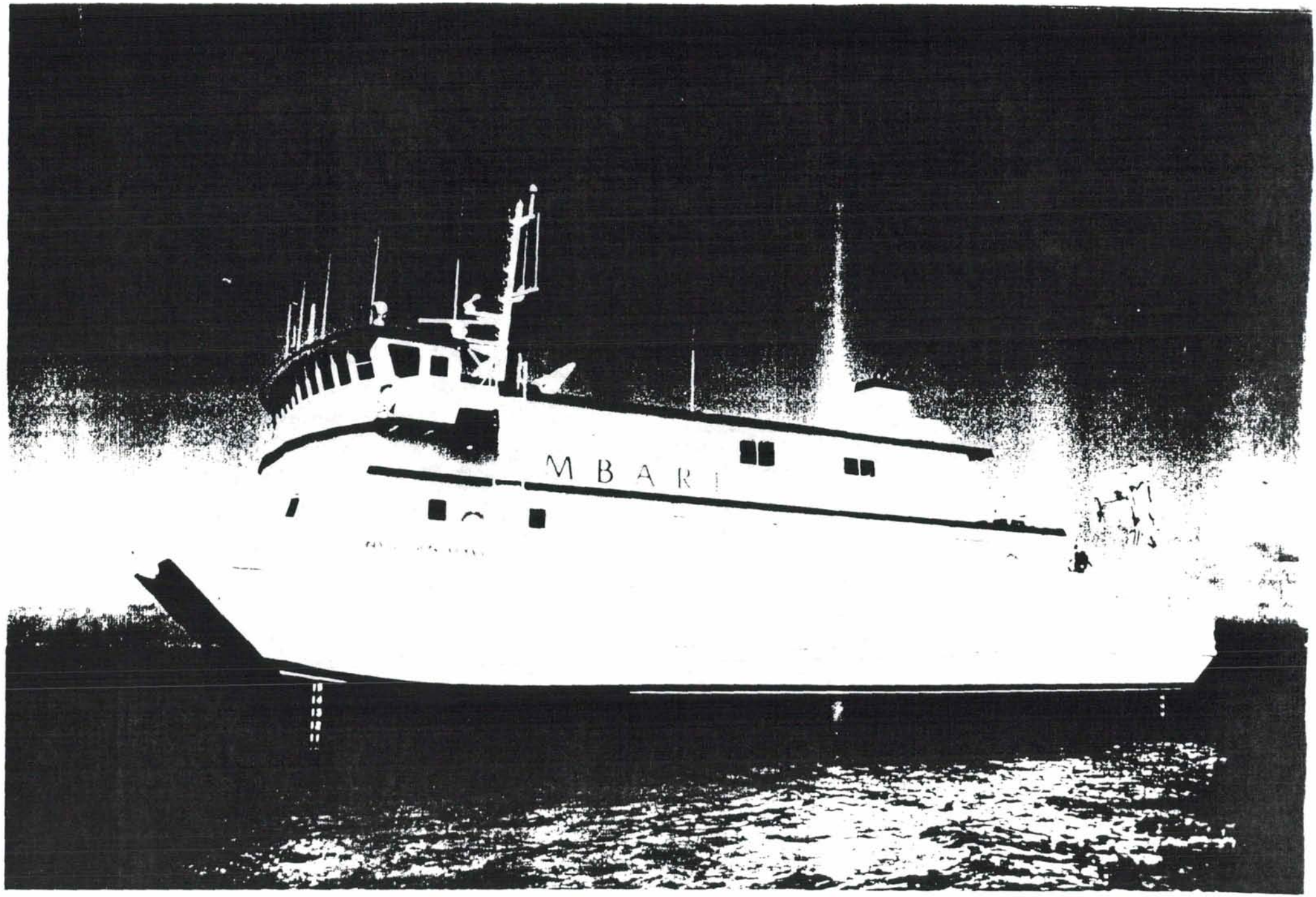
Pitch & Roll Sperry Accustar

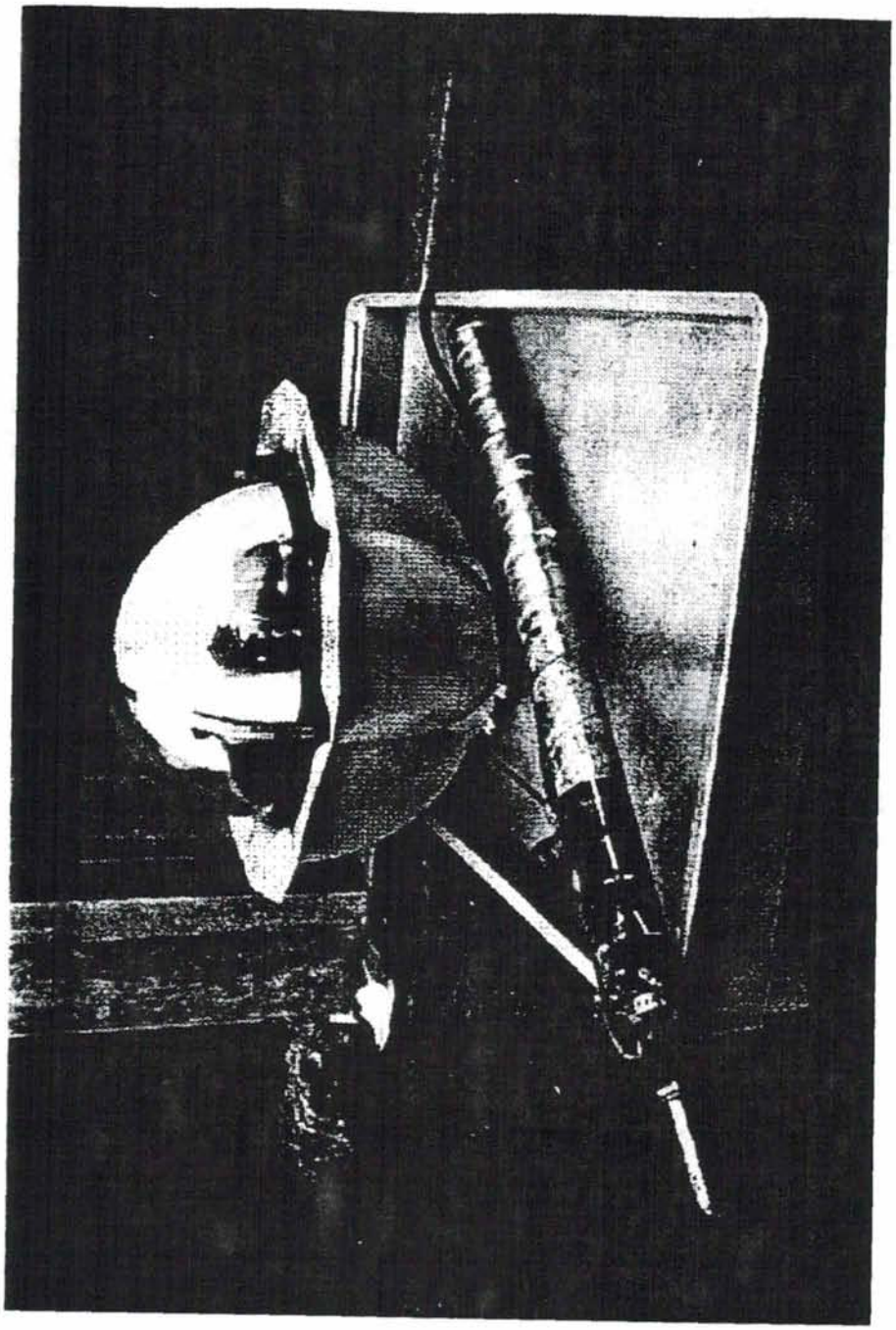
Lights 4x DSPL Daylight Lamps 400 watts
4x DSPL incandescent Lamps 500 watts
2x Aux Lights to 500 watts
Sonar UDI Sonarvision 4000 500khz/200khz
USBL Ferranti ORE Trackpoint II
(Ship to ROV) Responder to 3000m
USBL Sonardyne Homer Pro
(ROV to Beacon) 4000m capable, 400m range(LOS)
Speedometer Savonious Rotor/MBARI Electronics

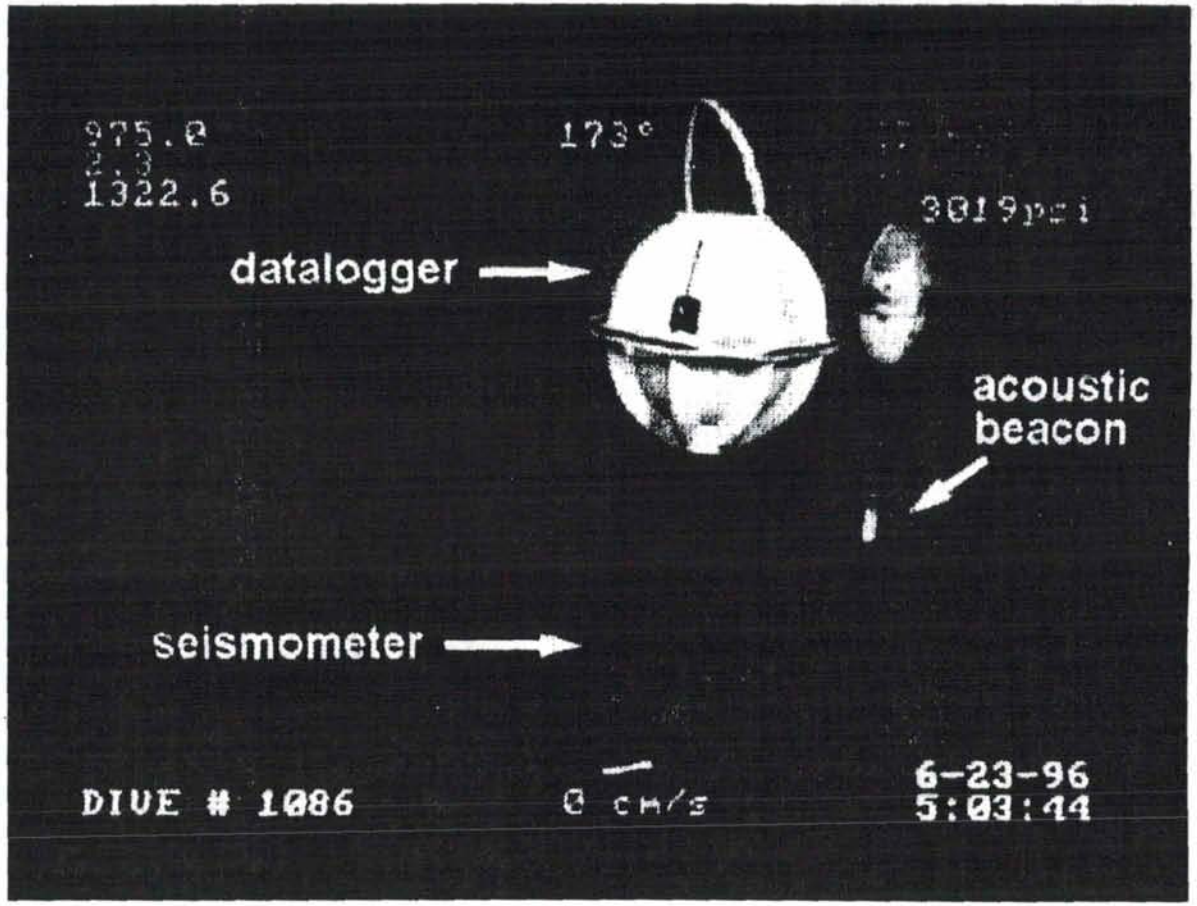
Camera Systems

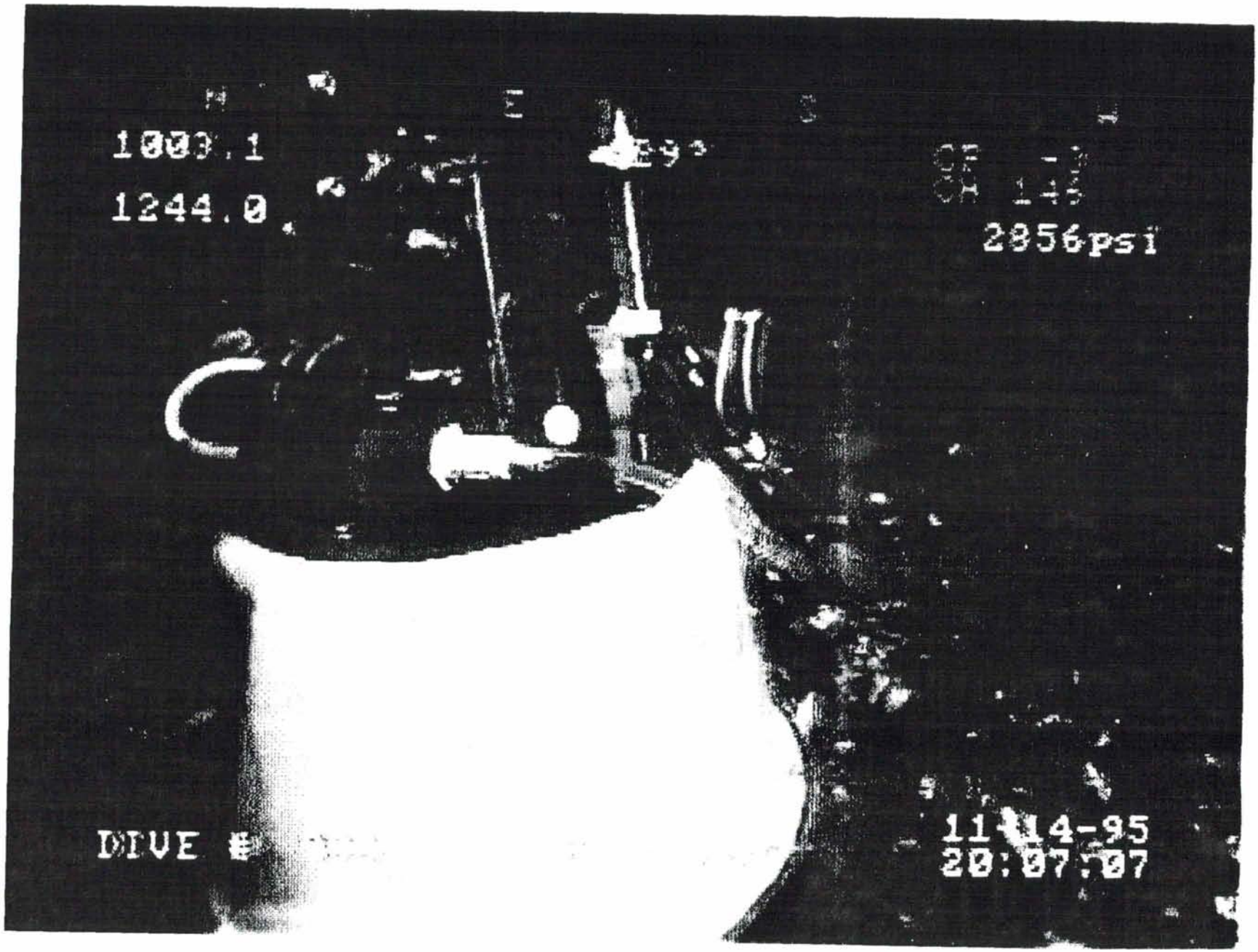
Video/Still Camera Systems

Sony DXC3000 3 chip Camera c/w Fujinon Zoom Lens f1.7 5.5 - 47mm
3 x Deep Sea Power & Light MSC2000 Pencil Cameras Lens f4 3,5mm
Stereo Graphics Crystal Eyes 3 Dimensional Viewing System cw 2 MSC2000
Photosea NDT4000 Stereo Macro Camera dual 28mm cw Video View Finder
Photosea 1500s 35mm Still Camera cw 28mm or 35 mm lens
SGI Video Capture System(direct from RGB Sony Feed)
Sony Betacam BVM30 Video Recording
Dynair 30 X 30 Video Switch (ROV Control Room)
MBARI/Maxim 8 X 4 Programmable Video Switch (subsea)
2 X 4 STC Analog Video to Laser Multiplexers


MBARI




975.0
1322.6
173°
3019psi
datalogger
acoustic
beacon
seismometer
DIVE # 1086
0 cm/s
6-23-96
5:03:44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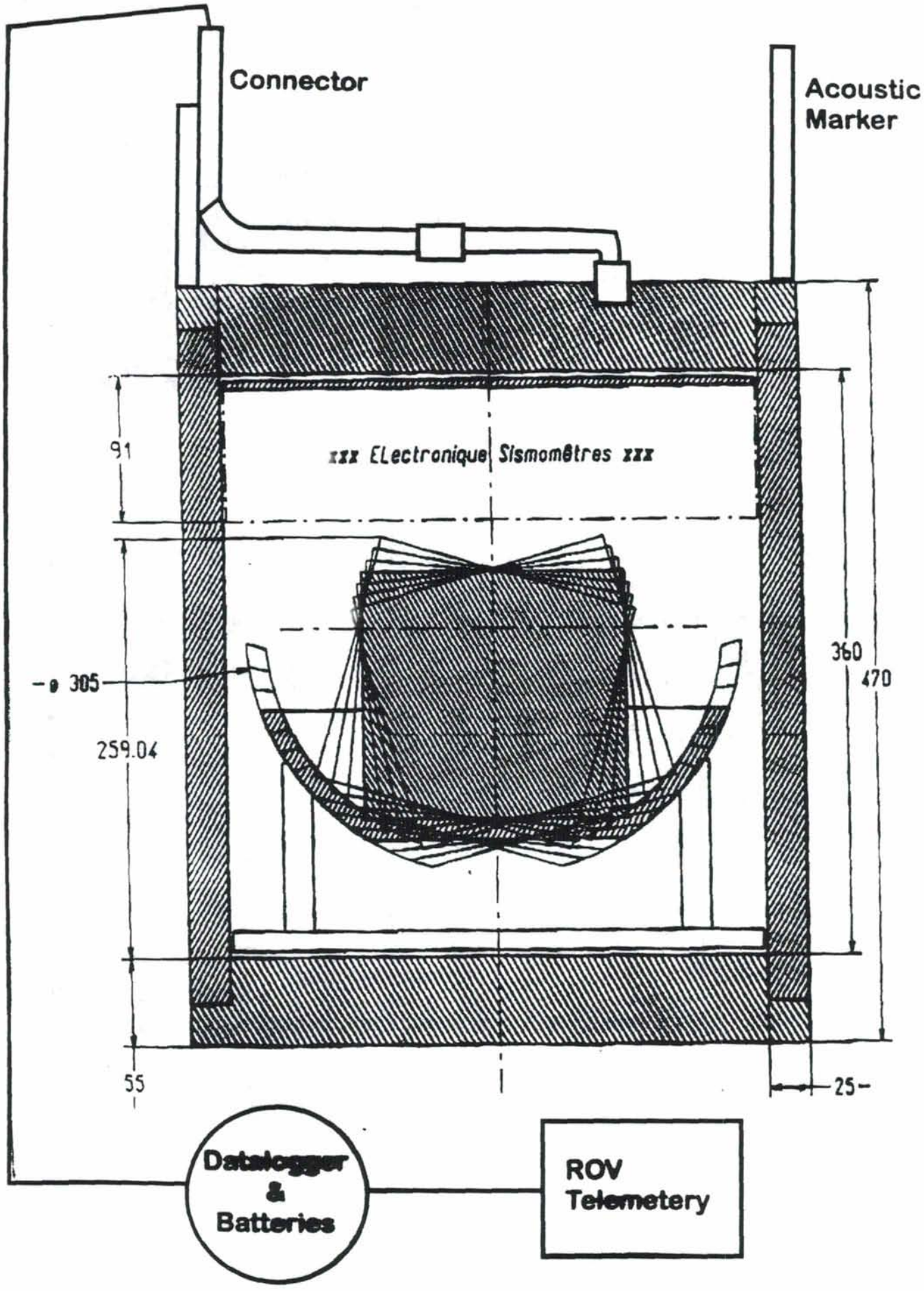
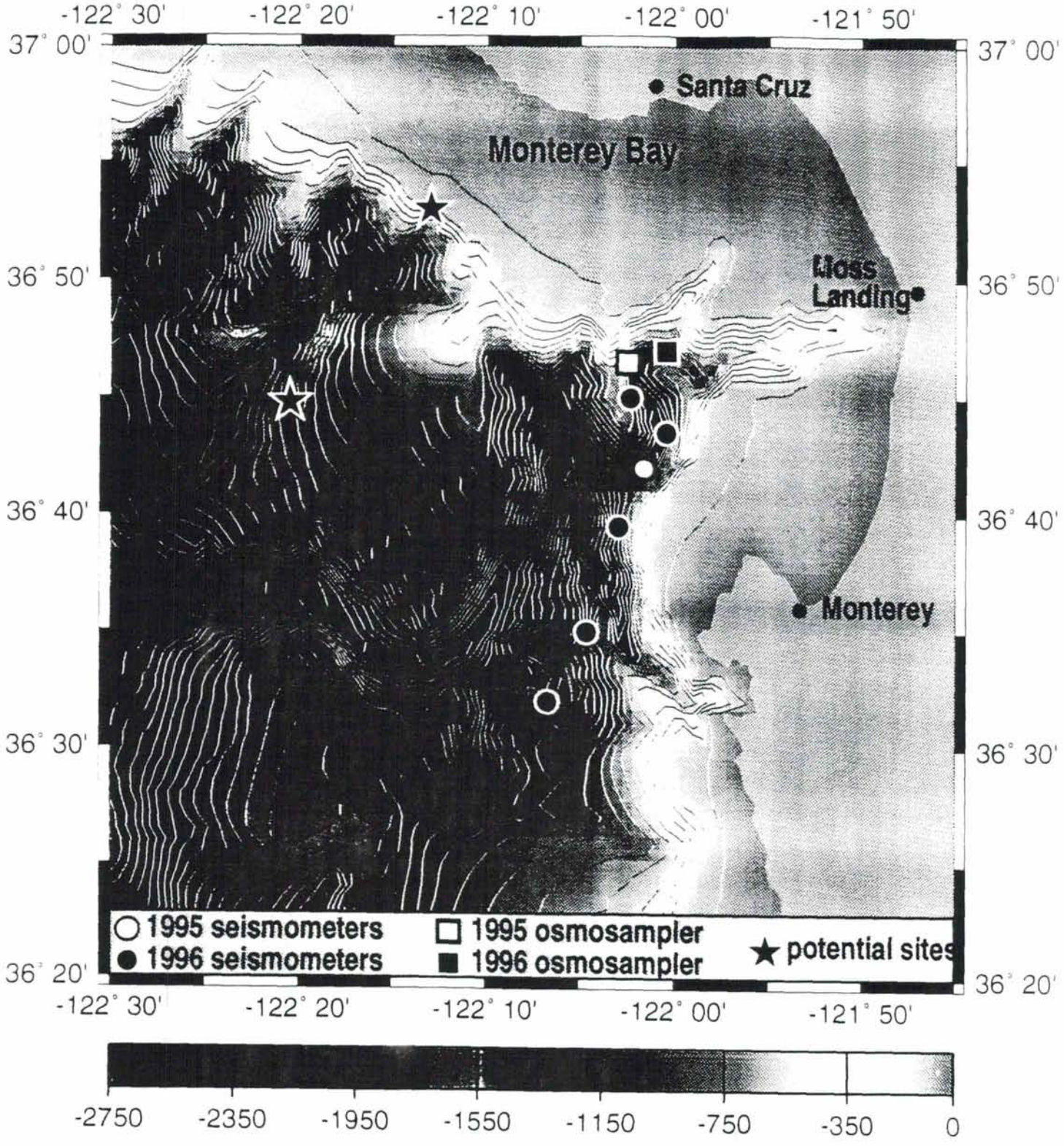
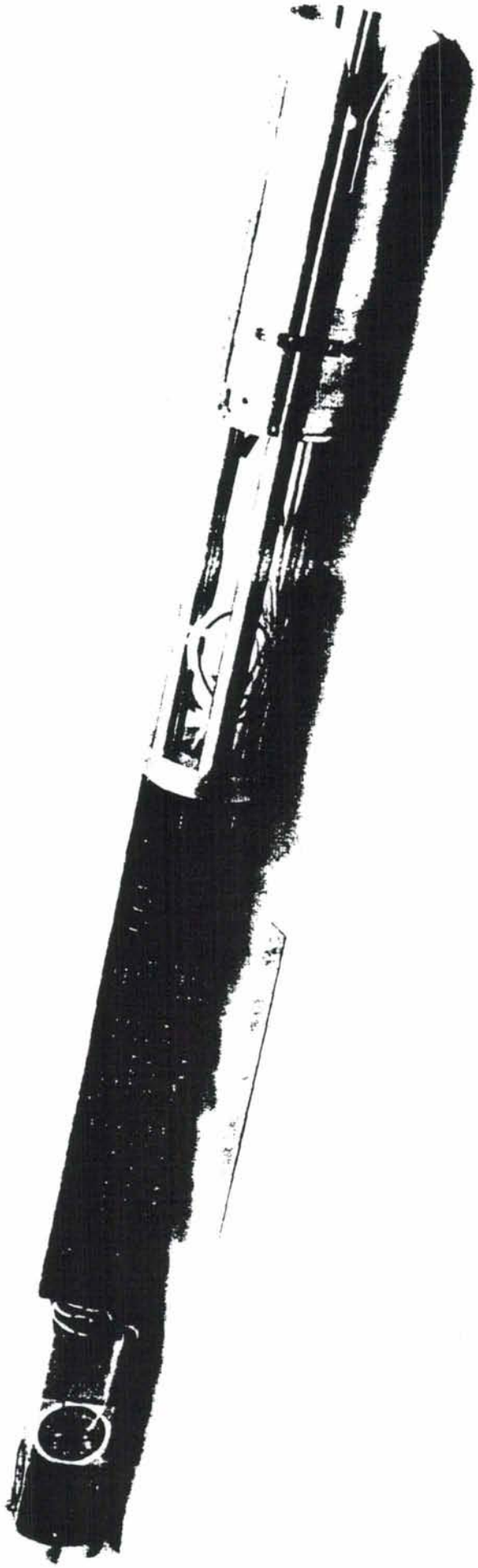
1244.0
2856psi
DIVE
11-14-95
20:07:07


Connector
Acoustic Marker
91
xxx ELectronique Sismomêtres xxx
ø 305
259.04
360
470
55
25
Datalogger & Batteries
ROV Telemetery

Instrument_Deployment_Sites





Tiburon Specifications

Depth Capability
- 4000 meters (13,123 feet)

Forward Speed
- No tether drag: 1.5 knots
- Full system transit at: 0.75 knots

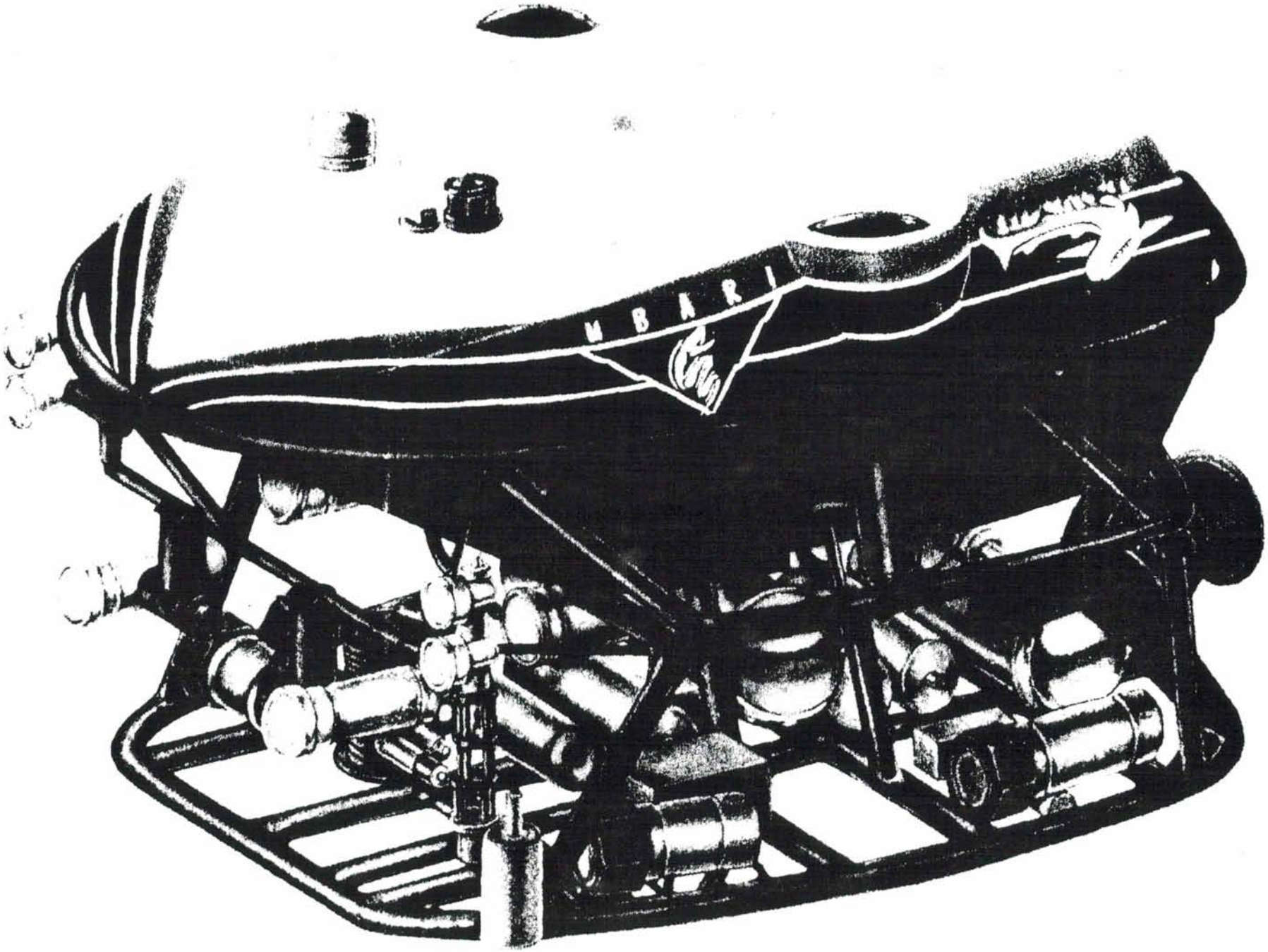
Vertical Speed
- 1.0 knots (100 feet/minute)

Payload
- Max. Toolsled weight: 750 lbs.
- Max. Toolsled weight in SW 250 lbs
- Variable Buoyancy capability 150 lbs
- Adjust buoyancy at: 5 lbs/minute

Power
- Thruster Motors
  - 6@3.7 KW (5HP) each
  - 220 lbs thrust each
- Distribution
  - 15 KW total
  - 240 VDC +/- 15%
  - 48 VDC +/- 15%

Toolsled Interfaces
- Electrical Power
  - 20 Amps @250 volts(5KW)
- Communications
  - RS485 serial bus, RS232
  - Ethernet (802.3)
- Hydraulic Power
  - 3.5 GPM @ 2500 psi

Tool	Weight (kg) Air/Water (est.)	Hydraulics	Power	Connectors	Deployment
Push Cores	18/9	none	none	none	Softball grip for manipulator
GeoCompass	2/1	none	+12V DC	19-pin female MinK connector	Strap on to manipulator
Heat Flow Probe	5/3	none	22-26V DC 1.5 amp during heat cycle <200 mA non-heat cycle	19-pin female MinK connector	T-handle for manipulator or insertion with hydraulic corer
1 meter Hydraulic Push Core	30/23	up to 800 psi	none	1/4" Swagelok Parker Paraflex connector	mount vertically on vehicle frame (device is 2 meters in height)
Rock Hammer	18/16	1000 + psi @5 gpm Sun Systems reducer regulates to 1500 psi	none	QT8-316 Swagelok Quick Disconnect	T-handle for manipulator
Sub-bottom Probe	3/2	none	none	none	T-handle for manipulator
Benthic Barrel	36/23	none	none	none	∩ handle for manipulator (Barrel is 65cm in diameter X 70cm high, including handle)
PISSPI		none	none		


UBARI

APPENDIX XXII

ROPOS UPDATE

1. **ROPOS lost when Thompson suprised by fast-moving storm while diving at Middle Valley to investigate venting initiated by ODP drilling.**

2. **NOAA-designed ROV manifold sampler successfully used on ROPOS during Middle Valley ops was lost with vehicle. However, deployment demonstrated that ROV's can be used for multiple, high-quality water sampling at vents.**

3. **ROPOS was insured but initial reaction from DFO was not favorable to replacement. E-mail appeal from community turned tide and final decision is to replace.**

4. **Insurance underwriters have accepted loss and we are presently negotiating final amount of claim.**

5. **New vehicle will most-likely be built by ISE. CSSF will participate directly in construction to bring improvements to vehicles based on operational experience. Estimated time for reconstruction and sea trials is 16 weeks. Work should start early January.**

6. **All winch mods for full depth diving have been completed. A single dive to 4960 m was conducted in Aleutian Trench in July. A total of 17 hours of bottom time at full depth were logged during this dive. During recovery of vehicle at end of this dive there was a massive failure of optical fibers in new 5000 m cable.**

7. **Vector Cable has acknowledged responsibility for failure of cable and they are working on a design for a new cable. We have requested delivery by April 1997. In the mean time we can continue to use our 3500 m Rochester cable.**

8. **The ROPOS system may be available in the Atlantic in late summer of 1997, following diving ops on the Polarstern (July 1 - Aug. 15), if there are interested (and funded) users. The Polarstern cruise will involve diving in the Arctic Basin, under the ice, to depths of 4400 m.**

APPENDIX XXIII

SPECIFICATIONS: DEEP TOW WIRELINE RE-ENTRY/ CONTROL VEHICLE

PHYSICAL DIMENSIONS: 26in. x 26in. x 10ft. (w.o. termination)

WEIGHT IN AIR: 2000lbs

WEIGHT IN WATER: 1000lbs

SURFACE POWER:

INPUT (FROM SHIPS POWER): 240/480 VAC, 1Ph., 60 HZ, 10KVA (INTO SURFACE TRANSFORMER)
OUTPUT (INTO MAIN CABLE): 2300VAC, 1Ph., 60HZ

CV POWER (MAIN TRANSFORMER):

INPUT (FROM MAIN CABLE)2300VAC, 1Ph., 60HZ

OUTPUT220VAC, 110VAC, 1Ph., 10KVA

OPERATIONAL DEPTH: 6000m

NAVIGATION: LONG BASELINE TRANSPONDER TRANSCEIVER:
INTERROGATE AT 8KHZ - 15.5KHZ IN 0.5KHZ STEPS
RECEIVE AT 12KHZ

PROPULSION: 2 INNERSPACE THRUSTERS (MODEL 1001) ORTHOGONALLY MOUNTED AND HYDRAULICALLY POWERED FROM 5HP INDUCTION MOTOR
100lbs NOMINAL MAXIMUM THRUST

VIDEO:
- SONY B/W CCD CAMERA (768x494 PIXELS) WITH WIDE ANGLE LENS IN DEEP SEA POWER & LIGHT TITANIUM HOUSING
- 2 AXIS PAN AND TILT (REMOTE OCEAN SYSTEMS MODEL PT10-412)) WITH COMPASS AND TILT SENSOR
- SONY 8MM VHS VCR W. DATE AND TIME STAMP AT THE CONTROL VEHICLE W. ON/OFF CONTROL AT SURFACE
- 256x256 VIDEO DISPLAY AT SURFACE EVERY .7SEC

LIGHTS:
- 4 x 250W Deep Multi-SeaLites (DSP&L)
- 1 x 250W TI LIGHT (DSP&L)
- 1 x 150W QUARTZ LIGHT (DSP&L)

SONARS:
- 23.5KHZ NARROW BEAM UP LOOKING SONAR
- 23.5KHZ NARROW BEAM DOWN LOOKING SONAR
- 325KHZ SECTOR SCANNING SONAR (TRITECH) W. 200m MAXIMUM RANGE AND COMPASS CORRECTED COLOR CODED RADIAL DISPLAY

TELEMETRY: FREQUENCY DIVISION MULTIPLEXED FSK, PSK, FM, AM
BANDWIDTH UTILIZATION: 10KHZ - 800KHZ ON STANDARD .680 TOW CABLE)

RELEASE CAPABILITY: STANDARD 5K OR 10K lbs INTEROCEAN RELEASE ACTIVATED FROM SURFACE

USER INTERFACE:

- STANDARD POWER: 110/220VAC, 1Ph., SHARED W. CV UP TO 10KVA TOTAL
- DOWNLINK: 1CH, RS-232, 9600 BAUD
- UPLINK: 1CH, RS232, 9600 BAUD
  1CH, RS232, 2400 BAUD

Title: SPECIFICATION SHEET: WLR VEHICLE
Size: A
Number: WLR_SPEC.SCH
Revision:
Date: 27-Nov-1996
Sheet: 1
File: C:\PROJECTS\WLR SYSTEM\WLR_SPEC.SCH