UNOLS
DEEP SUBMERGENCE SCIENCE COMMITTEE
May 2 & 3, 1994
Montery Bay Aquarium Research Institute
Monterey, California
MEETING REPORT SUMMARY

APPENDICES

I. Meeting Agenda
II. Attendance List
III. ALVIN Dive Record and Budget Figures
IV. KNORR Conversion Schedule and Plans
V. ALVIN Improvements
VI. Third Party Tool Development

May 2: Meeting Place - Monterey Bay Aquarium

Jeff Fox, DESSC Chair, called the meeting to order at 8:30 a.m. He extended a welcome to all participants and reviewed the meeting objectives. This meeting has been added to the DESSC calendar to provide an opportunity for the operator and DESSC to assess the state of the program on a yearly basis and grapple with long range plans and concerns. The agenda was reviewed and is included as **Appendix I**. These minutes reflect the order in which items were addressed. A list of meeting participants is included as **Appendix II**.

UNOLS REPORT - Garry Brass, briefly report that the Organic Act which would make NURP a budgeted entity within NOAA has been filed. Although UNOLS is supportive in principle of an Organic Act, the language of this Act is discouraging because it does not address the need to create a strong national office that could take the lead in the development of a coordinated national undersea research program. Garry will keep abreast of developments and is ready to testify on behalf of UNOLS if requested.

I. WHOI REPORT:

A. THE EFFECTS AND CONSEQUENCES OF RECENT NSF IMPOSED BUDGET CUTS:

Dick Pittenger reported on the recent NSF budget cuts and their effects on ALVIN/ ROV operations. His first series of overheads are included in **Appendix III**. Dick began by pointing out that ALVIN's dive success rate has been largely above 95 percent over the last ten years. However, funding limitations are putting a strain on operations. In 1994, there have been reductions in funding for both equipment and personnel. Man years were reduced by

1.05 instead of increased as requested. Manpower cuts in shore-based support were necessary. Total equipment funding was reduction by $82,379, or 62%.

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

WHOI's recommendations are to:

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

B. KNORR CONVERSION

Dick Pittenger continued with a report on the status of the KNORR conversion schedule, see **Appendix IV**. In Plan A, ALVIN is scheduled for overhaul in early Spring/late winter 1996 to coincide with the KNORR conversion to submersible support ship. However, there are indications from the agencies that operations on ATLANTIS II could cease by the end of 1995, putting Plan B into effect. Plan B ends AII/ALVIN operations in December 1995 and would begin ALVIN's overhaul in January 1996. After the June Scheduling Review meeting, AII's plans will be more obvious. On the positive side, Plan B would have ALVIN beginning operations earlier in 1996. On the bad side, it puts off any Southern EPR work for another year. Also, there will be a longer period between when AII goes off line and when AGOR 25 goes into service, leaving AII's crew without a ship. ATLANTIS II will most likely not be sold before Plan B goes into effect. AGOR 25 has been named ATLANTIS and delivery is scheduled for 14 April 1997.

The preliminary design package for KNORR's conversion is complete and available. Comments should be funnelled through Ken Johnson, Chair of the KNORR Conversion Subcommittee. Preliminary (structural only) estimates of cost for the reconversion ranges between $1.24 M to $1.7 M depending on the extent of the conversions. It is WHOI's responsibility to work out funding support. Proceeds from the sale of AII will go towards offsetting the cost for conversion. A list of design issues and considerations for the conversion are included in Appendix IV.

C. DEEP SUBMERGENCE ASSETS: UPGRADES

ALVIN Improvements - Barrie Walden reported on planned upgrades to the Deep Submergence Assets. He provided a matrix of ALVIN improvements for the near term, mid term and long term, see **Appendix V**. Near term improvements are those to be implemented prior to ALVIN's next overhaul. The mid-term improvements will be carried out prior to the

end of the next overhaul. Mid-term improvements generally will take more effort to carry out and in many cases funding will have to be identified for their support; improvements planned are for ALVIN's imaging capabilities, navigation, data logger, sensors & samplers, dive duration and submersible systems. ALVIN's imaging proposal was to a large extent funded and will be carried out in the next several months. The imaging proposal was treated like a hardware proposal, and requests for salary and wages to support the engineering costs associated with implementation were largely cut. However, overall salary support of $30K was provided under the proposal and can be spent as needed.

The funds in the imaging proposal that were to go toward the support of navigation improvements were not supported because the reviews suggested that there was a need to develop an integrated solution to navigation improvements. A sum of $60,000 would be made available in 1994 if the operator, with input from DESSC, could submit an outline of how this money would be and towards a fundamental improvement in navigation.

DESSC will create a subcommittee to establish a list of navigation improvements desired by the community. The list will be used by the operator to redefine the navigation proposal. The subcommittee will be headed by Jim Bellingham and Barrie Walden. Other potential members of the subcommittee include Jim Newman, Ken Stewart, John Gann, and Dana Yoerger. It was also recommended to include a science user on the committee (Russ McDuff).

Funding for near term improvements to the data logger system are in hand. The operating system will be upgraded to improve VP/ix capability and documentation in the User's Manual. Also it is planned to run NAV92 under VP/ix. Long term improvements would be a total replacement of the hardware and software.

Near term improvements for sensors and samplers include providing general use science computers. In the mid-term, a spare gyro will be obtained. Long term improvements are planned to provide Hydrowinch based 3/8-inch fiber optic ROV and AUV capability for night time operations. Baskets have been considered for improvements, but no recommendations are being made presently.

To increase dive duration, long term recommendations are suggested that would replace the main batteries and redesign the personnel sphere interior. The MIR submersibles will soon be outfitted with NiCd batteries which replace their original NiFe batteries which are no longer produced. ALVIN operators will watch to see how they perform. There was a lengthy discussion on possible near term improvements that might improve power consumption. One suggestion was to install a third battery on ALVIN, however this would increase the weight significantly requiring a great deal of foam for buoyancy. It was also suggested that a third battery could be carried on board the ship as a backup, to be traded out when the others run low. However, it was pointed out that trading out a battery at sea is a very difficult task. Power conservation methods were suggested:

1) Monitor power usage to see if it can be made more efficient.
2) Digitize all systems

3) Miniaturize systems
4) Educate the user on how to minimize power.

Near term improvements for submersible systems include evaluating lower cost motor controllers. The pressure tolerant motor controllers purchased from MOOG experienced failures during Jeff Karson's cruise in 1993. While trying to detect the problems, money ran out the old motor controllers were reinstalled. Dan Orange pointed out that MBARI purchased the same pressure tolerant motor controllers as WHOI and has experienced similar problems. MOOG has been trying to solve their problems and claims to have detected all problems. The repaired motor controllers have not yet been tested.

For the full matrix of ALVIN improvements, see Appendix V.

ROV Upgrades - Andy Bowen reported that improvements for navigation parallel what Barrie reported for ALVIN. There is no established near and long term strategy for upgrades, basically they plan to take advantage of commonalities with the ALVIN upgrades. Starting in 1992, ONR provided three years of transition support for the ROV system at WHOI.

The future of the JASON-MEDEA ROV is uncertain unless usage can be increased. There are a number of questions surrounding the future of the ROV program at Woods Hole. Such as, should ROVs be gearing for operations in shallower water, to work off of simpler platforms? Will the funding system as presently defined sustain an ROV operation at the institution?

In the last three years, 15 proposals for use of the ROVs have been submitted with only one being funded. The reason why they are not getting funded at a higher rate is not obvious. Five proposals have been submitted for the May 1 NSF target date. Interest in the ROV seems to be for site mapping in preparation for ALVIN programs; there is also demand for the ARGO II and 120 kHz deep-towed systems.

Advertising and education of the ROVs capabilities needs to be increased. The ROV and poster sessions at the Fall AGU were well received. Recently, there was a science article on JASON-MEDEA in EOS. Additional efforts are needed and will be discussed later in the meeting.

D. ENGINEERING DIVES: RATIONALE AND METHODOLOGY

Barrie Walden lead a discussion on how the DESSC might help the community and the agencies realize the importance of engineering dives. Barrie explained that scheduling engineering dives became a problem when heavy science utilization pushed the engineering dives off of the schedule. There are two types of engineering dives: 1) Those needed after any lengthy down period, and 2) those needed to assure operation of gear. Barrie feels that the second type of engineering dives are actually science dives since the tools are needed to meet the specific scientific objective of the proposed program. He recommends that scientists should include dives for testing gear in their science proposals.

DESSC needs to communicate to the community a new strategy for proposal submittal to include engineering dives for check out of science gear. The engineering dives for checking out of gear should be scheduled well in advance of the science dive program in order to allow for a learning curve.

At the June meeting, DESSC will look at the proposals submitted to see if any engineering dives might be required.

Day 2: Meeting Place - Victorian Inn

F. MANAGEMENT ISSUES AND INITIATIVES:

Dick Pittenger reported on management issues and problems that have been and continue to face the ALVIN pilots. The pilots continue to experience burn-out due to the demanding schedule and too few pilots. Pilot discontent can effect the health of the entire program. Dick reported that three new pilots are close to certification for solo operations. Plans to try to make the pilot program more attractive with better career paths have been met with many difficulties because of funding limitations. Dick plans to calculate the estimated minimum and optimal manpower needs to maintain the National Facility. **It was recommended to have next year's Spring meeting at one of ATLANTIS II's port calls so that participation by the pilots can be possible.**

II. UPGRADE PLAN FOR DEEP SUBMERGENCE SUBMERSIBLE ASSETS - IMPLEMENTATION STRATEGY

Upgrades for near, mid, and long term were identified by Barrie Walden earlier in the meeting. Garry Brass pointed out that in order to be on the cutting edge of technology and science, more risks in the technology and development areas need to be taken by the operator. It may be advantageous for the ALVIN group to be more proactive in technology development.

It was recommended that a model for an implementation strategy to upgrade ALVIN capabilities be developed by the operator and DESSC for presentation at the December DESSC Planning Meeting. The model should provide a comparison of the level of support foreign countries provide to their submersible programs and that spent by U.S. agencies on the National Facility. The model should also indicate how much money goes into the U.S. Navy's deep submergence programs. WHOI is doing a lot with very limited funding and they will have difficulty continuing at the present level of support. DESSC needs to work with the community to gain strength for support of the National Facility by the agencies.

The National Research Council (NRC) has been studying the future needs for Deep Submergence Science. Jeff Fox and Dick Pittenger will look into the initial report of their

findings. DESSC's implementation strategy should be consistent with NRC's findings. All technology proposals submitted should identify developments that are compatible with both ALVIN and the ROV system.

A number of recommendations were suggested:

1) Prepare a short document of recommended upgrades for the next five years. When the 1995 operation proposal is submitted by WHOI this fall, it could reference this document.

2) In parallel, create an ad hoc committee to work with the operator to document the need for greater financial support for the National Facility. The document should address the facility needs through the year 2010. It should be consistent with the NRC findings.

3) Determine what JASON will require to meet the needs to do Juan de Fuca time series work in 1996 when ALVIN is in overhaul or working in the global arena. The RIDGE committee should be contacted to get some feedback on this issue.

4) Continue to investigate new improved funding models for the National Facility.

5) Publish the workshop/technology report as soon as possible.

6) DESSC should communicate to the community that when submitting letters of interest for use of ALVIN, an explanation of the appropriateness of the proposed vehicle should be provided. DESSC could then offer advice to the PI before their proposals are submitted to the funding agencies.

In response to these recommendations, the following immediate actions were planned:

1) An ad hoc committee was identified to:
   a) Work in a constructive way with the operator to define the navigation proposal with the community's interest in mind.
   b) Document the need for greater financial support for the National Facility.

   The committee identified on page 3 will begin communications via e-mail. The navigation proposal should be drafted as soon as possible.

2) The ad hoc committee will prepare a short document stressing the need for long and short baseline system technology improvements. The document will include the applicability of improvements to ROVs. The document could be attached as a cover letter to the WHOI's 1995 operations proposal.

3) The final draft of the DESSC Report will be prepared for review at the June meeting.

III. ENGINEERING DIVES

The need for placing engineering dives in the schedule and projecting these dives as the schedule evolves was discussed at length earlier in the meeting. In summary, it was recommended that dive time needed for testing new scientific tools should be included as part of the science proposal. At the June meeting, the DESSC will review proposals for the applicability of the platform (ALVIN/ROV) requested and for the need for engineering dives.

IV. THIRD PARTY TOOLS: A PLAN - Dick Pittenger led the discussion on the development of third party tools. Dick presented a flow chart, see **Appendix VI**, of a model development plan for third party tools. It was suggested that the DESSC be involved in the early stages of the development process to determine whether or not the proposed tool is needed and feasible. The engineering development and prototype work would be coordinated with the ALVIN/ROV group at WHOI with respect to specifications, compatibility and operational procedures. Requests for field testing and certification would be the coordinated by the PI. An important aspect of the new plan will be to determine who will be responsible for the upkeep and maintenance of the tool. Also an appropriate home for the tool must be determined. DESSC endorsed the proposed tool development plan and will work to refine the model. It was recommended that:

1) **DESSC appoint a subcommittee to work with WHOI to codify the process and develop a more defined tool development procedure by the June DESSC meeting.** An ad hoc committee of Dick Pittenger, Jeff Fox and Karen Von Damm was formed.

2) **DESSC make an announcement to the community that they are working with the operator to encourage submission of tool development proposals.**

3) Information on the availability of third party tools will routinely be distributed with the ALVIN/ROV flyer.

VISIT to MBARI

Dan Orange arranged a tour of the MBARI facilities at Moss Landing. Bill Kirkwood provided the DESSC with an overview of their ROV TIBURON which is under construction. It will be a 4000 meter vehicle with a tool sled weight of 750 lbs. This ROV will be operated from the SWATH vessel WESTERN FLYER presently under construction at SWATH OCEANS in San Diego. A mockup of the ROV was available in their workshop. The group then had a tour of their research vessel, POINT LOBOS and the ROV VENTANA.

V. IMPROVED UTILIZATION OF DEEP SUBMERGENCE ASSETS: DESSC INITIATIVES

JASON-MEDEA - Andy Bowen lead the discussion on this subject. The funding procedure for the JASON-MEDEA and other related assets requires the investigator to put usage costs in the NSF proposal as opposed to ALVIN which is block funded. This may discourage the use

of the ROVs in favor of ALVIN and may prevent the science from being done on the most appropriate platform. This paradigm must be addressed and a way to "level the playing field" devised. Andy felt that the AGU session which presented a video and several papers on JASON-MEDEA was very effective and well received. It was brought up that RIDGE has significant work that can utilize the ROV suite and could be a significant boon to its future. Dan Fornari will be mounting a lecture tour to explain the merits of JASON-MEDEA and how it can be productively used for science.

For the June DESSC meeting, Andy was asked to prepare a strawman ROV schedule to determine what the estimated costs to the science user will be. Andy was also asked to prepare a matrix, similar to that prepared by Barrie describing near/mid/far term upgrades needed for the WHOI ROV operation.

VI. THE NEED FOR A NATIONAL DEEP SUBMERGENCE SCIENCE PLAN: DESSC'S ROLE

The first step in working towards establishing a plan will be to complete the DESSC report. The final draft should be ready in June. Part 1 and the preface were distributed at this meeting and will be reviewed by DESSC prior to the June meeting. Parts 2 and 3 should be ready for distribution prior to the June meeting. The report will help define a deep submergence plan through the year 2005.

The need for block funding by a single agency was discussed. There is concern that if NOAA was selected as the agency to support deep submergence, the program would be in jeopardy unless the Organic Act was passed. Jim Baker has written a letter to Garry Brass and Ned Ostenso to call a meeting with NOAA, NSF and ONR to establish a long range vision of where deep submergence science is going.

VII. OTHER ISSUES

A. Membership Needs. Dan Fornari is becoming an ex-officio member of DESSC. It was recommended to replace him with a person from the RIDGE community. Starting June 1 of next year, Jeff Fox will assume the Chairmanship of the RIDGE Committee. His term as Chair of DESSC ends in June of next year and a replacement must be found. Suggestions for potential Chairs are welcome and should be made to Jeff Fox. Nominations for both membership positions will be discussed at the June DESSC meeting.

The meeting was adjourned at 5:00 p.m.

APPENDIX I

DESSC
Draft Agenda

May 2 and 3
MBARI, Monterey, CA

****

I. WHOI REPORT

A. The Effects and Consequences of Recent NSF Imposed Budget Cuts (R. Pittenger)

B. KNORR Conversion (R. Pittenger)

C. Deep Submergence Assets: Upgrades (B. Walden, D. Foster, A. Bowen)
   1. Near term (until overhaul early 1996)
   2. Overhaul
   3. Long term

D. Engineering Dives: Rationale and Methodology (B. Walden)
   1. ALVIN
   2. JASON/MEDEA

E. Third Party Tool Development (R. Pittenger)
   1. Guidelines, rules and regulations
   2. Update and status of Stakes/Holloway Drill

F. Management Issues and Initiatives (R. Pittenger and B. Walden)

II. UPGRADE PLAN FOR DEEP SUBMERGENCE ASSETS

A. Equipment and Improved Capabilities Identified and Prioritized

B. A Phased Acquisition Model

C. Implementation Strategy
   1. DESSC/Community contribution
   2. Timelines

III. ENGINEERING DIVES: ALVIN AND JASON-MEDEA

A. The Need for Engineering Dives

B. Integration into a Master Development Plan

C. How to Best Make the Case
   1. DESSC/Community contribution

IV. THIRD PARTY TOOLS: A PLAN

A. A General Plan

B. An Assessment of Tools Presently Under Development
   1. Rock Drill

V. IMPROVED UTILIZATION OF DEEP SUBMERGENCE ASSETS: DESSC INITIATVES

A. JASON-MEDEA

B. ALVIN

VI. THE NEED FOR A NATIONAL DEEP SUBMERGENCE SCIENCE PLAN: DESSC's ROLE

VII. OTHER ISSUES

A. Membership Needs

****

Other Items of Interest

- Tour of MBARI Facility (To be arranged by D. Orange)

APPENDIX II

MEETING PARTICIPANTS

DEep Submergence Science Committee:

Jeff Fox, Chair
Jim Bellingham
Bob Collier
Hugh Milburn
Dan Orange
Karen Von Damm
Carl Wirsen
Dan Fornari, ex-officio
Dick Pittenger, ex-officio

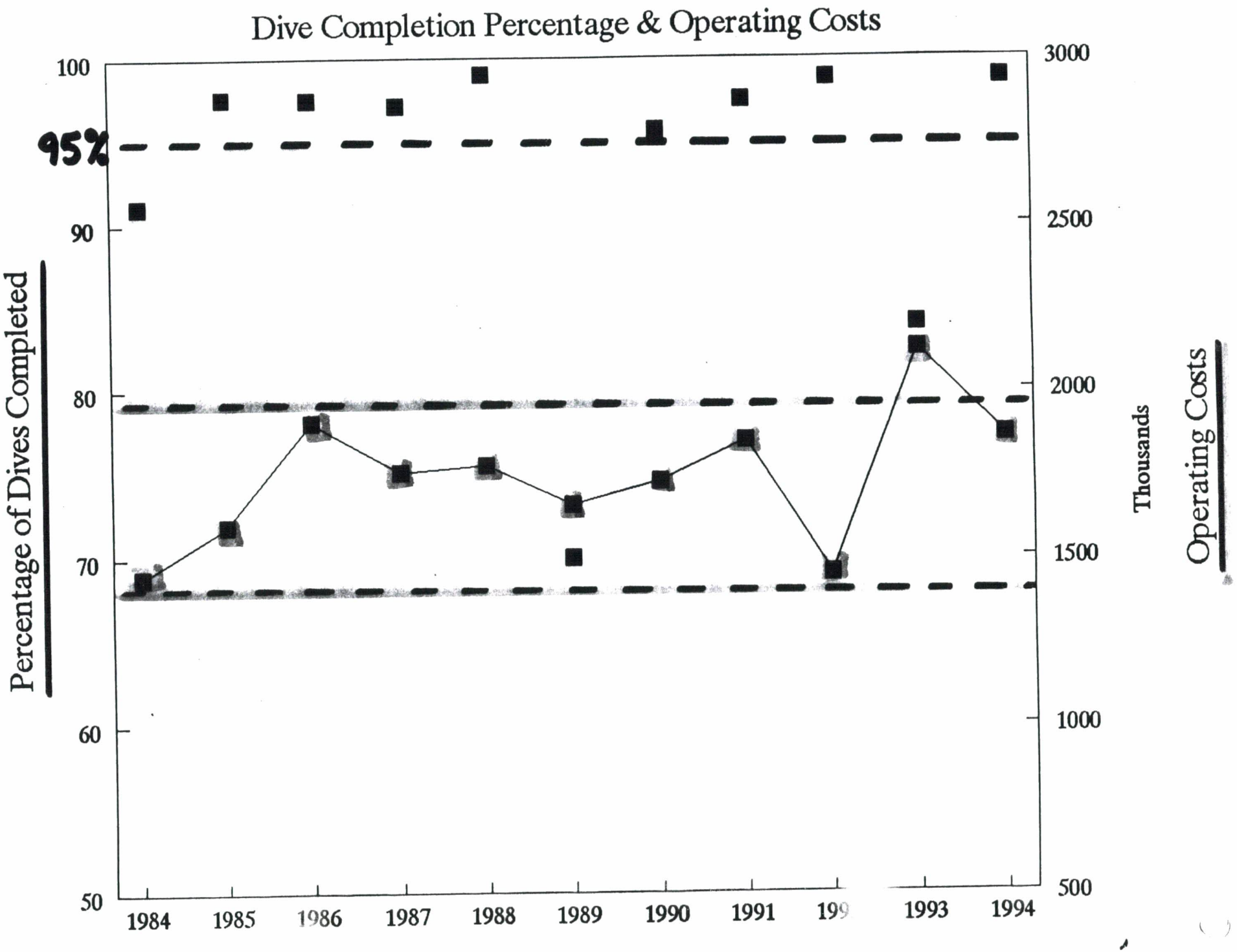
Woods Hole Oceanographic Institute Representatives:

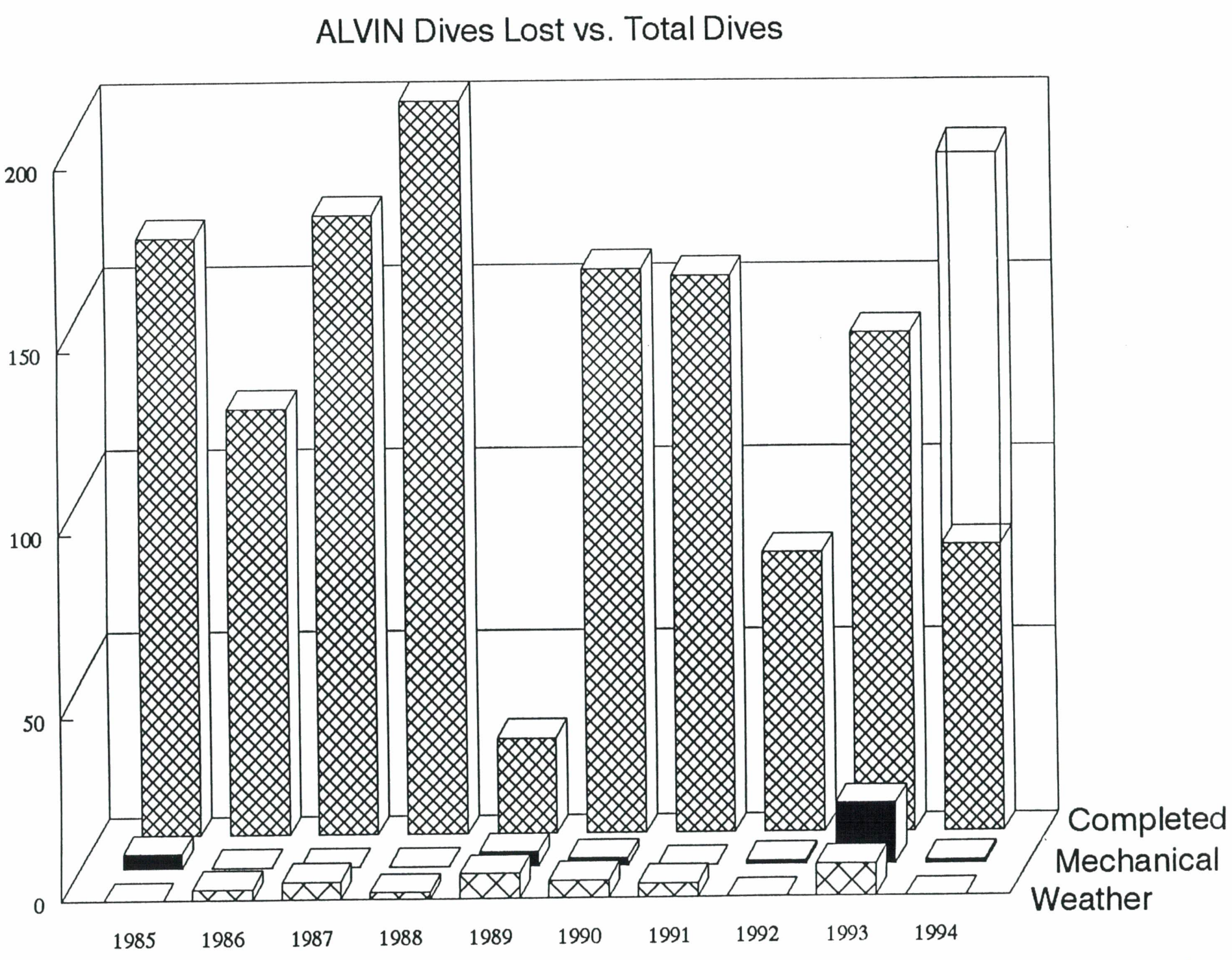
Andy Bowen
Dudley Foster
Barrie Walden

Other Participants:

Jack Bash, UNOLS
Garry Brass, UNOLS Chair
Annette DeSilva, UNOLS
Jim Newman, MBARI

APPENDIX III


Dive Completion Percentage & Operating Costs
95%
Percentage of Dives Completed
100
90
80
70
60
50
3000
2500
2000
1500
1000
500
Thousands
Operating Costs
1984
1985
1986
1987
1988
1989
1990
1991
1993
1994


ALVIN Dives Lost vs. Total Dives
200
150
100
50
0
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
Completed
Mechanical
Weather

Summary Impact in 1994

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

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

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

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

Major Equipment

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

Manpower

Shore-based

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

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

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

Details of Reductions

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

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

Challenge

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

- **Requires commitment**

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

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

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

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

WHOI'S DILEMMA

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

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

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

Recommendation

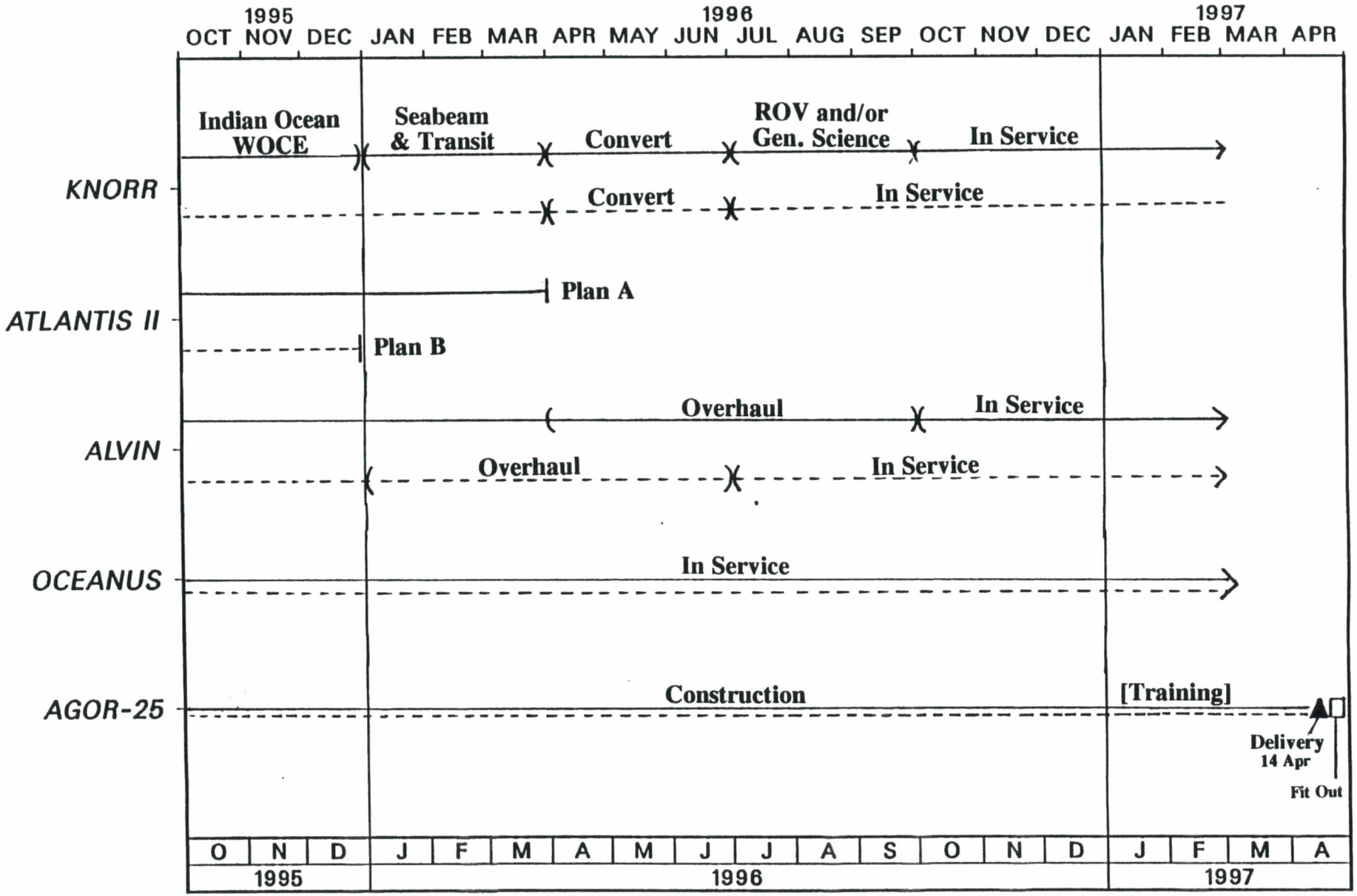
Given community appreciation of WHOI funding dilemma (expected to provide First Class service and upgrades with marginal funding):

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

APPENDIX IV

WHOI Ships

Schedule Options for 1995-1997



Plan A (Normal A-II Retirement)

Plan B (Early A-II Retirement)

KNORR RECONVERSION
ENGINEERING PLAN

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

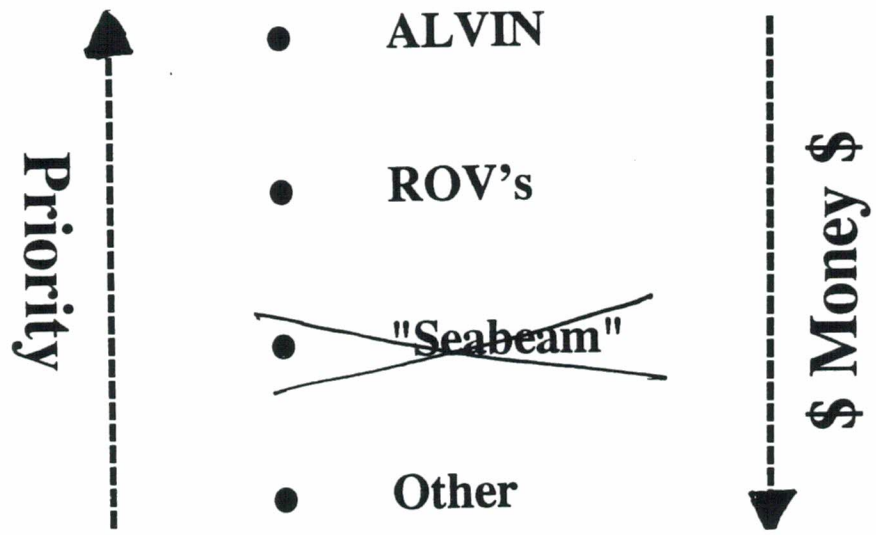
KNORR Conversion

OTHER CONSIDERATIONS:

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

KNORR Conversion

PRIORITIES:



Tentative
Planning Schedule

- Preliminary Design Package to WHOI/ONR
  May 1994

- WHOI and Ad Hoc Committee Review

- Discuss at June DESSC

- Decide Priorities, Funding Schemes

APPENDIX V

ALVIN IMPROVEMENTS

	NEAR TERM	PRIOR TO END OF NEXT OVERHAUL	LONG TERM (>3 YEARS)
IMAGING	Obtain 3-chip CCD and spare 1-chip CCD video cameras. Increase number of available video recorders. Obtain HMI lights. Clean up video signal handling and improve method for data overlays and time code recording Provide ranging/scaling lasers for arm camera.	Provide video camera pan and tilt mechanism. Provide spare light control relay assembly. Provide color monitors for observers. Provide general use mini-cams.	Provide to HDTV format capability.
NAVIGATION	Upgrade transponder survey programs to increase speed and accuracy. Add "EXACT" system utilization to ALVIN capabilities.	Replace navigation software.	Replace long-baseline navigation system with hull mounted short/ medium baseline.

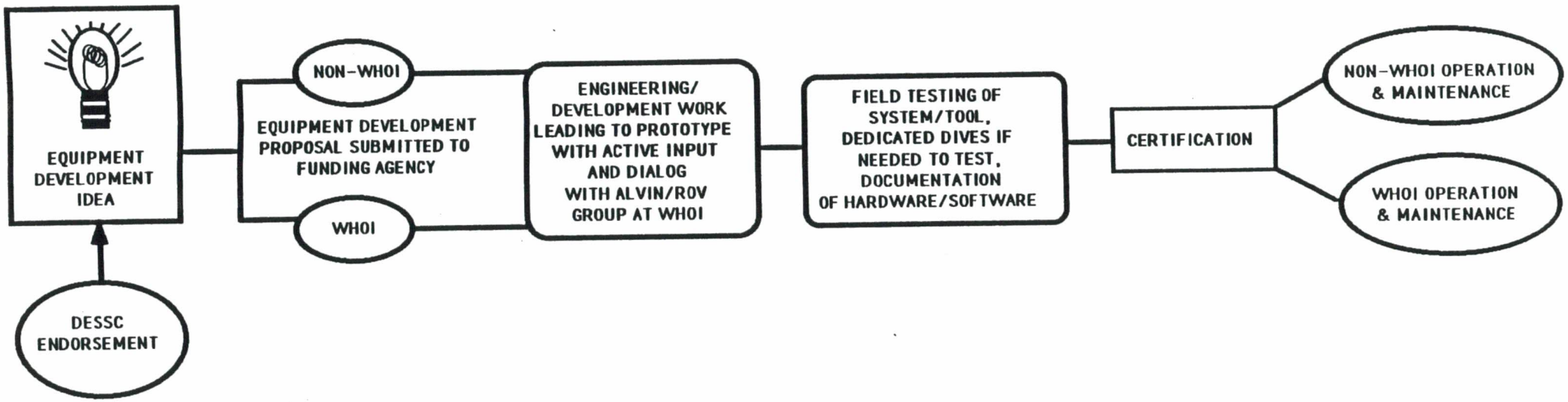
ALVIN IMPROVEMENTS

	NEAR TERM	PRIOR TO END OF NEXT OVERHAUL	LONG TERM (>3 YEARS)
DATA LOGGER	Upgrade operating system to improve VP/ix capability and document in User's Manual Run NAV92 under VP/ix.		Total replacement (hardware and software).
SENSORS & SAMPLERS	Provide general use science computers (Apple and PC).	Obtain spare gyro. Provide two-head capability for Mesotech and obtain "imaging head". Replace/supplement major samplers with new design.	Provide Hydrowinch ROV and AUV capability.
DIVE DURATION			Replace main batteries (NiCd?) Redesign personnel sphere interior (viewport locations?)

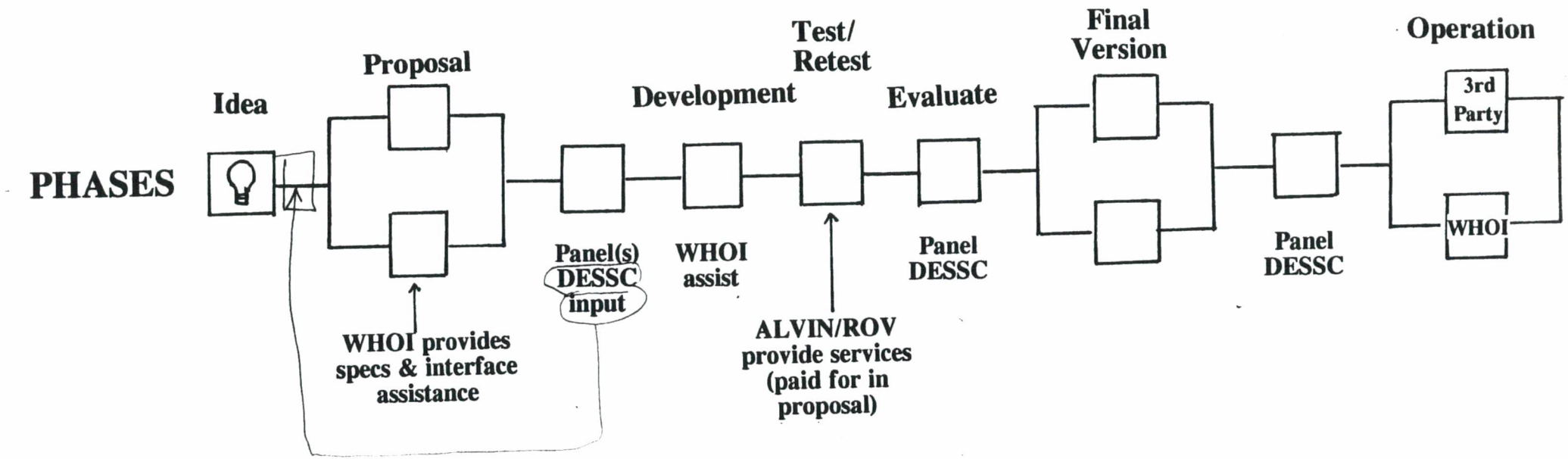
ALVIN IMPROVEMENTS

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

APPENDIX VI


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

Tool Development for ALVIN / ROV's



ODP PARADIGM

Development Tools

- P.I. Develops plan in coordination with Operator or Logging Contractor
- DMP endorsement

Certified Tools

- P.I. formulates request for certification
- Presented to DMP by Operator with P.I. assistance

Mature Tools

- Operator submits
- DMP endorses
- Planning Committee approves

Development Tools

The Development Plan should:

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

Mature Tools

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

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

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

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

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

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

Recommendations

- **DESSC appoint a subcommittee to work with WHOI to codify process.**

- **WHOI/DESSC submit procedures to NSF/ONR/NOAA for comment prior to June DESSC.**

- **At June DESSC, further discussion.**

- **Issue interim tool development guidelines.**

- **Evaluate at AGU DESSC Meeting.**

"Final" Guidelines