



DEEP SUBMERGENCE SCIENCE COMMITTEE

JULY 16-18, 1997
Carriage House
Woods Hole Oceanographic Institution
Woods Hole, MA
MEETING REPORT SUMMARY

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WELCOME, INTRODUCTORY REMARKS: The summer meeting of the DEep Submergence Science Committee (DESSC) was held at the Carriage House, Woods Hole Oceanographic Institution on 16-18 July, 1997. The meeting was called to order at 0900 by the Chair, Mike Perfit. Mike welcomed DESSC and members of the WHOI Deep Submergence Group and reviewed the meeting agenda, [Appendix I](#). The list of meeting participants is included as [Appendix II](#). Mike congratulated WHOI for their efficient progress in bringing ATLANTIS on line and for their excellent public outreach efforts with the visits to New York City and Washington, DC.

ACCEPT MINUTES: The minutes of the December 14, 1996 meeting were approved as written.

NATIONAL FACILITIES OPERATOR'S REPORT:

ATLANTIS Operations/Issues - Dick Pittenger provided a viewgraph of the time line reflecting the events during the transition from retirement of ATLANTIS II to the start of ATLANTIS operations, ([Appendix III](#)). He thanked Karen Von Damm and her subcommittee for their assistance in the conversion plans. The ALVIN overhaul went smoothly and ALVIN was integrated with ATLANTIS on schedule. Certification dives off Bermuda in June went well. Following certification, ATLANTIS and ALVIN began science operations in the Atlantic. Considerable cooperation by all involved with the delivery, outfitting and shakedown provided a smooth and on-time effort. The August issue of *Popular Science* magazine includes an article, "Science at Sea" by Marietta DiChristina, which features ATLANTIS. Dick explained that the NAVSEA ship construction funding will end 31 May 1998 at which time all warranty issues and the Post Shakedown Availability (PSA) must be completed.

Dick continued with a history of the AGOR Z-drive problems in the oceanographic fleet which include failures on THOMPSON, MELVILLE and KNORR, [Appendix IV](#). At least two of the problems were traced to bad metallurgy and gear design specifications in that the gears were not properly hardened and had insufficient contact area. Metallurgic analyses will be performed on the THOMPSON and KNORR gears which recently failed. The Navy and NSF will be funding a study by The Glosten Associates to analyze the AGOR Z-drive failures. A major problem associated with the Z-drive failures is the long lead time required to manufacture replacement parts. The Navy has procured spare lower Z-drive units for ATLANTIS, BROWN, REVELLE and THOMPSON in case of failure.

Dick reported that noise in the bow thruster of ATLANTIS appears to be a cavitation problem. The problem can most likely be corrected and they will try in January to fix it and mitigate the noise problem.

ALVIN Overhaul and Recertification - Barrie Walden discussed the ATLANTIS shakedown, outfitting/loading and ALVIN overhaul processes and post overhaul engineering testing and shakedown efforts including NAVSEA certification, [Appendix V](#). After delivery of ATLANTIS in February, a great deal of work still remained for WHOI to complete before science operations could begin. A lot was accomplished during the post-yard outfitting period in Mississippi, including wiring of the ship's Science Information System (SIS). The delivery trip from Mississippi to WHOI was conducted in three legs: 1) Mississippi to Fort Lauderdale, FL; 2) Fort Lauderdale to Norfolk, VA; and 3) Norfolk to Woods Hole. Underway testing went very well. Vendor representatives were aboard to witness the testing. SeaBeam testing was conducted during a survey of Hudson Canyon. The 2100 SeaBeam system on ATLANTIS is similar to the KNORR's but the ATLANTIS' hydrophone arrays are smaller. In January/February 1998 during the PSA period, the ATLANTIS system will be upgraded. The hardware required for this upgrade has already been ordered.

Ship Outfitting and loading continued after the ship reached home port at Woods Hole. After some adjustment to the ship's sled tracks, ALVIN was successfully loaded onto the railways. ATLANTIS' battery lift and A-frame both worked fine and integration with ALVIN went smoothly. Three tethered trim dives were conducted at Woods Hole. Before beginning science operations, ATLANTIS sailed to Bermuda and conducted 14 dives for certification and engineering. Following recertification, ATLANTIS and ALVIN began work on the Mid-Atlantic Ridge. At the time of the DESSC meeting, nine dives had been successfully completed with an average of 4.6 hours bottom time per dive.

Results from the first two science programs on MAR - Dan Fornari reported on the first two dives following ALVIN's certification. Two dives were conducted during the transit from Bermuda to the Azores and included filming by the British Broadcasting Corp. Everything went well and the group walked off the ship with all their data on CDs. The only problem experienced was with SeaBeam which was not functioning during the cruise because of a problem with its uninterrupted power supply and associated hardware/software issues. The system was fixed for the subsequent cruise but real-time hard copy plotting of the swath data was not able to be done which initially hampered the science program. Deficiencies in the multibeam system remain unsolved by SeaBeam. The science laboratories layout is very flexible and a major improvement over what was available on A-II. The science information system is very capable and includes extensive wiring throughout the ship and a video monitoring system. Dan reported that night time dredges were successfully conducted but suggested that it is essential that a PDR be added to aid in dredging operations and camera towing operations where detailed resolution of pinger traces are critical to the successful conduct of the towing operations. The ALVIN navigation and datalogger works as well as before the overhaul. Efforts are underway to transition the ALVIN and ROV vehicle navigation to the new Nautronix system provided with the ship and to take advantage of the new Winfrog navigation software. This is being done incrementally to ensure successful navigation on all cruises and full testing and verification that the new navigation hardware and software are fully operational before switching over.

Dudley Foster continued by reporting on operations on ALVIN's second dive program to the MAR which was headed by Bob Vrijenhoek (Rutgers U.) in cooperation with the U.K. BRIDGE scientists. This cruise also coincided with operations the French were conducting using NAUTILE. The French had scheduled three legs to the Rainbow site where they will work for a few months. Since their scheduled operations coincided with those of ALVIN, a dive was coordinated for a photo shoot opportunity with both vehicles

on the bottom. Highlights of the ALVIN cruise were documented by a reporter from the New York Times who participated in the cruise (see <http://www.nytimes.com/library/cyber/week/071497dive.html>).

Jason and tethered vehicle Operations Summary - Andy Bowen gave a summary of the four DSOG cruises during the period of November 1996 through June 1997, *Appendix VI*. The first of these cruises was with Haymond/MacDonald aboard MELVILLE to the Southern EPR using DSL 120, ARGO II and Medea. This proved to be a very successful cruise with 80 km of ridge crest surveyed. Next was Patty Fryer's cruise in the Marianas Forearc using Jason/Medea aboard THOMPSON. Weather, equipment and personnel problems were experienced on this cruise limiting the success of the ROV operations, especially the sampling program. However, many cruise objectives were met through creative work-arounds. A more comprehensive report is included later in the minutes. The third cruise was a forensic study on the wreck of the DERBYSHIRE in the Philippine Sea. The vehicles DSL 120, ARGO II and JASON/Medea were all used from THOMPSON. The ship's dynamic positioning system and the P-code GPS were instrumental in the program. This extensive operation was highly successful. Andy presented some of the ARGO images taken of the wreckage. Jason/Medea was then shipped to the Mediterranean for work with Bob Ballard aboard SSV CAROLYN CHOUEST. This was a joint operation with the Navy's nuclear submarine, NR-1. ONR funded a great deal of the engineering development required for Ballard's cruise. These improvements will also benefit future science applications (and have recently been put to good use on the Delaney/Fisher cruise on the Juan de Fuca Ridge). The cruise proved highly successful in imaging of Roman wrecks and recovering artifacts.

DISCUSSION OF SUMMER/FALL 1997 DEEP SUBMERGENCE OPERATIONS SCHEDULE:

Mike Perfit and Don Moller lead the discussion on scheduling of ATLANTIS and the DSOG vehicles [tools] for late 1997 and 1998. There are a number of issues complicating the scheduling process. To begin, there is a backlog of ALVIN programs waiting to go to sea. This is a result of ALVIN's lay-up for overhaul and also the transition period for ATLANTIS-II to ATLANTIS. THOMPSON had an upper gear failure to the starboard Z-drive requiring the cancellation of a series of Jason/Medea cruises on Juan de Fuca with THOMPSON in the summer and fall of 1997. Don Moller has been working to accommodate as many of the PI requirements as possible. The decision had been made that ATLANTIS would abandon its planned schedule and pick up the Juan de Fuca work in late 1997 and it appears that most of THOMPSON's work was able to be rescheduled. Because of the large number of funded programs from Juan de Fuca to the southern EPR, it was not possible to schedule each with the number of dives needed and the time requested while working around the PSA. The 1997 rescheduling of Juan de Fuca programs was reached through the compromises of many of the scientists and involved working closely with the various funding agencies and the operators. The other scheduling issue is the need for ATLANTIS to have its Post Shakedown Availability (PSA) before May 1998. Mike reported that this year's scheduling process has been a logistics headache because of the number of funded cruises in many different sections of the ocean and as a result of a new time-series project. DESSC requested greater communication and guidance from the funding agencies to help with the scheduling process in the future. More discussion was held on the 1998 ATLANTIS schedule later in the meeting.

Don Moller then presented the 1996 and 1997 Jason/Argo/DSL-120 schedule and the 1997 ATLANTIS schedule, see *Appendix VII*. ATLANTIS schedule is very full for the remainder of the year. A potential conflict may exist between ATLANTIS and EWING operations on the Northern EPR. (NOTE: as of this writing the conflict has been resolved by L-DEO and WHOI ship schedulers.) EWING is requiring a 40 mile radius free of other ship operations. Don noted that 38 percent of all the large ship scheduled operations is for deep submergence work.

Review of Planning Letters and Website Postings - Don Moller presented two lists of funded ALVIN and ROV programs. One lists the programs by vehicle requested and the other lists the requests by location, see *Appendix VII*. In 1998, there is a total of 329 days on station requested. This equates to over 500 ship days. The greatest number of requested days is for work at the Southern EPR. However, Don also pointed out that the work at Juan de Fuca involves time series programs. Don presented a map showing the areas with funded work. All areas are in the Pacific, and include Juan de Fuca, Northern EPR, California Coast, Southern EPR, Guaymas, Hess Deep, and Hawaii. Next Don showed a time line with the 1998 tethered vehicle work. The weather windows were highlighted.

DESSC addressed the 1997/1998 scheduling issues in detail later in the meeting.

AGENCY REPORTS:

Office of Naval Research (ONR) - Sujata Millick provided the report for ONR. There are no planned ALVIN programs funded by ONR for 1998. In 1997, ONR provided funding for Jason engineering improvements to prepare for Bob Ballard's cruise to the Mediterranean. In 1998, ONR will fund one Jason program for Ballard. The Navy plans to decommission TURTLE, SEA CLIFF and the ATV over the next two years. Sujata queried the DESSC as to whether the U.S. should try to establish a cooperative relationship with the international community for coordination of deep submergence assets. She questioned whether the federal agencies should establish MOUs with international partners. Some advantages of a cooperative relationship might include increased access to remote geographic areas for deep submergence research using international assets. It was noted that there are already a number of informal and formal partnerships in existence. Gene Smith reported that NOAA holds many agreements with international partners. These include cooperative arrangements with Japan and France. As an example, NURP has been working and meeting with JAMSTEC in a program to promote the preservation of natural resources. After discussion, the Committee agreed that international partnerships in theory are a good idea and can be beneficial to the future of deep submergence science, however, it was noted that in practice these agreements do not result in significant deep submergence opportunities for U.S. scientists so their potential in terms of access to other vehicle assets is very limited.

National Oceanic and Atmospheric Administration (NOAA)/ National Undersea Research Program (NURP) - The NOAA/NURP report was provided by Gene Smith. The reinvention of the NURP continues to progress. The six undersea research centers and national Headquarters are implementing the operational elements of their program which includes new elements of competition and the addition of a National Level Advisory Council. The FY 1998 NURP budget will be comprised primarily of core funding to support Center programs and a competitive fund to be allocated among centers based upon the advice of a national level panel that considers national, NOAA, and regional priorities. All proposals for research will be reviewed by each Center's review panel to ensure that proposals recommended for funding reflect high scientific standards. Proposals may be supported from Center core funding or from funds made available from the competitively-allocated fund. NOAA expects to fund ALVIN/ROV science programs at about the \$500 K level/year.

Beginning this year all investigators seeking NURP support for ALVIN projects are to submit proposals through one of the six NURP centers. Proposals for NURP funded ALVIN dives will be competitively reviewed and dive time will be allocated on the basis of available funding and recommendations of a national level review panel. Center schedules for proposal submittal deadlines were included in individual announcements sent out by the centers. Submission is open to the public and is not exclusive to NOAA scientists.

Gene commented that the NURP National Office provided funding for part of the ALVIN overhaul.

Gene concluded his report with comments regarding the Navy's deep submergence assets. NURP has continued to give scientists access to Navy assets. Plans for the decommissioning of SEACLIFF, TURTLE and ATV has given the community an opportunity to evaluate its future deep submergence facility needs. It was pointed out that there may be interest by the U.S. Coast Guard in acquiring ATV for search and rescue operations. In the past, they had relied on the Navy to provide vehicles for these types of operations. With the Navy retiring their assets, the Coast Guard will need to look elsewhere for facilities. Gene noted that NOAA has been the only agency to support the science use of ATV. They have an interest in the vehicle, but would like to hear from the community. Gene requested that DESSC determine the Community's interest in ATV as a deep submergence tool. If possible, he suggested using the SEACLIFF survey results to respond to this question.

National Science Foundation (NSF) - Phil Taylor provided the report for NSF. He thanked the community for working to try to accommodate everyone's deep submergence needs in 1997 in light of the difficulties presented by THOMPSON's gear failure. He noted that the 1998 deep submergence facility schedule is still unsettled due to the difficulties in establishing scheduling priorities. The main conflict is

between the need to continue time series work and the need to embark on expeditionary programs. Phil reported that the 1998 NSF budget is working its way through Congress. Although there is a chance for an increase in the overall NSF budget of up to 6% the fleet budget will most likely remain flat. Negotiations for updating the MOA between NSF, ONR and NOAA for support of the deep submergence facility should be resuming in the near future. Once an agency draft is prepared they will pass it to DESSC for comment.

Phil reported that the latest revision of the Third Party Tool statement has been reviewed at NSF and is acceptable. He also indicated that it would be acceptable for DESSC to attach their guidelines to the policy, but that the agency statement should remain intact.

In conclusion, Phil remarked that the DESSC should be responsive to the opportunity to take advantage of the Navy's decommissioning of SEACLIFF.

1998-1999 DEEP SUBMERGENCE SCHEDULING: Don Moller presented two 1998 "strawman" schedules for ATLANTIS, see *Appendix VIII*. Schedule (1) included work at the Southern East Pacific Rise (SEPR) and excluded the work at Juan de Fuca. In schedule (2) ATLANTIS remains north of the equator for the entire year. These provided a basis for discussion. After pondering the various cruises, priorities and cruise requirements the two schedule options were compared. The pros and cons for each schedule were identified:

Schedule (1) - Southern EPR Option (no Juan de Fuca)

PROS

1. Maximizes non-NSF dollars.
2. Accomplishes all SEPR work in 1998.
3. Satisfies international collaborations.
4. Meets long range DESSC/NSF objective.

CONS

1. No JDF work with ALVIN until fall 1999.
2. Larger shipping bill for ROVs
3. Stakes work may be compromised.
4. No time series start (except Manahan)
5. Fisher experiment jeopardized or compromised.
6. Austral winter port call at Easter Island.

Schedule (2) - Juan de Fuca Option

PROS

1. Time series accommodates.
2. Accommodates two more PIs
3. More efficient weather window use.
4. Both LEXEN cruises.
5. More cost efficient for scheduling.

CONS

1. No SEPR work.
2. No NURP funding.
3. No Japanese collaboration.
4. Stuck in the Yo-yo

The DESSC then considered hybrid schedules which combined features of each of the two options. They felt it was important to keep non-NSF programs and international collaborations if possible. They also felt it was important to accommodate the Juan de Fuca programs. A conceptual schedule was worked out and a consensus reached, see *Appendix VIII* (Note - subsequent to these deliberations additional information has been received causing still more changes. However at press time, WHOI in collaboration with NSF and DESSC has posted a finalized 1998 schedule). DESSC and WHOI agreed to forward the conceptual schedule to the funding agencies as a recommended plan of operation. Mike Perfit reported that he will prepare a cover letter endorsing the recommended schedule. He will also address the scheduling problems encountered this year and propose that the agencies establish a committee to keep the community

informed of funded programs and priorities.

PRESENTATION BY ADMIRAL BRAD MOONEY: Admiral Brad Mooney (USN Ret.) discussed with the committee the recently published Marine Board study titled, "Undersea Vehicles and National Needs." The study was chaired by Admiral Mooney with six of the 12 members being scientists. Briefly, the report concluded that the nation should have a long range plan for undersea research and that there should be enhanced access to vehicle assets by: (1) using and improving on present vehicle access processes, (2) providing a strategic plan to deal with future needs, and (3) providing stable multi-year funding.

Brad suggested that emergency and security applications will be the driver for future underwater efforts. The downing of TWA 800 caused those agencies involved in rescue and salvage to re-evaluate their ability to recover wreckage in deep water. As a result, the Marine Board is being tasked to prepare a strategic plan to address this issue. The Board has been asked to: 1) define a standing group of experts; 2) review agency missions; 3) review the adequacy of existing technical capabilities; 4) review the adequacy of existing funding; 5) review methods of funding; 6) determine the annual cost to maintain and improve undersea facilities; and 7) recommend sources of this funding. One concept for funding additional assets is to place a tax on each airline ticket purchased. The collected taxes would be used to support the vehicles needed for search and rescue operations.

Discussion followed concerning the role of science in any planning for deep submergence access. The DESSC felt strongly that the science community should have an active role in any new facilities or capabilities planning. The model of ALVIN was sighted as one that works and could be followed. ALVIN is Navy owned, academically operated and available for Navy emergency requirements. By operating ALVIN on a daily basis it is maintained in superb condition while providing a world class scientific tool. It was pointed out that it is essential for science tools to be dependable and functional. Also, it is important to have scientists involved in the planning stages from the start. It was noted that with an increase of assets, there must also be the associated increase in funding for science research. DESSC will address this larger issue later in the meeting. DESSC applauded the efforts being made by Brad to get more assets available for science. Brad assured the Committee that the scientific community would be involved in the planning process.

PRESENTATION BY BOB BALLARD: Bob Ballard provided the Committee with an update on the Jason project. The project now has 30 down-link stations enabling it to reach 600,000 students and 15,000 teachers. In both Florida and Connecticut schools, the Jason project has been directly linked to the classroom, significantly expanding student involvement. A complete year-round program is planned for 1998 including a tie-in with the United Nation's "Year of the Ocean." The field program for next year will feature the coral reefs of Bermuda "Descending the Ocean Ladder," the kelp forests in Monterey Bay, and cold water seeps and hot vents of the ocean bottom. By taking Jason to Guaymas Basin, they will be able to revisit previously explored sights. The Jason Project can be reached on the Internet at <http://jason.project.org>.

DESSC SEACLIFF WORKING GROUP REPORT: Mike Perfit presented a summary of the SEACLIFF Working Group Report including a series of viewgraphs depicting the community's response to a questionnaire, *Appendix IX*. The initial tasking to the DESSC by ONR Technical Director, Fred Saalfeld, included eight options concerning the disposition of SEACLIFF. These ranged from deactivating SEACLIFF (option 1) to modifying ALVIN using SEACLIFF's sphere and equipment (option 8). The group only considered the last four options. WHOI offered two additional options, 8a) Improve ALVIN with SEACLIFF components, excluding its sphere, keeping the sphere for future upgrade; and 9) Redesign of a new submersible using ALVIN and SEACLIFF equipment. The Working Group concluded that: a) Options 8 and 8A are the most appealing; b) WHOI's technical evaluation of the options is needed and requires ONR funding; c) The deep submergence community has identified numerous scientific objectives to be met in the deep ocean and on the seafloor that require HOVs, ROVs and AUVs; d) A new science ROV must be designed and built; e) There is a critical need to maintain the excellent HOV capability which now exists in ALVIN to 4500m; and f) Deep submergence science should be highlighted as a key initiative for 21st century exploration and discovery of Inner Space.

Mike reported that the community's response indicates there is strong support for HOV depth capability to 6000m, and to 9000m for ROVs, to allow for research over a wide range of tectonic, sedimentologic and geographic environments. The Group acknowledged the continued need for an HOV at abyssal depths and in general, supported the concept of engineering an HOV using some combination of ALVIN and SEACLIFF equipment to create a 6000m HOV. However, the Group could not rank or seriously consider any of the more viable options for utilizing SEACLIFF because costs in time and money for the conversion were not available at the time of the meeting, and a detailed technical feasibility study has not yet been done, nor have any commitments for increased funding for the National Facility to accommodate conversion/utilization of SEACLIFF been made.

The Working Group agreed that WHOI and DESSC must work together with the Navy to gather more specific information regarding the costs that options 7, 8, 8A, and 9 represent, and what the science capabilities of a merged vehicle are expected to be. A proposed ONR funded engineering study by WHOI of these options was recommended.

Mike continued by reporting on the results of the SEACLIFF survey. A questionnaire was distributed by mail and via electronic mail in February 1997 to over 400 members of the research community. The greatest number of responses came from marine geologists and biologists followed by chemists and geophysicists. The most frequently listed research areas were the mid-ocean ridge and continental shelf/slope regions. The survey showed that while eighteen different remotely operated vehicles (ROVs) had been used, the most extensively used deep water vehicles were Jason, the Canadian ROPOS, and the Navy's ATV. ALVIN was by far the most frequently used HOV, and represented over 50% of the total use of those responding to the survey.

The survey also showed that there is a good deal of interest in having access to a maximum depth range of 6000m by deep submergence vehicles for the next twenty years. Most respondents indicated that HOVs were very important to critical for depths to 4500m (85%) and many (56%) thought there would be an HOV need to 6000m. Individual comments by respondents stressed that there is no substitute for human presence in the deep ocean and there are important needs for HOVs up to 4500m particularly at sites in the ocean where long term, time-series experiments of a multi- and inter-disciplinary nature are occurring. Work in the Western Pacific will require an HOV with a deeper depth capability than 4500m.

When asked to what extent current and future science objectives could be met at depths >4500m, most indicated that between 50% and 100% of their work could be done by either HOVs or ROVs. Fifty-one percent indicated that HOVs could accomplish greater than 75% of their objectives at depths greater than 4500m in comparison to 47% who felt that ROVs could do it. Smaller payload capabilities of many ROVs compared to HOVs was a common concern (although development of new strategies for elevators is helping to mitigate the ROV payload problem), whereas limited bottom time was a problem noted for HOVs. Some respondents indicated that both HOVs and ROVs are needed as deep submergence tools. It was also noted that at greater depths bottom time of HOVs is much more limited compared to ROVs. Many felt that less than 10% of their work could be accomplished by AUVs, and voiced concern about their limited payload capabilities. The lack of popularity of the AUVs was largely due to the admitted unfamiliarity with AUVs and the fact that many of these vehicles have not yet been proven as mature science tools.

Category B of the questionnaire focused on options available for SEACLIFF upon retirement from the Navy. Many responded to the questions posed by answering "unsure" because they were unfamiliar with SEACLIFF's capabilities or they were concerned with the financial implications of the option and felt they could not answer with confidence.

The majority of responses indicated that SEACLIFF should NOT replace ALVIN, citing SEACLIFF's poor track record and ALVIN's proven capabilities. They did not want to compromise ALVIN's performance for increased depth capability. Responses were very positive (59% YES, 14% NO, 27% UNSURE) for transferring SEACLIFF's equipment to WHOI for use in enhancing ALVIN and preserving the titanium sphere for later use. Most found this to be the best alternative and most cost-effective option. Those opposed to this idea suggested building a new class of 6000m HOV or keeping SEACLIFF available if funding could be found.

Mike Perfit agreed to prepare a cover letter to the Working Group Report which provides a brief summary of the recommendations of the report and states that the community is interested in acquiring SEACLIFF. (Following the meeting, Mike prepared the cover letter and it is included as *Appendix X*.)

UPGRADES TO NATIONAL FACILITY VEHICLES AND SCIENCE SENSORS, AND RELATED ISSUES:

Status of Recent Upgrade Proposal - Dudley Foster started the report by providing the status of ALVIN's imaging upgrades, *Appendix XI*. His presentation included a listing of completed tasks. The entire list is provided in *Appendix XI*. Dudley noted that the scope of the imaging proposal is complete. Next Dudley reviewed the status of the DSF science sensor upgrades. The upgrades will be implemented over two years. NSF funded the program completely at \$425K. Many of the upgrades apply to both ALVIN and Jason. WHOI cost shared approximately \$50k in costs associated with the upgrade proposal. \$26k was targeted for acquisition of a ring laser gyro to improve vehicle heading information, and ~\$25k will be spent on developing a prototype of a steerable elevator. The complete list of science sensor upgrades is also included in *Appendix XI*.

Status of WHOI Deep Submergence Data Archiving Policy - Dick Pittenger presented a report by Cathy Norton, Library Director, titled "DSOG Data Rescue Project" and is included as *Appendix XII*. The goal of the WHOI archive preservation program is to preserve and digitize DSOG media and make electronic retrieval of the information useful to the scientific community. The projects include digitizing and repairing media collected by ALVIN and the WHOI ROVs. ALVIN media includes bulk film rolls, video imagery, and 16 mm film. WHOI has identified ALVIN data rescue as top priority and has funded personnel, equipment and supplies for the effort. During the period from January 1997 to July, ALVIN film at risk has been identified. Dives 1-1,000 were examined with 100 rolls cleaned and duplicated. The process is ongoing and will continue with the same process for dives 1,001 through 2,500 (years 1980-1995). Additionally during this period, a working committee of DSOG, graphics and library personnel was established; an FTP site for data log information transfer was set up as well as a template for on-board dive data entry. The full list of activities since the start of the year is included in *Appendix XII*. Dick reviewed the big issues still facing the archive project; such as, future services, locational servers, international problems in accessing data and integration services. A goal of the DSOG archive project is to make data retrieval more user friendly. This will be a two year effort.

Dan Fornari continued by reviewing his draft guidelines for deep submergence data acquisition, archiving and commercial use. The draft provides information on the present archiving policies for the National DSF, data distribution, custodial responsibilities of WHOI for distribution of imagery collected by the National facility vehicles, and guidelines for use of imagery taken from the National vehicles. At present, no data is archived from Jason, Argo-II or DSL-120. DESSC raised a number of issues regarding the draft guidelines and remarked that additional information is needed before finalization of the guidelines. It was pointed out that there is a lot of information being collected that the community would like to have access to. DESSC raised a number of questions:

- What is the effort required for archiving the ROV vehicle data?
- What does the gross data (size/weight) look like for a 24 hour period for each vehicle?
- How can the data to be archived be reduced (cost/size/effort) but still provide a reasonable representation of the cruise information for future investigators?

It was recommended that other archiving models be examined, such as those used by NASA. The DESSC agreed that they would like as much data as possible archived including the best video which has not always been WHOI's property. The federal agencies recommended that DESSC work with the operator in drafting a new archive policy. The following tasking was assigned:

- 1) Determine ROV data archiving cost and volume - Andy Bowen.
- 2) Determine the cost of a second master video tape for each ALVIN dive so that information from two cameras can be recorded and archived - Barrie Walden.
- 3) Establish a Data Archiving Subcommittee to review the present policy and provide recommendations at the December DESSC meeting - Cindy Van Dover and Carl Wirsén.

WHOI indicated that it too was establishing an internal, institution wide data handling and archiving

committee which would review current policies and make recommendations-- deep submergence data would be an important facet of the committee's deliberations.

Third Party Tools - The Third Party Tool Policy was briefly discussed. Mike Perfit reported that the policy has undergone a number of revisions by the agency representatives. After a few minor changes, the policy will be ready for distribution to the community. The first half of the policy will provide the tool policy and the second half will provide guidelines. DESSC is waiting for final agency approval of the policy.

DESSC DISCUSSION OF INTEGRATED FACILITIES, NESTED SURVEY STRATEGY AND HOW TO BETTER EDUCATE THE USER COMMUNITY ON CONDUCTING FIELD PROGRAMS: Both Patty Fryer and Dan Orange provided written critiques of their experiences using the DSF ROV vehicles. These were used as a starting point for the Committee's discussion. Patty and Dan had a cruise in the Western Pacific using the ROVs off THOMPSON. Problems encountered during the ROV operations were related to staffing; communications with DSOG; and perceived vehicle weaknesses in payload, manipulators, surveying and sampling capabilities. The criticisms were constructive in nature and were intended to be used to help advance the systems for future operations. The DESSC felt that it was imperative that the community be educated on the capabilities and limitations of the ROVs. WHOI will prepare a formal response to the critiques provided by Patty Fryer and Dan Orange for DESSC's review. The response will then be sent to the agencies. It was recommended that a white paper for community distribution be prepared that would provide guidance on how the vehicles should most effectively be planned and used. The paper should address the lessons learned through past operations and also highlight the vehicles' successes. The paper could eventually be used as a kick off for a proposal to improve the vehicles in areas in which they need improvement.

The areas of concern identified by Patty and Dan were then discussed in more detail by the Committee beginning with the personnel issue; use of contract technical and engineering personnel by WHOI to support ROV operations. It was pointed out that in the case of Patty's cruise there were not enough qualified people to properly handle the cruise. Additionally, Jason does not have the on-hand reference material such as user manuals available as exists for ALVIN. It was recommended that the ratio of contract technical and engineering personnel support people should be kept as low as possible and that a more aggressive orientation program be implemented. WHOI noted that they are trying to establish a core group of experts with specialties in the ROV systems. It was recommended that an EOS article be written highlighting the capabilities and limitations of the ROVs along with guidelines on how to most effectively utilize the vehicles in a new survey strategy. (Note: since the meeting an article by D. Fornari, S. Humphris, and M. Perfit, "Deep Submergence Science Takes a New Approach," EOS, Vol 78, No. 38, Sept 23, 1997, page 402 was published.) Mike Perfit indicated that he will contact NSF regarding the ROV operational problems and DESSC's plan of action.

ADVANCED TETHERED VEHICLE (ATV) - The Navy has announced in a letter from Admiral Krul that they plan to retire ATV. Scripps has indicated they are interested in operating it. At the June UNOLS Council Meeting, the agencies tasked DESSC to investigate the community's interest in using ATV as a science tool. They suggested that the DESSC use the results of the SEACLIFF survey in providing their input. Bob Knox (SIO) is organizing a meeting to be held in September to address the future of ATV. Cindy Van Dover noted that she has used ATV with some success. The manipulators are very responsive and can easily be functioned. Bob Collier noted that he has also had successes with the Navy vehicles. DESSC raised a number of questions regarding ATV including its cost of operation, past uses, and technical capabilities.

Gene Smith remarked that DESSC should let the agencies know that the community might be interested in ATV. Mike Perfit will write a letter to the agencies indicating that the community is interested in ATV. The letter will also request information on the technical capabilities of the vehicle.

Admiral Mooney Discussion - Admiral Mooney returned to the DESSC meeting to wrap up his discussion and thoughts from his earlier presentation. He vowed to include the DESSC Chair and representatives from NSF, ONR and NOAA in the group which will be addressing the future of deep sea access. He indicated that he would not be able to support a proposal for an airline ticket tax for deep sea

science support; however, a proposal for a tax to support the deep sea facility assets would be appropriate. Brad emphasized that is important that he and DESSC maintain an honest, open dialog.

ATLANTIS Modifications - Dick Pittenger stated that if the community was interested, WHOI will submit a proposal to increase the berthing capacity on ATLANTIS by six. The berthing modifications may be able to be made in January when the ship enters its PSA. There would be some trade-offs associated with the increased berthing. The additional berthing could compromise some science van storage, main lab space and limit endurance (food). Dick needs to know if these are major tradeoffs that would seriously impact the science capabilities of the ship. If the community desires the added berthing, WHOI will need an endorsement letter from DESSC. Mike Perfit has requested an increase of six additional berths on ATLANTIS but it appears that funding for this will not be available until at least the summer of 1998 at which time a more detailed plan will be developed.

LONG RANGE PLANNING: The Committee reviewed the list of programs (from the electronic requests) which have been funded or proposed for 1999, see *Appendix XIII*. Dan Fornari and Cindy Von Dover have funded work in the Indian Ocean in 1999. It was suggested that a message be sent to the community indicating where the funded work is located in 1999. The Committee discussed methods in which to educate the community on how to request assets for their research. There are two issues: (1) How to get vehicles committed for multi-year time series work, and (2) How to plan expeditionary research (when ROVs may be the only available facilities). DESSC has asked the funding agencies to provide the operators with more guidance regarding multi-year scheduling and they have agreed to provide it. It was suggested that Mike Perfit address this issue of planning in his next UNOLS Newsletter Article. It was recommended to further address this issue at the DESSC fall meeting in December.

Science Initiatives beyond 2000 - Mike Perfit requested that each Committee member send him a page highlighting their directions and facility needs for future deep submergence science. Mike will use these inputs to establish a white paper outline. Once the outline is in place, he will assign writing tasks to DESSC.

Public Outreach Programs - The meeting concluded with a discussion on ways in which to publicize deep submergence science achievements. It was recommended that a proposal be submitted to NSF's Education Division to support a Deep Submergence Science Lecture Program. The program would select guest speakers to discuss exciting topics in their field. The proposal would include support for the speakers, program development and brochure printing.

The meeting was adjourned at 1:00 p.m.

Appendix I

**Deep Submergence Science Committee
Carriage House, Woods Hole Oceanographic Institution
July 16-18, 1997**

MEETING BEGINS AT 9:00 AM

I. Introductory Remarks - (Perfit)

1. Logistics, Agenda items
2. Accept minutes

II. Discussion of Summer/Fall 1997 Deep Submergence Ops. Schedule (Perfit - Overview)

1. Latest news on constraints and priorities for accommodating science on JDF - (Moller/Pittenger and Agency Reps.)
2. Status of ROV traction winch and launch/recovery facilities on Atlantis - problems and plans for resolving them - (Walden/ Pittenger)
3. Impact to Fall ALVIN Schedule and to 1998 Atlantis and DSOG scheduling - (Perfit/Moller/Pittenger)

III. National Facility Operators Report (Pittenger/WHOI Personnel)

1. ALVIN Overhaul and Recertification - Walden/Foster
Results from first 2 science dives on MAR - (Fornari)
2. Jason and tethered vehicle Ops Summary - (Bowen)
W. Pacific & Mediterranean
Fryer cruise
Derbyshire cruise
Ballard cruise
3. Status of WHOI Deep Submergence Data Archiving Policy - (Fornari/Pittenger)

IV. Upgrades to National Facility Vehicles and Science Sensors

1. Status of Upgrade Proposal - (Walden/Fornari)
2. Plans for implementation of upgrades - (Walden/Fornari)
3. Questions to ONR and NOAA re: possible contributions to the upgrade effort- (Fornari)

V. Agency Reports

1. NSF - (P. Taylor, D. Elthon)
Results from May panel - updating DESSC/UNOLS deep submergence funded programs listing
2. ONR - (S. Millick)
Funded science programs
Clarification on Navy deep submergence vehicle decommissioning
3rd party tools
3. NOAA (G. Smith)
Funded programs
New NOAA funding paradigm
Significance for Deep Submergence Facility support
Interest in Navy assets
4. Status of interagency MOU
5. Other Deep Submergence Activities - (NURP, MBARI, ROPOS)

VI. 1998-1999 Deep Submergence Scheduling

1. Review of Planning Letters and Website postings - (Chandler/Moller)
2. Identification of funded programs, science/logistical constraints, different vehicle requests, and nature of time-series projects to achieve a workable schedule for PIs and funding agencies.
3. Additional Long Range Planning -
Future global deep submergence initiatives: Western Pacific, Indian Ocean, S.EPR, Mediterranean, Polar Regions
International collaboration initiatives (JAMSTEC/BRIDGE)
4. Discussion of traditional operating areas vs. expedition science.

VII. DESSC Sea Cliff Working Group Report (M. Perfit)

1. Results of survey
2. Meeting summary
3. Final report
4. Discussion of ATV retirement and request for DESSC input
 - a. Scripps initiative - Sept. meeting
 - b. Plans for new science ROV

VIII. DESSC Discussion of Integrated Facilities, Nested Survey Strategy and How to Better Educate the User Community on Conducting Field Programs With ALVIN, Jason, Argo-II and DSL-120 sonar - (Fornari/Orange/Fryer)

1. Jason letter , discussion and response

IX. DESSC White Paper Discussion-

1. Deep Submergence Science Initiatives- Beyond 2000
 - a. New Science ROV- planning and funding
2. Assignment of written sections to DESSC members

Deep Submergence Science Committee Social
Wednesday, 16 July 1997
5:00-7:00 p.m. Clark Building, 5th Floor

Woods Hole Oceanographic Institution invites the DESSC Meeting Participants to join representatives from WHOI for a Social on Wednesday, 16 July, 5:00 p.m., 5th floor of the Clark Building located on the Quissett Campus of the Woods Hole Oceanographic Institution.

Appendix II

DESSC Meeting - July 16-18, 1997

NAME	Affiliation	Phone #	Fax#	E-mail
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Cindy Van Dover	NURP/U of Alaska	(907) 474-5870	(907) 474-5804	vandover@ims.alaska.edu
Barry Walden	WHOI	(508) 289-2407		bwalden@whoi.edu
Carl Wirsen	WHOI	(508) 289-2307	(508) 457-2169	cwirsen@whoi.edu

Appendix IV

Z-Drive Population in the U.S. Oceanographic Fleet

<i>Knorr, Melville</i>	3 each
<i>Thompson, Revelle, Atlantis, Brown</i>	2 each
TAGS 60, 61, 62, 63, 64, 65	3 each

Failures to Date

	<u>Probable Cause</u>
<i>Thompson</i> - lower units (Port and Starboard)	Manufacture/Grounding
<i>Melville</i> - lower unit	Manufacture
<i>Knorr</i> - lower - Port (Derated to 70% torque by ABS)	Unknown
<i>Thompson</i> - upper gear box	Unknown

Plan of Action

- **Analysis of failures to date.**

- ◇ NAVSEA funding.
- ◇ Scripps (Tom Althouse) lead; WHOI, UW assist.
- ◇ Team to witness removal of *Thompson* and *Knorr* gears, conduct metallurgic analysis.

- **Possible Outcome**

- ◇ Design problem (worst case) - seek Navy/NAVSEA assist in resolution.
- ◇ One off manufacturing defects - pursue recourse with LIPS with ONR and NAVSEA backing.
- ◇ No common cause/failure mode - review sparing provisions

Appendix V

ATLANTIS SHAKEDOWN

- ▶ **SeaBeam underway testing**
Hudson Canyon survey
- ▶ **Gravity coring**
- ▶ **Mooring deployment**

SHIP OUTFITTING & LOADING

Six weeks total

- ▶ **ALVIN shops and storage areas constructed**
- ▶ **Sled tracks modified**
- ▶ **Stores and supplies loaded**

ALVIN POST-OVERHAUL

- ▶ **3 tethered trim dives in Woods Hole**
- ▶ **14 certification/engineering dives off Bermuda**
Increasing depths from 10 to 4,500m
- ▶ **Science equipment tested:**

35mm stereo cameras

datalogger

navigation

external video cameras

all lights

video recorders

manipulators

temp probes

science strobes

shipboard video editing

lasers

pan & tilt

- ▶ **9 science dives so far on Mid-Atlantic Ridge**
All systems working well
Average bottom time: 4.6 hrs.

Appendix XIII

ALVIN/ROV PROGRAMS 1999 AND BEYOND

Atlantic

Blackman 14 ALVIN and 10 Jason Funded

Gulf of Mexico

MacDonald 10 ALVIN and 10 Jason Funded

Juan de Fuca

Carson 7 Jason Funded

Chadwick 1 Jason Funded

Torres 24 ALVIN Pending

Cowen 10 ALVIN or Jason Funding

Off California

C. Smith 7 ALVIN Pending

North East Pacific Rise

Lutz 11 ALVIN and 12 Jason Funded

Manahan 8 ALVIN Funded

Mullineaux 10 ALVIN Funded

Luther/LEXEN

Indian Ocean

Fornari/VanDover 11 Jason and 6 Argo Funded