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UNOLS

DEep Submergence Science Committee

Meeting Report

May 24-25, 200

Woods Hole Oceanographic Institution
Carriage House
Woods Hole, MA

Meeting Minutes
DEep Submergence Science Committee
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Welcome and Introductions – The DEep Submergence Science Committee met in the Carriage House of Woods Hole Oceanographic Institution (WHOI) on May 24-25, 2000. Patty Fryer, DESSC Chair, called the meeting to order at 8:45 am. After introduction of the participants, the meeting agenda was reviewed. See ***Appendix I***. The items of the agenda were addressed in the order as recorded in these minutes. The meeting participant list is included as ***Appendix II***.

Accept Minutes - The December 1999 DESSC meeting minutes were accepted as written.

National Deep Submergence Facility (NDSF) Operator's Report – Dick Pittenger began the report for WHOI. He introduced James (Frank) Wall who is with the Department of the Environment, Transport and the Regions) DETR, UK. He was at WHOI to participate in the Jason II design review meeting.

National Facility Vehicles Operations Summary - Rick Chandler made a presentation on WHOI operations in 2000, see ***Appendix III***. A new pilot has been hired. To date, ALVIN has 91 days at sea with 53 of dives completed. Argo II and DSL-120 each have 48 days at sea with 5 lowerings completed. Highlights of this year include recovery of a gravimeter for Scripps Inst. of Oceanography (SIO). 259 miles of DSL-120 sonar data was collected and processed at sea, and 128 miles of Argo photography was obtained. No ALVIN dives have been lost in 2000.

Dan Fornari continued by reporting on highlights from his MELVILLE cruise from March 24, 2000 to May 10, 2000. The cruise was to conduct a marine geology survey in the Galapagos Islands using rock dredging and camera and sonar mapping. Other scientific objectives of the

project were to investigate the Galapagos rift and the EPR at several locations from 10N to 10S. They were able to obtain detailed sonar imaging on the axial trough. They were very successful in collecting DSL-120 data, processing it over night and using that data to base the next survey on. Sonar acquisition went without a hitch. Many people are interested in this area, so the data, plots, and raw data have been made accessible to the community at the url: http://128.128.21.37

Bill Ryan requested that there be a discussion on data and website policies.

Final SEACLIFF Engineering Study – Barrie Walden began the report by providing a history on the SEA CLIFF project. The study was to investigate methods for providing the National Facility manned submersible with improved scientific capability and to determine the best utilization of the assets made available with the decommissioning of SEA CLIFF, see ***Appendix IV***. There were many options to consider in the study. The method of study included the following items:

- Assess SEA CLIFF equipment
- Survey other 6000 m subs: Russia, Japan, France
- Survey current technologies
- Survey users and operators to identify problems they had experienced in the past and recommend improvements
- Develop desired vehicle functional specifications and make sure that the vehicle was at least as capable as ALVIN was.
- Conduct cost analysis on design and construction of new submersible.
- Investigate hull replacement / modification possibilities – there is at least one other sphere available.
- Evaluate options

Barrie reported that the recommendation of the study is to build a new submersible rather than utilize SEA CLIFF or ALVIN. It appears that there would be little benefit in utilizing SEA CLIFF's sphere. SEA CLIFF's interior diameter/volume is much smaller than ALVIN. SEA CLIFF's viewports are placed in same locations as ALVIN. SEACLIFF is very heavy and cannot be handled by ATLANTIS without modification to the ship. Modification of the vehicle would be a very expensive option.

Barrie noted that there are some items that can be removed from SEACLIFF and utilized. It has been recommended that during the next ALVIN overhaul some of SEA CLIFF's smaller items be installed on ALVIN.

Barrie requested that DESSC consider WHOI's recommendations and provide direction to the operator. The decision on how to improve the Nation Facility must come from the science community, not the operators. The science community must indicate a clear need for the added capabilities.

Bob Brown continued the SEACLIFF discussion with a review of the user survey. The users indicated that critical areas for improvement should address power, bottom time, video imaging, external payload, manipulators, sampling devices, navigation, and viewport locations. In evaluating SEA CLIFF's equipment, the following items have potential for future use:

- Pressure hull
- 6000 m rated pressure vessels
- Syntactic foam – however the foam is in small pieces.
- Atmosphere control equipment
- Navigation/communications
- Variable ballast pump and valving.

As part of the study other 6000- meter manned submersibles were visited (MIRs, NAUTILE, CONSUL/RUS, SHINKAI 6500). Details of their features are contained in Appendix IV and can also be viewed at the URL:
http://www.marine.whoi.edu/ships/SeaCliff/report.htm .

Bob discussed the field of view from various viewports. A comparison of ALVIN and MIR viewports was made. From the viewports in the MIRs, there is a lot of viewing overlap between the pilots and observers. The MIRs offer the overlap, but they lose coverage. Many scientists prefer the overlap.

Current technology highlights include:
- Navigation
- Manipulators
- Distributive control and data systems
- Computers – smaller
- Composite framing
- Buoyancy material – Composites are available that keep the total vehicle weight down. WHOI would like to keep the vehicle weight within the a-frame capability.
- O2 storage and monitoring

Bob reviewed the basic design specifications desired for a 6000 m occupied submersible. WHOI provided the subcontractor, Southwest Research Institute (SwRI), with these specifications to use in developing a conceptual vehicle design and cost estimate. They examined five options:
1. An improved ALVIN
2. SEA CLIFF - as is
3. SEA CLIFF - modified for science
4. 6000 m ALVIN
5. New design 6000 m DSV

A comparison chart showing the pros and cons of each option was presented. A new 6000+-meter DSV is estimated to cost approximately $15M.

In conclusion, design and construction of a new DSV would take approximately three years. WHOI could maintain the submersible operations throughout the construction, with the exception of the last couple of months. Lastly, Dick presented a world map, which shows the added sea floor coverage than can be achieved with a 6000-m vehicle. The map is included in ***Appendix IV***.

Upgrades to the National Facility Vehicles, Science Sensors, and ATLANTIS:

Status Report on current upgrades proposals (ROV) – Andy Bowen, provided a status report on the ROV upgrades, see ***Appendix V***. Andy had held a daylong meeting the day before the DESSC meeting and that several DESSC members attended. He reviewed the anticipated missions for the upgraded vehicle that included high-resolution mapping and surveying, installation/service of seafloor observatories, and manipulation and sampling in a more "ALVIN-like" manner. The systems are being modeled to a fairly high degree to determine how their objectives are being met. Andy showed a sketch of the Jason configuration. The design has pivoting side baskets and front baskets. They are currently selecting equipment for the vehicle. Andy noted that WHOI has been receiving advice from outside sources. MBARI has been assisting in the development of the upgrades. WHOI is posting the upgrade design features on their webpage: http://www.marine.whoi.edu/ships/rovs/upgrades.htm

Andy noted that community input is needed on a few of the upgrade items. Dan Fornari will poll the community to determine if a CTD capability is needed for DSL-120. Andy will discuss with Barrie and Dudley whether a 120V requirement is needed.

Bill Ryan voiced his concern with the .680 cable. Dolly reported that the community is addressing this issue and that a winch and wire workshop was held in the fall. Andy indicted that they have been designing the vehicle upgrades to stay within the .680 cable parameters. A question was asked about the vehicle's depth capability. Andy indicated that this is dependent on the cable. The cable is expensive and they would like to exploit it to its fullest potential.

Andy reviewed the upgrades planned for each of the vehicles: Jason II, Argo II and DSL-120a. He also reviewed a timeline for implementing the upgrades for each of the vehicles. The specifications for the vehicles have been written. More personnel have been added to the project. 3-d Modeling of the Jason II design is underway. Power subsystem design is well underway. Some components have been purchased and are being testing. The cable is being tested for voltage stress. Sensor suites and manipulator candidates are being investigated.

The science payload for Jason II will be approximately 450 lbs. The tool sled is not included in the payload. There may be an option for an exchangeable foam capability. This would allow the use of lower density foam when working at shallower depths. Jason has a 150 lb capability. Dan Fornari suggested that the payload capability be clearly defined on the webpage. Andy and Dan have discussed putting together a poster on the Jason II upgrade project.

ALVIN Overhaul Plans and Priorities – Dudley Foster reported on plans for ALVIN's overhaul, see ***Appendix VI***. He indicated that there are science and system upgrades planned. Dudley reviewed the overhaul timeline. ATLANTIS will be offloaded from the ship on arrival at WHOI in December. The overhaul work will begin on January 2, 2001. The vehicle will be operational by July 1, 2001. There will be a website reporting on the overhaul progress: http://www.marine.whoi.edu/ships/alvin/alvin.htm

Possible upgrades include:

- Improve pan/tilt controls – A need to maintain flexibility has been indicated.

- Improve ergonomics – better cushions, more floor space in sphere.
- Retain Benthos 35 mm cameras – They will not remove the 35mm during this overhaul, but will continue to look at this.
- Investigate fiber optic penetrator to increase bandwidth – There may be some risks involved with this upgrade. There may be some certification issues.
- Upgrade single chip cameras.
- Install flat screen displays – There will be improved colors. There are some resolution concerns associated with the angle of viewing.
- Acoustic modem for depth/position telemetry. A simple telemetry system also could be used for a backup communications if phone is out.
- Digital video recorders – These are for masters and archiving. There is a big question of what format to provide the community? It is important that the community provide input on this item. What do they want as their standard? What is the first copy medium to be?
- Doppler navigation w/RLG – continuous fixes with acoustic updates.
- Lateral thruster with DP control on bow – This will help the sub move laterally which might be useful if working on chimneys.

Dolly questioned the overhaul schedule and reported that there are two cruises that may have added days (Delaney and McDonald). Also the Blackman cruise will be at the MAR in December in conditions are likely to be rough. This will be revisited later in the agenda.

Prior to the DESSC meeting, the community was surveyed for input regarding overhaul priorities. Responses from the survey can be found in Appendix VI and also are posted at the URL: http://gso.uri.edu/unols/dessc/alvinup.htm

A second survey was conducted to determine whether to eliminate the ALVIN external stills. The results of this survey are contained in Appendix VI.

R/V ATLANTIS Shipyard Work list in 2001 – Theo Moniz reported on plans for ATLANTIS' shipyard period planned for 2001, see ***Appendix VII***. Theo reviewed the science modifications.
- Phase III bow thruster sound deading – Sound insulation will be added between decks.
- Renew refrigeration units to science boxes.
- Remove seismic air compressors – The compressors are never used and take up a lot of space.
- Modify lab drains to improve drainage. – Cindy Van Dover noted that she has been using the outdoor sink, which is adequate, but a better, protected work area is needed.
- They hope to redesign the ALVIN dehumidification system.
- Modify the power distribution to the labs.
- Raise starboard hydroboom to improve the fairlead.
- Provide additional space in the ALVIN electronics workshop.
- Improve access to 01 and 02 decks aft.

Some of the general modifications planned include:
- Enlarge potable water tanks.
- Replace sewage pumps.
- Improve noise quality on mess deck.

- Install exterior general alarm bells.
- Inspect thruster gears.

A problem was reported concerning diesel fumes in biological lab. WHOI will look into this. There is no plan to increase berthing at this time. WHOI will continue to study the berthing increase and science storage areas. It was noted that the anchor slamming problem on ATLANTIS has been corrected.

Agency Report:

National Oceanographic and Atmospheric Administration (NOAA/NURP) – There was no report. There was a brief discussion by the operator on the status of NOAA funding for this year's programs.

National Science Foundation (NSF) – Mike Reeve gave the report for NSF. The NSF budget request for next year indicates an increase. The Biocomplexity theme received $15M in 1999 and in 2000 was supported at approximately $55M. About half of these funds were awarded for ocean and coastal programs. This was good, however the associated ship costs were not included in the budget. The proposals for the 2001 panel are to be reviewed in June. The budget request for 2001 includes an increase to cover the ship costs associated with biocomplexity. By next year a significant amount of the data related costs would fall under the area of Information Technology Research (ITR). The Major Research Equipment (MRE) account, which supports many of the large value items, has been funded at $250M. Rita has indicated that she will try to increase this to $1B. New ship acquisition might be funded out of this account.

Mike reported that Don Heinrichs has retired. Twenty applications have come in for the science directorate position. Dolly's position was readvertised and will be kept open until mid June.

Mike reported that as of Monday, the FOFCC has changed its name to FOFC. It will now become a part of the ocean partnership.

Office of Naval Research (ONR) – Sujata Millick reported that ONR has no ALVIN dives and only a small number of ROV days this year. They are focussing on work with AUVs. This work is primarily in support of shallow submergence operations. Work with Odyssey-type AUV vehicles is planned for Gulf of Mexico.

Navy support for facilities this year is approximately $15M. Of this, approximately $12M is ONR funded. ONR is still trying to have the SEA CLIFF spares transferred from the Navy to WHOI. The value of the spares is estimated at approximately $11M.

The reporting requirements for Foreign Nationals intending to use ALVIN have been removed from the NDSF Memorandum of Agreement (MOA). The MOA awaits signature by NOAA.

Activities are underway to transfer ATV from the Navy to academia. Two institutions have expressed interest in operating the vehicle, Scripps Institution of Oceanography/MPL and University of Hawaii/HURL. A MOA is being drafted.

DESSC Terms of Reference – Updated Terms of Reference were presented to the UNOLS Council in February 2000. See ***Appendix VIII***. Patty asked the DESSC to review and comment on this latest update. Dan Fornari made the following recommendations:

General - Remove references to AUVs throughout the terms since they are not part of the NDSF.

Paragraph 4 – Dan will rewrite and circulate a revision to this paragraph. As a side note, the operator may be getting a Doppler in the fall. A proposal for a digital camera is out for review. The operator has continued to study camera systems. There was concerned that paragraph 4 conflicted with the 3rd party tool policy. It was recommended that the paragraph be clarified and that that the third party tool policy be referenced.

Paragraph 7 – There should be a statement added stating, "Nominations for the DESSC membership shall be publicly advertised."

There was a discussion about NOAA membership on DESSC. Should scientists/engineers who are employed by NOAA be allowed to serve on DESSC? The committee felt that individuals should be reviewed based on their qualifications when being considered for the DESSC. Whether they are an employee of a federal agency or an academic institution should not be a factor.

Operational Summary of other Deep Sub Activities:

Monterey Bay Aquarium Research Institute (MBARI) – Mark Chaffey provided a report on MBARI activities, see ***Appendix IX***. Western Flyer is now on-line and has been operational since November 1999. Initial expeditions were conducted in local waters at seamounts off the central California coast. Upcoming expeditions include work in the Santa Barbara Basin, Mendocino Escarpment and Gorda Ridge. There are 150 days scheduled in 2000. Mark provided a Tiburon sampling update. The Toolsled system is working well. It is routine to have the vehicle toolsleds all aboard the ship and switched out during a cruise. A fourth toolsled, a core drilling sled, is under construction and expected to be complete in June 2000. This adapts the Halloway/Stakes drill to TIBURON. There was a question on whether the drill will be available to the community. Jason II should be able to operate it. The answer is unclear at this time. There has been some software refinement of Tiburon. Camera dome cracking problems have been experienced. The inside domes have been working fine. Both main domes have been replaced.

The PT LOSOS / Ventana system have received recent upgrades. Ventana has an 1800m capability. They have installed an HDTV camera (Sony HDC 750). A second seven-function manipulator arm has been added and a vibro-coring tool has been successfully integrated. In 2000, 153 ROV sea days are scheduled.

Major MBARI Initiatives for 2000 focus on the MOOS (MBARI Ocean Observing System) project. The project is a seafloor observatory connected to a surface buoy. There is

collaboration to the maximum extent possible with other observatory efforts. AUVs will be incorporated when unattended docking is feasible.

SIO Marine Physical Lab – A written report was provided by the Deep Tow Group after the meeting and is included as ***Appendix X***.

Navy - The Navy report was included in the earlier ONR report by Sujata Millick.

National Undersea Research Program (NURP) – No report.

ROPOS – A written report was provided by the Canadian Scientific Submersible Facility (CSSF) on ROPOS prior to the meeting, see ***Appendix XI***. Patty reviewed the report which covers ROPOS operations in 1999 and plans for 2000 and 2001. A new data management system was tested in 1999. Features are contained in the report. The vehicles 5000m capability has been restored.

Status Report on the Archiving of all Deep Submergence Data in the WHOI Archives – Dan Fornari reviewed the archiving status. See ***Appendix XII***. ALVIN archives are current to cruise 3-49, dive #3539. Data from eight DSL projects have been archived. Some scientists are being funded to archive their old cruises. Dudley reported that hand held camera pictures will be held in the archive, but are not going to be cataloged. These are becoming popular and may need to be revisited in the future.

Discussion on Plans for the DESSC December meeting - This year's AGU Fall meeting will fall over the weekend, December 15-19, 2000. It was recommended that every other year the DESSC meeting should coincide with The Ocean Sciences meeting so that more of the biology community can attend. The Ocean Sciences meeting is held every other year and their next meeting is scheduled for early 2002. The DESSC recommended that an additional, smaller scale meeting should be held at the fall AGU in those off years. The smaller meeting could be in the form of night meetings or special sessions. As an action item, strategies for reaching the biology community need to be developed. Cindy Van Dover and Anna Louise Reysenbach were asked to address this issue and report back to the DESSC. For the time being, DESSC will tentatively plan to hold a meeting at the next AGU The Ocean Sciences conference in 2002.

Data in Real Time – There was a discussion on distribution of data in real time. There is an issue of ownership of data. There is also the issue of use of the data for public news versus use of the data for commercial purposes. Some feel that this may not be an issue since there is not a lot that can be done with the data commercially. Because bandwidth is so expensive, it may be prohibitive for the data to be transmitted in real time and as a result use for commercial purposes is not pursued. Mark Chaffey indicated that this is a big issue at MBARI since copyright privileges are at risk. As a precaution, MBARI puts their logo on everything.

Deep Submergence Scheduling: 2001 and Beyond

Schedules for 2000 and 2001 – Jon Alberts provided a review of the 2000 schedule for ALVIN and the ROV operations, see ***Appendix XIII***. ATLANTIS has a full schedule of 299 days. Joint

operations are planned with THOMPSON in July. The Prod drill tests were not successful on THOMPSON in the early part of the year and as a result impacted the schedules of ATLANTIS and KNORR. Jon reviewed the ROV cruise schedule, which is very busy this year. He presented a timeline showing the various weather windows by geographic region. The timeline also shows the ALVIN overhaul period as well as the DSL-120 upgrades period. It was requested that Jon post this timeline on the WHOI website. The ALVIN overhaul will be conducted in the first part of 2001. ROV upgrades are planned at the end of 2001.

There are many NDSF requests for 2001 and they are distributed around the world. A map and listing of the requests are provided in Appendix XIII. Jon showed a draft timeline of operations for 2001. ATLANTIS will be available for non-ALVIN work while ALVIN is in overhaul. Once the overhaul is complete, it will be too late for ATLANTIS to get to Juan de Fuca and stay within the weather window. There was discussion on the timing of Lisa Levin's ROV cruises off Eureka. There is a strong potential for the weather conditions to be poor during the cruises. Lisa's equipment will be deployed in October 2000 and recovered in February 2001. Both cruises will be taking place outside of the ideal weather window for that area. The February 2001 cruise in particular has the potential for very poor weather conditions. The operator made it clear that this is a recipe for failure. There is financial constraint associated with the program. The sponsor wants to fund the program over two fiscal years. Additionally, there is a scheduling constain. The Blackman cruise, which follows Lisa's cruise, is a two-ship program. The other ship is foreign and may not be available at any other time than what has already been scheduled. The question was asked if Lisa's cruise could be conducted in a different geographic region. The DESSC has not seen Lisa's proposal and as a result cannot make a recommendation. The operator expressed a great deal of concern over this situation.

Long Range Planning Issues – Patty presented a map showing the areas of interest for 2002 and beyond, see ***Appendix XIV***). There was a discussion on how to alert the community to long range planning efforts and research areas of interest. It was recommended that the long-range map be posted on the DESSC website. A blast could be sent to the community letting them know that the map is available. This would allow the community to determine the areas of high interest and encourage collaborations.

Day Two: May 25, 2000

Datasets and Archiving Discussion - Patty opened the day with a discussion on data sets. Bill Ryan mentioned that he has been in discussions with Dave Epp regarding datasets. A workshop on this topic may be put together. There are a variety of issues associated with data sets:

- Should there be Data standards/formats?
- What data should be sent for archiving?
- When should datasets be made available?

Peter Cornillon (URI) has been funded by NSF to develop a set of data standards. Bill Ryan noted that one of the exciting findings of this year's Observatories Workshop was the recommendation to follow the ALVIN model for data archiving. In the ALVIN model, data is immediately sent to WHOI following the cruise, instead of sending it to the PI who holds it for two years. It was recommended that groups already established for archiving should be utilized.

There was a lively discussion on this topic. It was pointed out that in some cruises archiving is very good and in other cruises nothing or very little is archived. Cindy Van Dover pointed out that biologists have very little need for large data sets and they don't want to devote the time to putting the data together. It was recommended that there should be a standard for inputting data.

It was noted that the archive policy needs to be made more user friendly. Cindy suggested the addition of an archive fellowship. Bill Ryan suggested that there be a DESSC recommendation to increase the operator's budget to augment the addition of an archiving fellowship. Bob Brown suggested that a box be added to the Letter of Interest form asking the PIs if they will require archiving. It was noted that it takes some time and effort for people to get the datasets into the archive system. Dan Fornari indicated that on his recent cruise; a person was designated to process the datasets. This brings us back to the original issue of how to get data into the system. Major program initiatives need to address this issue (and some have). In fact, in some programs 5% of their budget is designated to maintaining the database.

Mike Reeve noted that the 2-year policy for releasing data is an old, pre-web policy. There may be a move to have immediate release of the data, with exceptions requiring permission. This is not a very popular view. It was also noted that if immediate release is required, there might be a tendency to provide generic, less useful information by the science community.

Future Funding for Deep Submergence Science (possible new mechanisms) –Dan Fornari introduced the topic and stated that from his perspective there should be a lead funding agency for the National Deep Submergence Facility. He sited ODP as a model. Dan noted that deep submergence research in the US is funded at a much lower level than other countries, yet we get a lot more done. The Navy funds the construction of the facilities, but they do not fund the operation of the facilities. Unless the mechanism for support of the facility is changed, we will always be hampered by the funding constraints now facing the operation. A lead agency would provide the Facility with a proponent. Science and facility costs could be grouped into one program.

The "Lead Agency funding paradigm" was presented some years back to NSF, ONR and NOAA. At that time each agency indicated an interest in remaining a partner. Sujata asked what is missing now from the current funding paradigm that would be gained by having a lead agency. Mike Reeve pointed out that ODP is scheduled to end in 2003 and unless efforts are made to renew it, the program will end. Also, ODP is an international program and is restricted by inflation. This may not be the best model to follow. Since the benefits to be gained by having a lead agency were a bit unclear and the agencies have indicated that they want to remain partners, it was decided to not pursue the concept of a lead agency at this time.

DESCEND Workshop Discussion – Patty gave a brief overview of the findings of the DESCEND Workshop. In very general terms it was recommended that greater access to the sea floor is needed. More and different vehicles are needed. A series of discussions evolved, some were directly related to DESCEND while others were not. The following paragraphs include summaries of these discussions.

There was a recommendation to include a deep submergence scientist to serve as an advisor in reviewing research proposals. This person could help recommend the most appropriate vehicle for the proposed work. Patty offered to discuss this issue with NOAA and NSF. Other issues that should be addressed with NOAA include:

- Increasing the $500K annual level of NOAA support for the National Facility. This level has not been increased in a number of years. It was recommended that the funding be increased to meet inflationary costs.
- NOAA's scheduling and financial over commitment of the facility in the past couple of years.

Patty will discuss these items with Barbara Moore and report back to the committee.

The needs of the deep and shallow submergence research are very different. It was recognized that the shallow water community has issues that need to be addressed. There was a discussion on adding a person to DESSC to serve as an advisor and liaison to the shallow water community. It was recommended that Shirley Pompani (HBOI) be asked to serve in this capacity. She attended DESCEND and displayed an understanding of the need for better coordination among the shallow water community. The DESSC supported this recommendation and encouraged Patty to contact Shirley Pompani to discuss her interest in serving as a liaison to DESSC. [Note: Since the time of the meeting, Shirley has been contacted and has agreed to serve in this role.]

Bill Ryan recommended that PIs should be encouraged to increase proposal pressure and young scientists should be encouraged to get involved.

There was a discussion on archeology. A group from Texas A&M has expressed an interest in DESSC. The committee recommended that the group be encouraged to attend the DESSC meeting in December. Dave Mindell noted that a link between the archeology and ocean sciences could be beneficial. Both groups could learn from each other. Bill Ryan pointed out that archeologists do a good job at reaching the general public through publications and news events. Perhaps oceanographers could learn from them.

DESCEND Report Discussion – Patty provided DESSC with a status of the DESCEND report. Patty has compiled all of the session inputs. At the time of the December DESSC meeting, the report was not ready to be released. It was too long and too repetitive. She has since rewritten and reorganized the report. Each session has been reorganized into the following format: introduction, themes, questions, approaches envisioned. Since the Coastal session was lightly attended, Patty added to its report by consulting with coastal scientists at SOEST and searching the web. The technology sessions have been reorganized into the following format: introduction, critical issues, and summary of technical needs. There is still a bit of redundancy with the report and it is still too long. It was recommended to post the report on the web as proceedings of the DESCEND Workshop with a click-on index on the side. There should also be searchable links keyed into search engines. Patty compiled the technology/facility needs into a matrix by session. See ***Appendix XV***. It was recommended that Patty's matrix be posted on the web. Dick made the point that the table does not indicate the need for an HOV. The continued reliability of the HOV must be addressed.

It was recommended that a glossy, brochure be printed which would highlight the recommendations of the DESCEND workshop. The brochure should answer the questions:

- What are the future research directions of submergence science?
- What tools will be needed?

The DESSC were responsive to this strategy. The web posting of the proceedings document could have a click-on to request a hard copy of the report. Since the report will be seen as a proceedings, additional editing can be minimal. It was suggested that a section on archeology be added. Dick cautioned the DESSC that when requesting additional assets, we don't jeopardize what we already have. The NDSF should not be degraded in anyway.

Patty reported that the executive summary for the proceedings still needs to be written. Patty would like to hear from DESSC on what should be included in the executive summary. The summary should identify the primary goal of workshop. It should address how support for initiatives can be obtained. The science needs to be clearly stated. The need for greater access needs to be stated. With greater the access, more discovery and knowledge that can be gained. The need for AUVs should be identified. There was a discussion on hiring a professional writer to help draft an executive summary for the DESCEND report. Dan suggested having someone check the proceedings grammatically. We should wait to post it until the executive summary is written. In summary the executive summary should provide a list of the vehicles needed to support future science. The list will include:

- A fleet of AUVs
- A suite of ROVs
- A deep diving HOV and ALVIN

Bill Ryan thanked Patty for organizing the DESCEND workshop and for making it such a positive workshop.

DESSC Meeting Dates - It was suggested that DESSC meetings be scheduled a full year in advance.

Patty reviewed her action items:

- Patty will talk to the agencies about DESSC serving as an advisor during panel reviews.
- Contact Shirley Pomponi to determine if she is interested in serving as a liaison to DESSC,
- Talk to the margins community about the need for new deep HOV.

The meeting was adjourned at 12:15 pm.

Appendix I

5/4/00

DEep Submergence Science Committee
Woods Hole Oceanographic Institution
Carriage House
24-25 May 2000

MEETING BEGINS AT 8:30 AM

Day One: Wednesday, 24 May 2000

AM

I. Introductory Remarks, Meeting Logistics, Introductions, Any Changes to Agenda Items, Accept minutes (Fryer)

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

A. National Facility Vehicles Operations Summary
B. Final SEACLIFF Engineering study

III. Upgrades to National Facility Vehicles, Science Sensors, and ATLANTIS (WHOI-DSF Personnel)

A. Status Report on current upgrades proposal (ROV - Bowen)
B. ALVIN Overhaul Plans and Priorities
C. Annual request for upgrades to science sensors and operational capabilities of NDSF vehicles - joint WHOI/DESSC
D. ATLANTIS - Atlantis yard/dry dock, shipyard worklist

PM

IV. Agency Reports

A. NSF -
B. ONR -
C. NOAA -

V. Terms of Reference (updated terms were presented at the UNOLS Council meeting Feb. 2000 with a request for action)

VI. Operational Summary of Other Deep Submergence Activities (Fryer)

A. MBARI
B. MPL
C. Navy
D. NURP
E. ROPOS

VII. Status report on the archiving of all deep submergence data in the WHOI archives

Day Two: Thursday, 25 May 2000 MEETING BEGINS AT 8:30 AM

AM

VIII. Deep Submergence Scheduling: 2001 and Beyond

A. Results from April NSF panel - updating DESSC/UNOLS deep submergence funded programs listing. Mechanism for dissemination of funded programs information to potential PIs.
B. Review of Planning Letters and Website postings and identification of funded programs (any progress?).
C. Review strawman schedule for 2001

IX. Long-Range Planning Issues

A. Science/logistical constraints, different vehicle requests - Additional Long-Range Planning and dissemination of funded programs information to potential PIs.
B. Future global deep submergence initiatives
C. Future funding for deep submergence science (possible new mechanisms)

X. DESCEND Workshop discussion: DESCEND report and brochure and role of DESSC as follow up after the Workshop, Follow-up Tech meeting

Appendix II

DEEP SUBMERGENCE SCIENCE COMMITTEE
WOODS HOLE OCEANOGRAPHIC INSTITUTION
WEDNESDAY, 24 MAY 2000, CARRIAGE HOUSE

ATTENDANCE

NAME	INSTITUTION	TELEPHONE	E-MAIL
Patty Fryer	SOEST/Unv. of Hawaii	808-956-3146	pfryer@soest.hawaii
Theophilys Moniz, III	WHOI	508-289-3489	tmoniz@whoi.edu
Bill Ryan	Lamont Doherty	914-365-8312	billr@ideo.columbia.edu
Cindy Van Dover	W&M	757-221-2229	clvard@wm.edu
David Mindell	MIT	617-253-0221	mindell@mit.edu
Dan Fornari	WHOI	508-289-2857	dfornari@whoi.edu
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Mark Chaffey	MBARI	831-775-1708	chma@mbari.org
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Appendix III

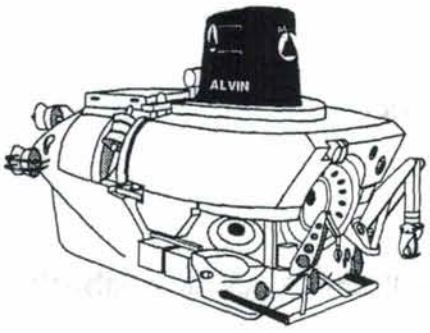
2000 NDSF Operations *(to date)*

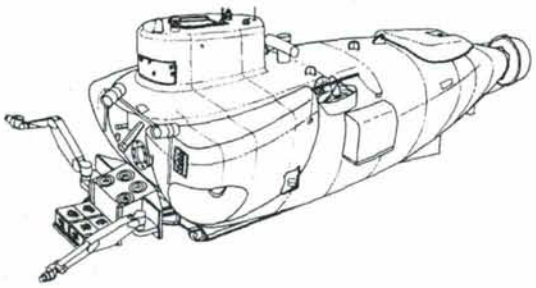
	ALVIN	*Argo2*	*DSL-120*
Days at Sea:	**91**	**48**	**48**
Assigned Operating Days:	**111**	**38**	**38**
Dives/Lowerings Completed:	**53**	**5**	**5**
Average Duration (hrs):	**7.9**	**41**	**49**
Average Bottom Time (hrs):	**5.2**	**36**	**34**

- **Highlights:**
  - *No ALVIN dives lost*
  - *Recovered $200K gravimeter for SIO*
  - *259 miles of DSL-120 sonar data at five EPR sites; all data fully processed at sea*
  - *128 miles of Argo photography*
  - *Vehicle upgrade planning underway*

Appendix IV

Comparison of Options for an Improved Manned Deep Submersible Vehicle for Research





The Deep Submergence Group at WHOI has completed an engineering study to investigate methods for providing the National Facility manned submersible with improved scientific capability and to determine the best utilization of the assets made available with the decommissioning of SEA CLIFF.

Background

- Availability of SEA CLIFF
- Desire to maintain U.S. 6000 meter manned capability

Opportunity

- Review sphere size, viewport arrangement
- Improve battery capacity and access
- Improve ascent/descent times
- Review other options to produce a 6000 meter manned capability

The motivation for this study was the transfer of SEA CLIFF to ONR in late 1998 for use in the NDSF. It was the only US manned asset capable of operating up to 6000 meters.

We viewed this as a unique opportunity to not only study the best use of SEA CLIFF but also review other issues that have been constrained by the original ALVIN design 35 years ago. Among these are sphere size, viewport arrangement, battery capacity and maintenance access and ascent/descent times.

Method of Study

- Assess SEA CLIFF equipment
- Survey other 6000 meter submersibles
- Survey current technologies
- Survey users and operators
- Develop desired vehicle functional specifications
- Evaluate possible modification to ALVIN and / or SEA CLIFF
- Investigate hull replacement / modification possibilities
- Conduct cost analysis on design and construction of new submersible
- Evaluate options

This is an outline of the components and process of the study. It was desired to obtain a baseline of information on what equipment is currently used, the staus of current technology, and the requirements of the users and operators prior to determining what options should be studied.

Improved Submersible Capabilities User Survey

Critical Areas for Improvement ?

- Available power
- Bottom time
- Video imaging
- External payload
- Manipulator performance
- Available sampling devices
- Navigation accuracy/reliability
- Viewport locations

Listed are only the areas where 10% or more of the respondents asked for improvements.

SEA CLIFF Equipment Evaluation

- General condition
- Spare parts
- Possibilities for use
  - Pressure hull
  - 6000 meter rated pressure vessels
  - Syntactic foam
  - Atmosphere control equipment
  - Navigation /communications
  - Variable ballast pump and valving

This evaluation was made by reviewing technical publications and drawings and inspecting equipment and spares where feasible.

All of the equipment necessary to operate SEA CLIFF is available with the exception of the HMI lights and manipulators which were not delivered with the vehicle.

Most of the electronic/electrical equipment on SEA CLIFF is at least 15 year old technology. The mechanical equipment is typically large, heavy and custom manufactured (ie. expensive). Because of these factors it would make little sense to use much of this equipment on ALVIN.

Study of Other 6000 Meter Submersibles

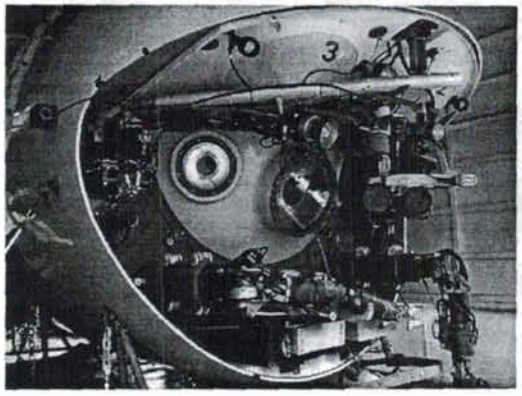
- MIRs
- NAUTILE
- CONSUL / RUS
- SHINKAI 6500

Visits were made to all other 6000 meter manned submersibles in order to evaluate their systems and discuss features and performance with their operators.

It was instructive to see how these other organizations, having the latitude to start from a clean sheet of paper, designed their vehicles.

MIR Highlights

- Interior layout and volume (2.1 meter ID sphere)
- Viewport locations and size
- Battery power
- Combined VB/Trim/ Ascent-Descent weight system
- Exterior design and maintenance access



The larger hull inside diameter gave the interior an impressive amount of volume and along with its viewport arrangement allowed for increased comfort. The viewport locations allowed for a significant field of view overlap between the observers and the pilot. Although designed for two observers and one pilot it is often used with two pilots.

The NiCd battery system allows a 100% increase in capacity over that of ALVIN.

The combined Variable Ballast and Trim system frees the submersible from having to carry and discard steel ballast weight. It also avoids having to carry mercury along with its various hazards and handling difficulties.

A well thought out exterior layout and design affords easy servicing and maintenance.

Disappointments:

Lack of junction boxes for scientific equipment.

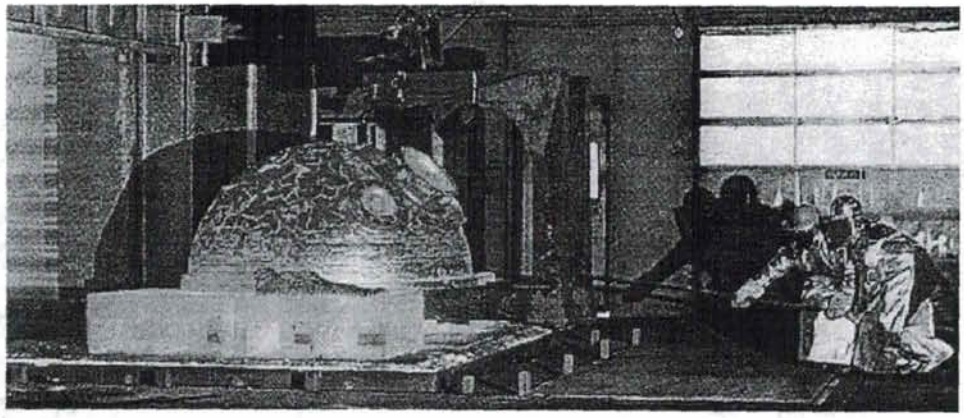
Small sample basket volume.

Poor positioning of exterior equipment in observers field of view.

Light weight but complex and occassionally dangerous recovery system.

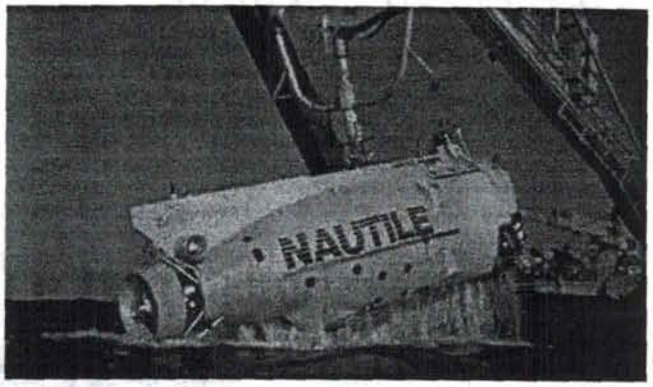
Lokomo Pressure Sphere

- Maraged steel (2.1 meter ID)
- Certifiable through ABS or Germanische Lloyds
- Available for sale



An extra personnel sphere was made by Rauma Repola in conjunction with the MIR project. These spheres are made from maraged (high nickel) high strength steel. This is the same material that was used in Lockheeds's DEEP QUEST and the Navy's Deep Submergence Rescue Vehicles. This sphere is available for sale in a completed state (without electronics or interior structure) (price negotiable). Two international certifying agencies, American Bureau of Shipping and Germanische Lloyds, have indicated that the hull is most likely certifyable. Germanische Lloyds certified the hulls used by the MIRs about 5 years ago.

NAUTILE Highlights



- Viewport locations
- Controller Area Network (CAN) bus
- Pressure hull construction (2.1 meter ID)
- Battery arrangement
- O_2 system
- Variable ballast system

Nautile was designed for 2 pilot / 1 observer operation. Its two lower forward tending viewports have overlapping fields of view. Asked how they would change their viewport arrangement if given the opportunity IFREMER responded by saying they would increase the field of view overlap. The third centerline and horizontal window is rarely used.

Nautile has begun to use a networked system of instrument control using a CAN system. This system allows for software control of external devices, reduced wiring, weight, and number of penetrators.

The pressure hull design is similar to the MIRs in that it uses no welding. Inserts for the viewports, penetrators, and the hatch are all separate components and mechanically sealed to the hull. The inside diameter is 2.1 meters.

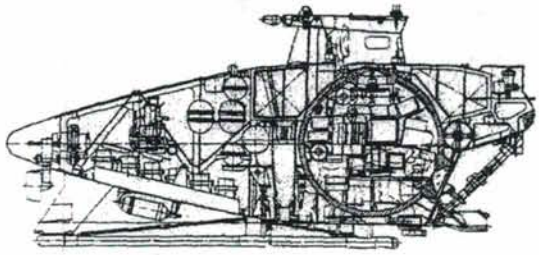
Battery arrangement in the keel of the vehicle allows for easy servicing.

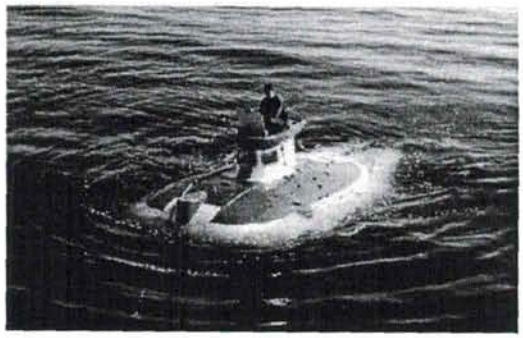
The French store all of their emergency oxygen outside the sphere freeing up that space in the sphere.

The VB system although not as flexible as ALVIN's (fixed capacity) is considerably smaller.

CONSUL / RUS Highlights

- Propulsion arrangement
- Trim system

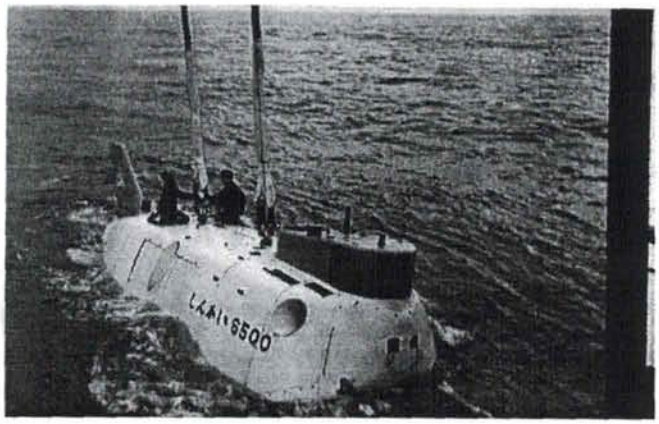




The CONSUL is the sister vehicle to the RUS which is completed and was delivered to the Russian Navy last summer. A 6000 meter Ti hull vehicle to be used by Sevmorgeo when completed. Sevmorgeo is looking for partners to help complete outfitting the sub. The design bureau, Malachite, an experienced submarine and submersible designer, is offering to modify CONSUL or build a new submersible. they have designed a 7000 meter submersible.

Currently, CONSUL is approximately 50% complete, lacking electronics for the most part. Construction has resumed recently due to an appropriation of money from a Russian government ministry. Although well designed light weight was not an objective and it is quite heavy compared to the MIRs and Nautile.

SHINKAI 6500



- Moveable science baskets
- Electrical capacity
- Manipulators
- Ascent/descent weight system
- Battery access

Although well designed the Shinkai 6500 is a relatively heavy vehicle.

A second science basket has been added recently in order to carry more equipment. Both baskets rotate offering greater access to the bottom for manipulator sampling.

Ag-Zn batteries give the vehicles very good endurance and have easy access for maintenance.

The operators seem to be happy with the performance of their Schilling Titan 3 manipulators.

The ascent/descent weight system, stell plates similar to ALVIN, requires very little manual handling. The large weights give it excellent ascent/descent rates.

Field of View Examples

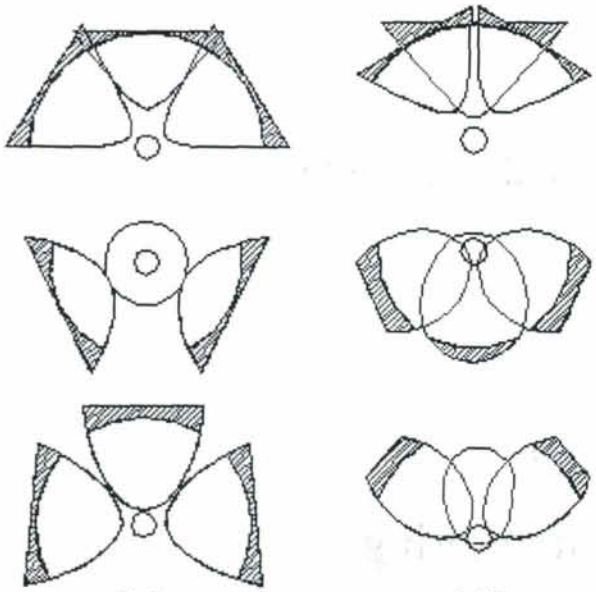
Assumes:

- Binocular foveal field of view
- Sea floor - submersible sitting on sea floor
- Vertical wall - 5 meters horizontally from center of sphere
- 45 deg slope - 5 meters horizontally from center of sphere
- 25 feet visibility (light)

The following fields of view compare ALVIN with the MIR to give an example of the overlap and forward view possible with a different viewport arrangement.

These fields of view assume that the observer can move his head as necessary to obtain direct vision using the fovea of the eye.

Comparison of Fields of View

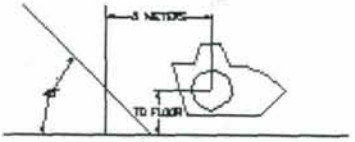


Alvin MIR

SHADED AREA BEYOND 20' VISIBILITY

VIEWFIELDS FOR ALVIN AND MIR
THE VIEWPOINT IS PERPENDICULAR TO THE VIEWPLANE.
APEX OF THE VIEWCONES:
ALVIN--35° FROM SPHERE CENTER
MIR--37.5° FROM SPHERE CENTER
SEA FLOOR:
ALVIN--65° BELOW SPHERE CENTER
MIR--67° BELOW SPHERE CENTER

SEA FLOOR



VERTICAL WALL
5M. FROM SPHERE CENTER

45°SLOPE
5M. FROM SPHERE CENTER

Current Technology Highlights

- Navigation
- Manipulators
- Distributive Control and Data Systems
- Computers
- Composite Framing
- Buoyancy material
- O2 storage and monitoring

Our research into the state of applicable current technologies included:

A doppler navigation system
An inertial navigation system
Fiber optic and Ring Laser gyros
A GPS based, floating acoustic LBL system

New generation position and force feedback manipulators (Kraft, Schilling, and Cybernetics)

Several copper and fiber optic based distributive control and data systems (CAN, LON Works, SEANET)

Light weight and low powered computers.

Latest lightweight plastics and composites for structural and fairing materials

A composite syntactic foam with aluminum spheres for buoyancy material

Light weight, high pressure composite wrapped O2 storage containers and light based life support monitoring sensors.

Basic Design Specifications

- No present capabilities compromised
- Size - no larger than ALVIN
- Ascent/descent to 6000 M - 2 hours
- Improved viewport arrangement
- Increased sphere interior volume (2.1 meter ID)
- Battery capacity increased by 30 %
- Automated position keeping in all axes
- Operating costs comparable to ALVIN

A specification list was developed and used by SwRI along with ISE to develop a conceptual 6000 meter vehicle and develop cost estimates. These two companies have extensive experience in ocean engineering and submersibles and have recently teamed to bid on the US Navy's new deep submersible rescue system that will replace the DSRV's.

These listed highlights are among those found on the 5 page functional design specification document.

Comparison of Options

- Option 1 - 4500 M Improved ALVIN
- Option 2 - SEA CLIFF (as is)
- Option 3 - SEA CLIFF (modified for science)
- Option 4 - 6000 M ALVIN (SEA CLIFF Hull)
- Option 4a - 6000 M ALVIN (Mod SEA CLIFF Hull)
- Option 4b - 6000 M ALVIN (Lokomo Hull)
- Option 5 - New design 6000 M DSV
- Option 5a - Lokomo hull
- Option 5b - New Titanium hull

These are the options that were selected for comparison.

OPTION 1 uses SEA CLIFF equipment and material to improve its capability but with out extending its depth beyond 4500 meters.

OPTION 2 uses SEA CLIFF as is with the addition of manipulators, a science basket and HMI lights.

OPTION 3 modifies SEA CLIFF to attempt to make it more cost effective to operate and more acceptable for science work. The sphere interior would be significantly modified to allow better access to the starboard observer window and space would need to be made for science support equipment and science add-on equipment. The battery system would be modified to lead acid or Ni Cd.

OPTION 4 modifies ALVIN for 6000 meters using the SEA CLIFF hull and other SEA CLIFF pressure rated equipment. The sphere interior would be completely redesigned to interace with ALVIN systems. Because of the increase in weight forward caused by the SEA CLIFF hull much of the heavy equipment on ALVIN will need to be shifted to the stern section involving some frame modifications. All of the syntactic foam would be replaced with new foam.

OPTION 4a is similar to Option 4 except that the SEA CLIFF hull would be modified for a different viewport arrangement. This new arrangement would require some further frame mods for mounting the manipulators, and possible equipment relocation depending on penetrator locations.

OPTION 4b is also similar to Option 4 except that it would use the Lokomo hull. Because of its increased diameter more extensive changes to the vehicle frame would be required. Soft ballast tanks would need to be redesigned and equipment behind the shere would need to be relocated to provide access to the electrical penetrators. this would essentially require the redesign of the whole vehicle.

OPTION 5 is a completely newly designed vehicle using either a new 2.1 meter titanium hull or the existing Lokomo hull. Its size and weight would be on a par with ALVIN.

Comparison of Vehicle Options

Blue = Pos attribute Red = Neg attribute ↗ = Increase ↘ = Decrease ↔ = No change	Improved 4500 M Alvin	Sea Cliff (as is)	Sea Cliff (Mod)	6000 M Alvin (Sea Cliff hull)	6000 M Alvin (Mod Sea Cliff hull)	6000 M Alvin (Lokomo hull)	New DSV
6000 Meters	No	Yes	Yes	Yes	Yes	Yes	Yes
Sphere							
Window Arrangmnt	↔	↔	↔	↔	↗	↗	↗
Interior Volume	↔	↘	↘	↘	↘	↗	↗
Comfort	↔	↘	↘	↘	↘	↗	↗
Science							
Electrical Capacity	↔	↗	↔(?)	↔	↔	↔	↗
Payload	↗	↗	↗	↔	↔	↔	↗
Sea Floor Footprint	↔	↗	↗	↔	↔	↔	↔
Maneuvering Characteristics							
Ascent/Des Rates	↔	↗	↗	?	?	?	↗
Maneuverability	↔	↘	↘	↔	↔	↔	↗
Speed	↔	↗	↗	↔	↔	↔	↗(?)
Launch/ Recovery Hazard	↔	↗	↗	↔	↔	↔	↔
Construction							
Maintainability	↗	↘	↘	↔	↔	↔	↗
Operating Costs	↔	↗	↗	↔	↔	↔	↔
Variable Ballast	Water	Water/ Steel	Water/ Steel	Water	Water	Water	Water
Trim	Hg	Hg	Hg	Hg	Hg	Hg	Water (?)
Asc/ Des Weights	Steel	Steel	Steel	Steel	Steel	Steel	Water (?)
Ship Infrastructre							
DSV Weight	↘(?)	↗	↗	↗	↗	↗	↔(?)
A-Frame Mods	No	YES	YES	No	?	?	No
Hanger Useable	Yes	NO	NO	Yes	Yes	Yes	Yes
COST	$686,800	-----	$1,507,718	$2,657,533	$3,472,531	$4,207,405	$13,248,670

OPTION 1 - The cost for any significant reuse of the SEA CLIFF foam would be substantial because of the cutting, rebonding and fabricating that would be necessary.
This option does not deliver a 6000 meter capable vehicle.

OPTION 2 - Because this option would have a large increase in operating expenses and significant degrade in science capability this was not considered further and no cost estimate was completed.

OPTION 3 - This option makes SEA CLIFF as reasonable as possible to operate without redesigning the whole vehicle. It would allow operation to 6000 meters but would suffer from increased size, and weight and decreased interior volume. Maintainability would be difficult and expensive leading to increased operating costs. There would be no improvement in viewport arrangement. The ATLANTIS A-Frame would require extensive modifications to handle the increased weight. The next three pictures show some of the size and weight concerns.

OPTION 4 - this option would solve the size issue with using SEA CLIFF but would still have a decreased interior sphere volume, increased weight involving modifications to the A-Frame system, and no improvement in the viewport arrangement. Additionally we would still have our present battery capacity limitation, our battery maintenance limitation and no increase increase in ascent/descent rates due to hull hydrodynamics.

OPTION 4a - This option would improve the viewport arrangement but all the other deficiencies of option 4 would remain. Additionally the weight would probably increase in this option from option 4.

OPTION 4b - This option aloows for an improved viewport arrangement and increased sphere interior volume. The battery limitations, hull hydrodynamics, and vehicle weight would remain issues. The weight would again be an increase over options 4 and 4a. Additionally this option will require extensive redesign of a majority of the vehicle. It would seem a waste to not completely redesign it.

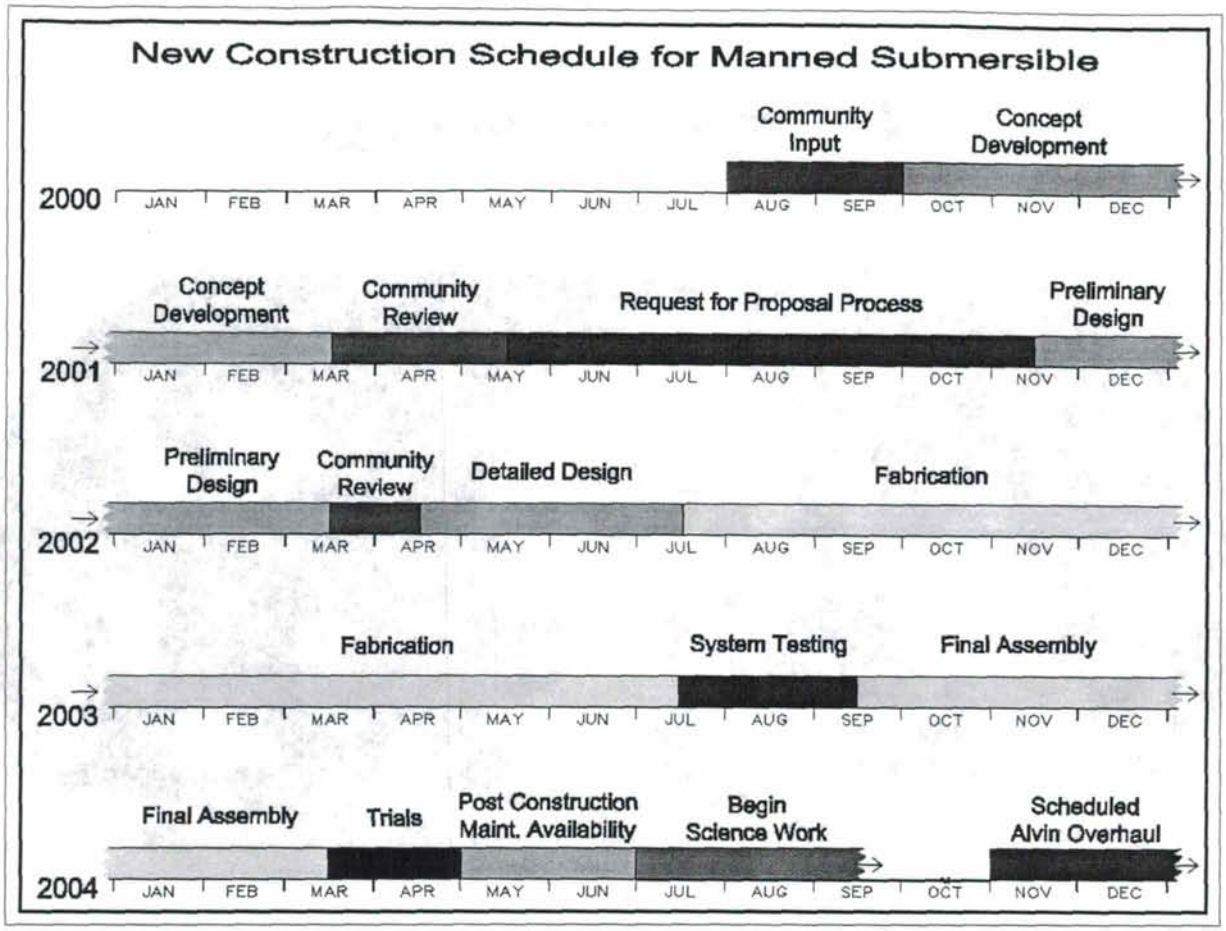
Conclusions

- A new submersible will provide the best opportunity for the US to regain its 6000 meter manned capability and to achieve significant improvements in other areas.
- Maximum utilization of SEA CLIFF assets during the 2000/2001 overhaul will make an incremental improvement to ALVIN's present capabilities.

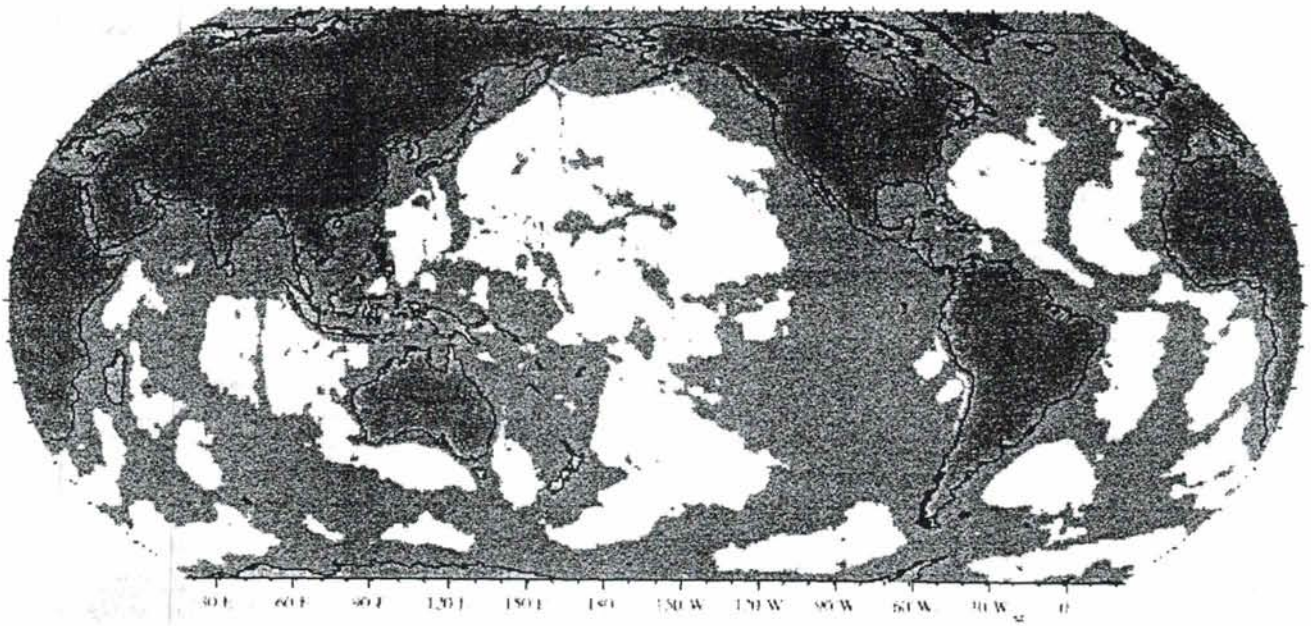
Any option which replaces ALVIN with SEA CLIFF would degrade science capabilities, reduce reliability, and increase operational costs. Options for upgrading ALVIN to 6000 meters carry the SEA CLIFF limitations and will not fix many of the problems inherent in the present ALVIN.

It is our opinion that building a new submersible will provide the best opportunity for the US to regain its 6000 meter manned capability and to achieve significant improvements in other areas.

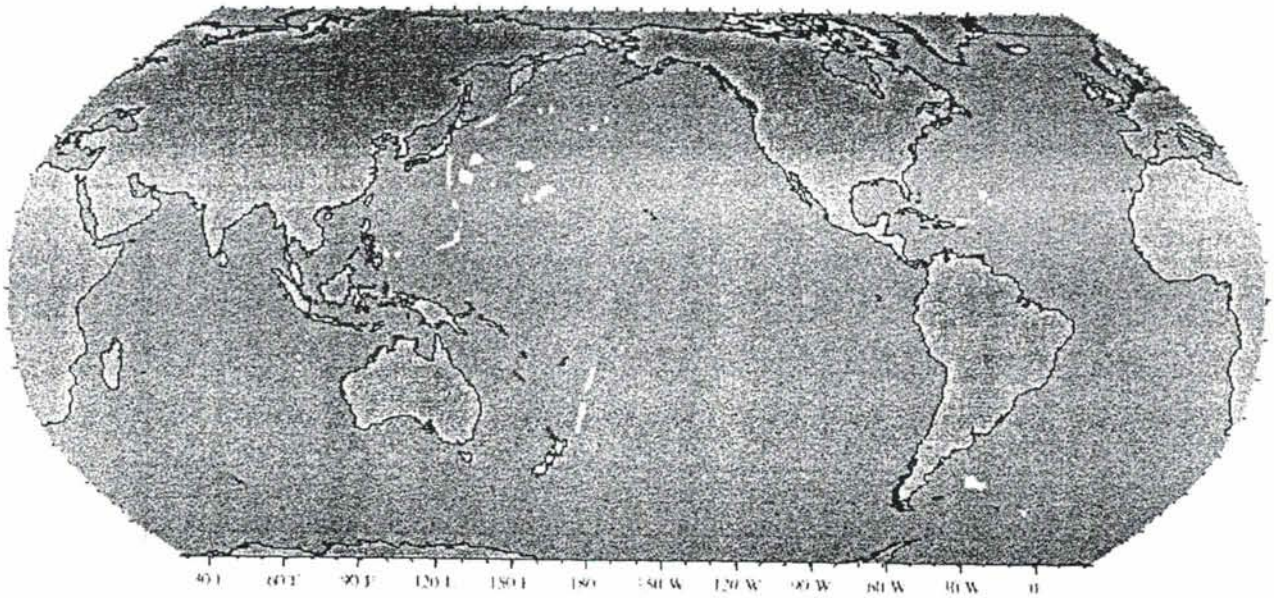
We recommend that this process be started as soon as possible and present this example timeline as a possibility.


New Construction Schedule for Manned Submersible
2000
Community Input
Concept Development
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
2001
Concept Development
Community Review
Request for Proposal Process
Preliminary Design
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
2002
Preliminary Design
Community Review
Detailed Design
Fabrication
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
2003
Fabrication
System Testing
Final Assembly
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
2004
Final Assembly
Trials
Post Construction Maint. Availability
Begin Science Work
Scheduled Alvin Overhaul
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

4500m Dive Coverage



6000m Dive Coverage



Appendix V

Anticipated Missions

- **High resolution mapping and survey (multi-frequency acoustic and image based)**
- **Installation/service of seafloor observatories**
- **Manipulation and sampling in a more "Alvin like" manner**
  - → **multi-disciplinary hydrothermal sampling**
  - → **large volume biological sampling**
  - → **high demand hydraulic tools (e.g. rock drill)**
  - → **large volume/weight geological sampling (e.g. box cores, in-place rocks)**
  - → **deployment/retrieval of large scale instrumentation**

Upgrades to NDSF ROVs

Jason II

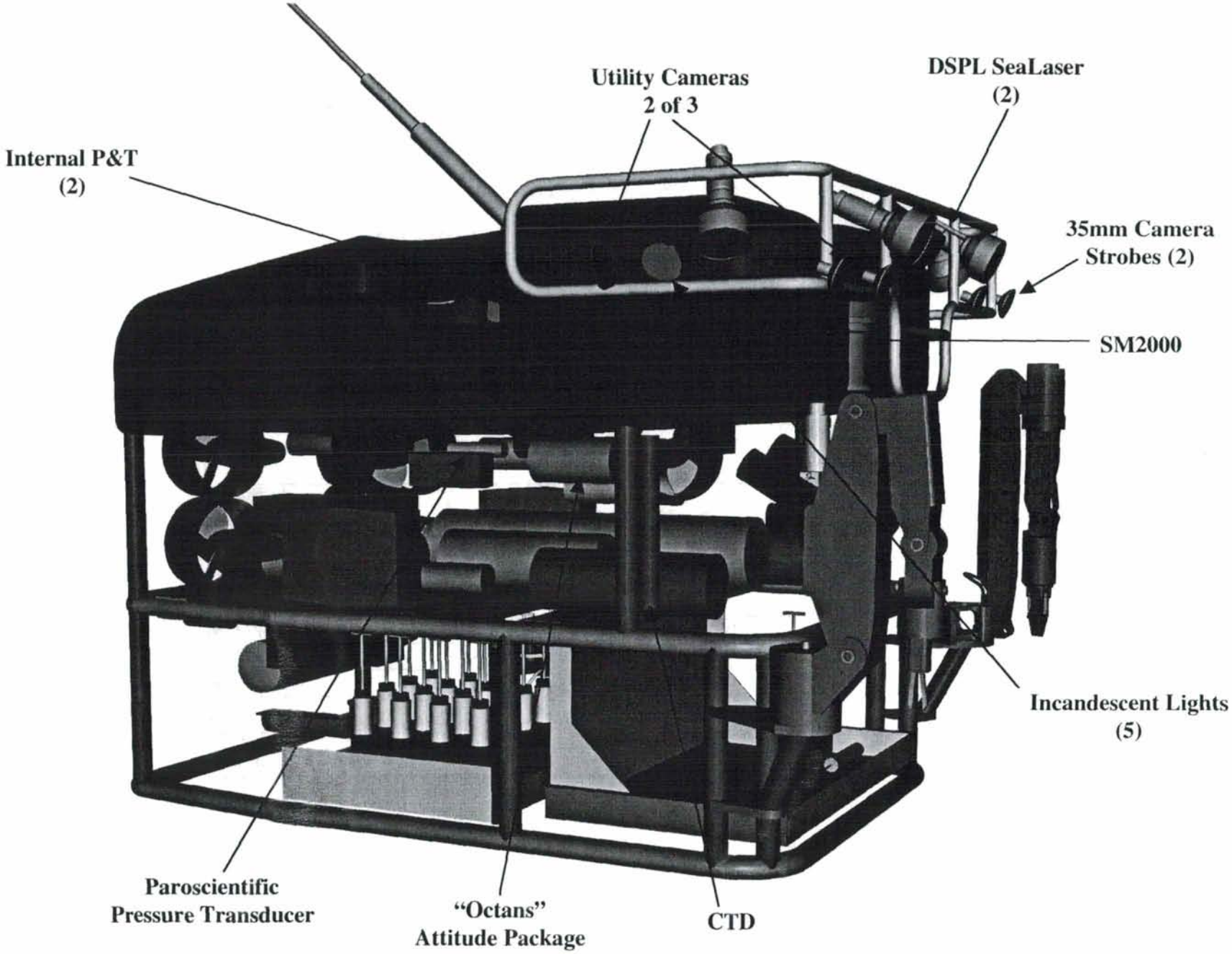
- Improve manipulative capabilities
- Increase sample and equipment payload capacity
- Increase speed and thrust
- Increase depth rating to 6500 meters
- Include tether management

Argo II

- Build common control/telemetry for compatibility with Jason II and DSL-120
- Dedicated sensors
- Increase lighting and power of maneuvering thrusters

DSL -120a

- Build common control/telemetry for compatibility with Jason II and Argo II
- Dedicated sensors
- Increase payload and improve tow dynamics
- Improve sonar transmit and receive electronics


Utility Cameras
2 of 3
DSPL SeaLaser
(2)
Internal P&T
(2)
35mm Camera
Strobes (2)
SM2000
Incandescent Lights
(5)
Paroscientific
Pressure Transducer
"Octans"
Attitude Package
CTD

Medea

Physical Characteristics		
Drum Diameter	**0.61 m**	**24 in.**
Width	**1.2 m**	**48 in.**
Height	**1.2 m**	**48 in.**
Length	**2.4 m**	**96 in.**
Weight	**1250 kg**	**2750 lbs.**
Spooling speed	**60 m/min**	**195 ft./min**
Line pull (variable)	**100 kg**	**220 lbs.**
Tether diameter	**21.3 mm**	**.840 in.**
Tether working load	**22 kN**	**5,000 lbs.**
Tether breaking strength	**182 kN**	**41,000 lbs.**

JASON 2 ROV GENERAL SPECFICATIONS

(preliminary)

OVERALL CHARACTERISTICS

Dimensions		
Length	2.7 m	8 ft. 10 in.
Width	1.5 m	4 ft. 11 in.
Height	2 m	6 ft. 6 in.
Weights		
Weight (include. tool sled)	3000 kg	6,600 lbs.
Payload		
Standard buoyancy (tool sled or other payload)	190 kg	420 lbs.
Depth Rating		
Maximum working depth	6500 m	21,400 ft.
Power Available		
Electric	50 kW @ 1000 m 18 kW @ 6000 m	
User power (various voltages)	Up to 5 kW	

PERFORMANCE

Thrust		
Forward (6,500 meter)	2224 N	500 lbs.
Forward (1,000 meter)	4448 N	1000 lbs.
Vertical	2224 N	500 lbs.
Lateral	2224 N	500 lbs.
Speed		
Forward (6,500 meter)	.75 m/s (min.)	1.5 knots (min.)
Forward (1,000 meter)	1.0 m/s (min.)	2.0 knots (min.)
Lateral	.75 m/s (min.)	1.5 knots (min.)

MANIPULATORS

Manipulator #1		
Reach	**1.3m**	**53 in.**
Lift capacity	**54 kg**	**120 lbs.**
Rotate torque	**102 N-m**	**75 ft-lbs.**
Jaw gripping force	**3336 N**	**750 lbs.**

Manipulator #2		
Reach	**1.7 m**	**5 ft. 7 in.**
Lift capacity	**45 kg**	**99 lbs.**
Rotate torque	**N-m**	**ft-lbs.**
Jaw gripping force		

SUBSEA POWER CONTROL AND DISTRIBUTION

Capacity of 240 Volt DC Systems for Vehicle by Configuration		
	Deep	Shallow (future provision)
Jason II	18 kW (9kW x 2)	50 kW
Medea	9 kW	9 kW

TELEMETRY SYSTEM

Digital and Video Telemetry	
Video x 8	**10 bit digitization, 6 MHz BW**
Audio x 2	**10 bit digitization, 16 KHz BW**
Analog x 2	**10 bit digitization, 1 MHz BW**
RS-422 x 12	**10 Mbit/sec, 6 x oversampling**
RS-232 x 40	**19.2 Kbaud, 6 x oversampling**
RS-485 x 8	**19.2 Kbaud, 6 x oversampling**
RS-485 x 2	**115Kbaud**
10 Base T Ethernet link x2	**6 x oversampling**

AUTO CONTROL

Auto Functions		
Auto Depth control	+/- 1 m	+/- 3 ft.
Auto Heading control	+/- 5 deg.	
Auto Altitude control	+/- .5 m	+/- 1.6 ft.

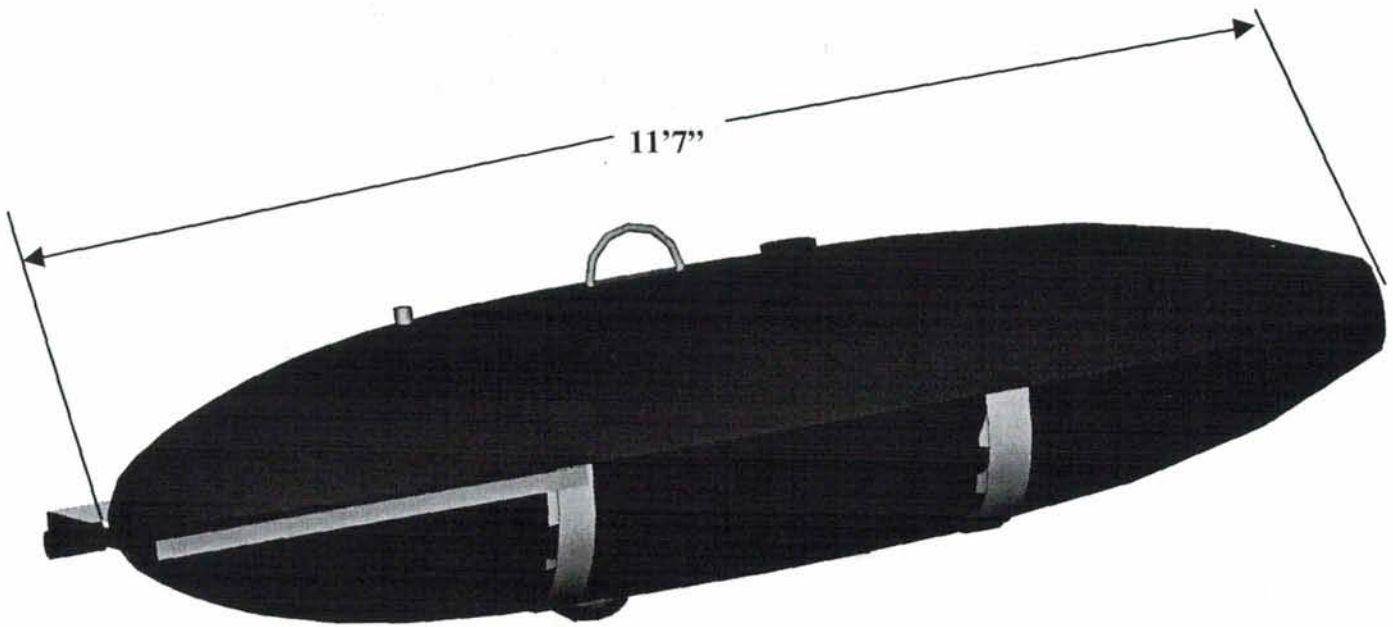
AUXILLARYAUXILIARY HYDRAULIC SYSTEM

Hydraulic Power Unit		
Power	3.7 kW (minimum)	
Flow	10.6 l/min.	2.8 gpm
Pressure	194 Bar	2850 psi
Auxiliary Functions		
Proportional Flow Control (2)	11 l/m max	3 gpm max, 1000 & 2000 psi relief settings
Solenoid (4)	11 l/m max	3 gpm max, 1000 & 2000 psi relief settings

SAMPLE STORAGE

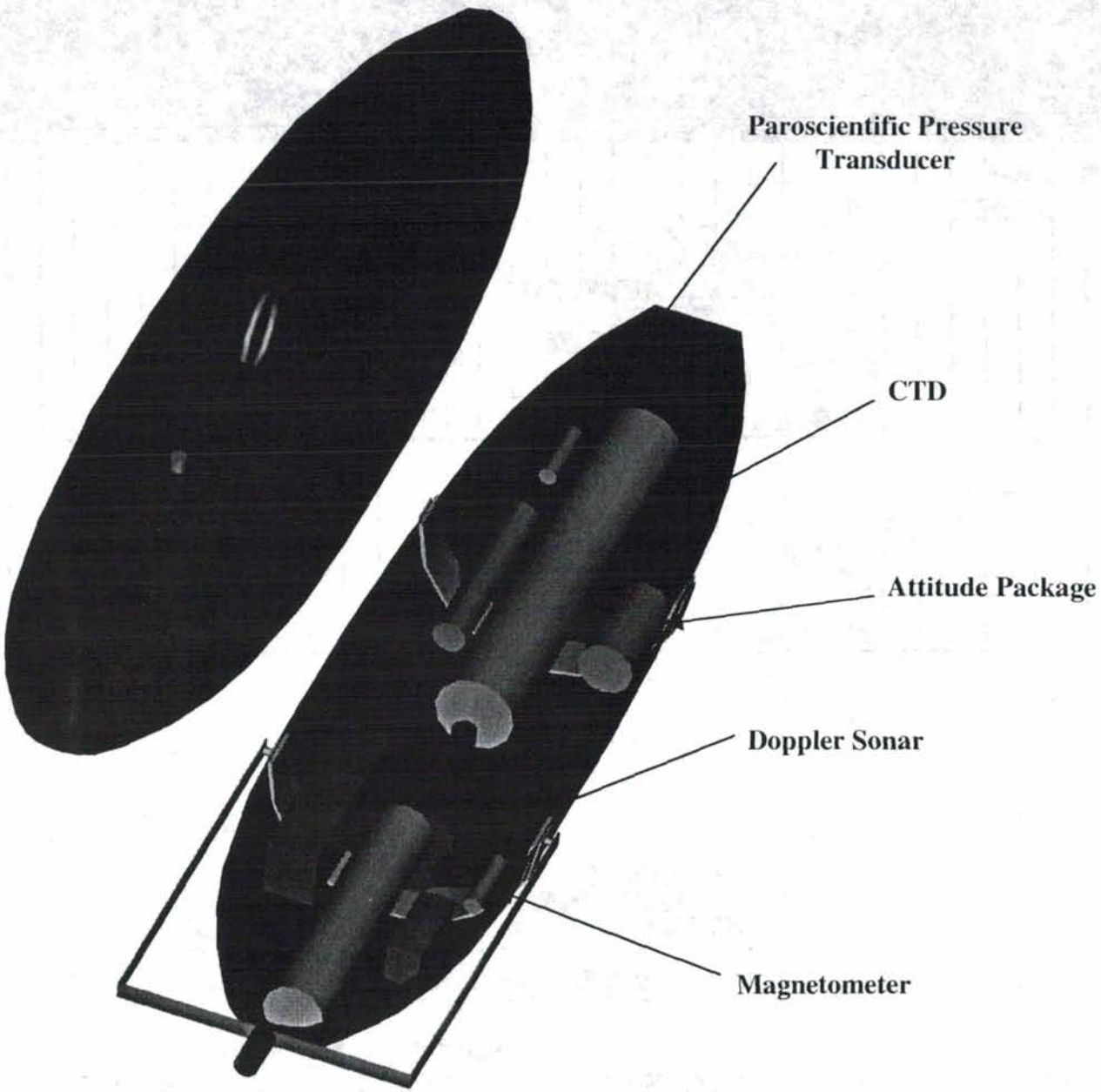
Basic Sampling Tool Sled		
Structural Weight	75 kg.	165 lbs.
Maximum Payload	70 kg.	155 lbs.
Sample Drawer Volume	0.7 cu m.	24 cu ft
Side sample storage Payload (qty 2)	22 kg.	50 lbs.
Side Sample Storage Volume	0.4 cu m	12 cu ft

DSL 120a

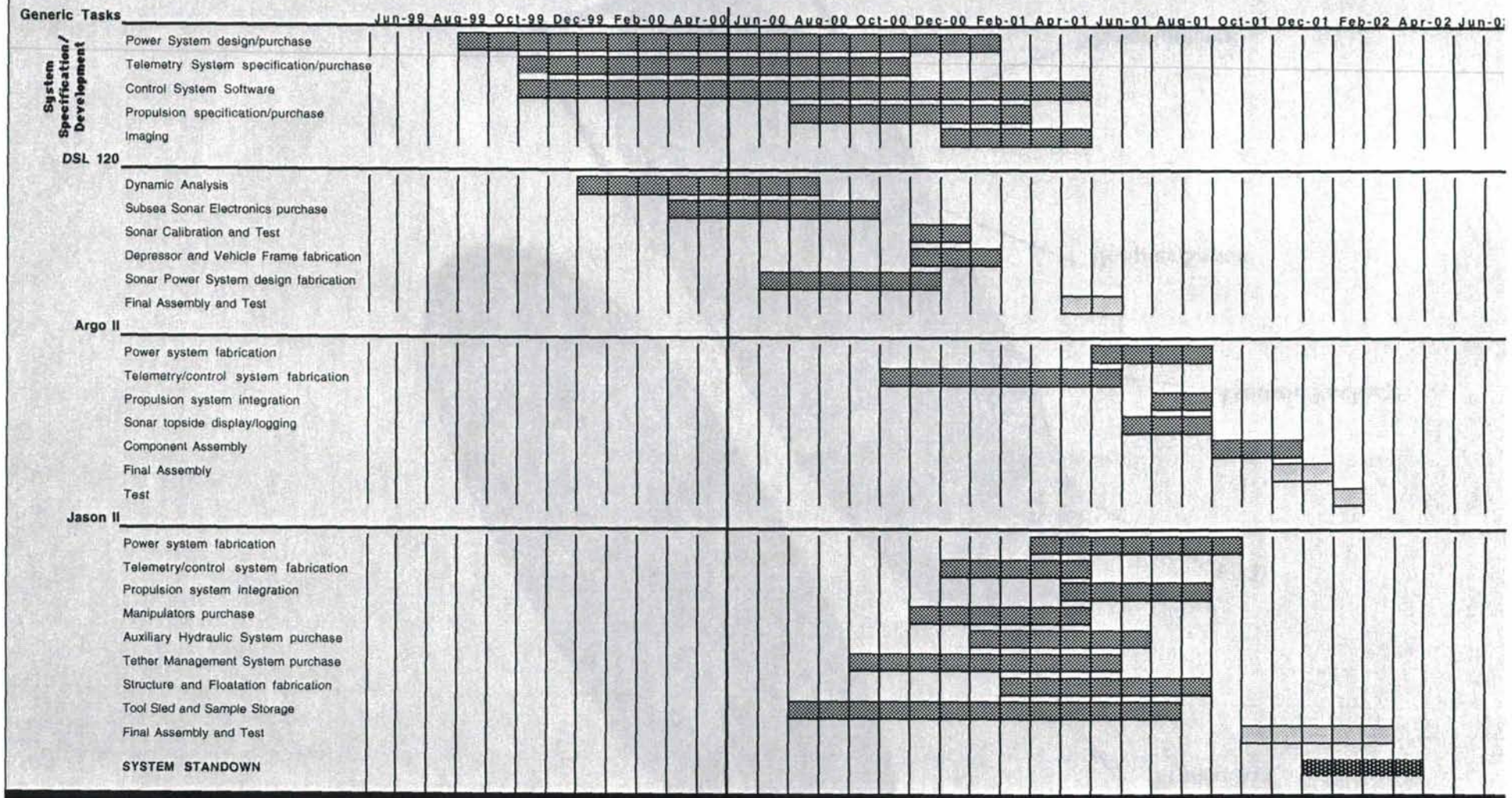


1,200 Pounds Air Weight

DSL 120a


Paroscientific Pressure Transducer
CTD
Attitude Package
Doppler Sonar
Magnetometer

NDSF ROV Upgrades



- **Preliminary. Design Review Meeting**
- **Detailed Specification for Jason/Medea, Argo and DSL120a Written**
- **Telemetry purchases specification written and purchase order placed.**
- **Three Subsea 120 sonar electronics candidates identified, RFPs written, circulated, reviewed, final selection made and purchase order presently underway.**
- **Two syntactic foam floatation candidates identified**
- **New personnel added**
- **Web page and poster**
- **3D Modeling of Jason II design**
- **Extensive evaluation of other science ROV systems completed.**
- **MBARI Trip East**
- **MBARI non-disclosure**
- **Bluefin non-disclosure**
- **Documentation system established**
- **Power system design well underway**
- **DSPL HMI Purchase (Argo)**
- **Semi-Power brushless motor controller purchased for evaluation**
- **Main umbilical tested for strength and insulation qualities**
- **Jason II and DSL120a Weight & Balance completed**
- **Sensor Suite Selection**
- **Thruster candiates identified**
- **TMS specification written and RFP presently circulated**
- **Manipulator candidates identified**
- **New neutral tether cable specified and purchase underway**
- **T est/evaluation of RLG based attitude/heading reference**

Appendix VI

ALVIN [illegible] Plans and [illegible]rities

National Deep Submergence Facility
May 2000 DESSC Meeting

Overhaul Timeline

- **Offload ATLANTIS on arrival in December**
- **Begin overhaul work January 2, 2001**
- **Complete overhaul work May 31, 2001**
- **Sea trials and certification June 2001**
- **Operational July 1, 2000**
- **http://www.marine.whoi.edu/ships/alvin/alvin.htm**

Possible Upgrades

- Improve pan/tilt controls
  - Observer positions, flexibility
- Improve ergonomics
  - Better cushions, more floor space in sphere
- Investigate "modular" basket design
  - "Erector Set" to modify as required
- Retain Benthos 35mm cameras
  - Digital frame grabs will eventually replace
- Investigate fiber optic penetrator
  - determine need, technical review

Possible Upgrades cont.

- Upgrade single chip cameras
  - Better single chip of small 3-chip
- Install flat screen displays
  - Pilot and Observer monitors
- Acoustic modem for depth/position telemetry
  - Increased navigation options
- Digital video recorders
  - miniDV cam (pro format) masters
- Doppler Navigation w/RLG
  - Continuous fixes with acoustic updates
- Lateral thruster with DP control

ALVIN OVERHAUL
Community Input for ALVIN Upgrade Items

In 2001 the Deep Submergence Research Vehicle (DSRV) ALVIN will undergo its scheduled overhaul period. Every three years ALVIN is required to be hull inspected and overhauled. This period offers an opportunity to implement improvements and upgrades to ALVIN.

The DEep Submergence Science Committee (DESSC) requested input from the community regarding ALVIN upgrade priorities. A list of ALVIN upgrade items currently under consideration was provided by e-mail to the community. The community was asked to review the list and indicate priorities. Additional suggestions for upgrades or improvements are welcome. Input received from the community will be used by WHOI to prepare their ALVIN overhaul proposal to the funding agencies.

The community was asked to prioritize the list below on a scale of 1 to 5, with **1 = highest priority and 5=low priority.**

ALVIN Overhaul - Upgrade Item

- Hard mount observer video controls near observer locations
- Modify the bottom of the science rack to improve floor space arrangement.
- Modify science basket for better user equipment interface
- Replace external still film cameras with digital cameras
- Develop a fiber-optic penetrator
- Upgrade single chip video cameras
- Replace observer CRT video displays with flat panel LCD displays
- Acoustic modem for data telemetry to the surface.

A summary of the community responses follows.

Community Input
ALVIN Overhaul Priorities
Last posting: 5/12/00

The cells of this table give the number of respondants who gave each upgrade item the given priority.

UPGRADE ITEM	PRIORITY RATING				
	HIGH 1	2	3	4	LOW 5
Hard mount observer video controls near observer locations	3	6	3	1	6
Modify bottom of science rack to improve floor space arrangement	3	2	3	5	6
Modify science basket for better user equipment interface	6	6	4	2	1
Replace external still film cameras with digital cameras	13	3	1	2	0
Develop a fiber-optic penetrator	3	3	3	5	4
Upgrade single chip video cameras	7	5	3	2	2
Replace observer CRT video displays with flat panel LCD displays	3	6	8	1	2
Acoustic modem for data telemetry to the surface	2	3	6	2	5

Total Number of Surveys Received: 23

Other Upgrade Suggestions:

- The very most important "upgrade" to me would be to make video overlay of data optional, and the data items chosen by the observer. i.e. depth, X, Y heading and other basic info should always be available as an overlay. This feature seems to have been deleted in the recent video upgrade, but is essential. Those who don't want it should be able to turn it off. Priority = 1

- Handheld digital cameras with greater memory capacity synced to flash and tested so typical settings can be told to new observers. Present camera only holds 20 shots at good resolution, and outside ambient light is not enough. (based on San Clemente cruise, 4/00) possibly onboard download to a laptop during dive when memory is full. Priority = 1

- Improve gyro heading, and institute heading check before launch and after recovery so that heading data is verified or correctable. This is important to us structural geologists who are looking at orientation of seafloor features. Priority = 2.

- Replace ancient computer system with something simple and reliable i.e. a small Unix box running some stable, supported OS like Solaris, and include a redundant machine for backup. Priority = 1

- Is digital video an option? at least for limited recording time for special uses... It's possible to buy pretty compact DVD drives these days... This would also get a "5" from me if its doable/affordable

- The business of putting man on the bottom is for having his MK ONE Eyeball there. As such, camera upgrades and the acoustic modem (to move that telemetry topside to the support ship seems a higher priority to me.

- In response to your question about ALVIN upgrades, there is one capability that I would like to see improved on the sub - that of sampling particulates and plankton with a pump system. The system currently available, the 'Lazy-Susan Slurp Pump', is not quantitative i.e., there is no measure of volume pumped) and is difficult for the ALVIN group to mount and maintain. The community has asked for a replacement repeatedly; I urge you to give this request a high priority in your planning efforts.

- Set up two parallel lasers that are set apart one meter or some other set distance to provide a scale for digital and video images.

- Set up (or at least plan for) an easy mount for the new GEOCOMPASS being designed and/or built at Harbor Branch for rock orientation measurements - contact Jeff Karson for details if necessary.

- Increased data-flow from the basket into the submersible, and the reverse, is fundamentally controlled by the penetrator. Fiber penetrators exist, and would greatly upgrade the submersible's capabilities, and would best be done during overhaul. The other items are less cost-effective, and/or less critical to be done during this overhaul.

- Convert to recording video in digital format.

- Observer control of camera pan/tilt/zoom (if not already available).

Additional Comments Received on Surveys:

- Hard mount observer video controls near observer locations - no way. A flexible approach is much better for the uncomfortable "seating" in ALVIN where one is adjusting constantly.

- Hard mount observer video controls near observer locations. - I'd rather leave them in flexible control boxes

- Hard mount observer video controls near observer locations - Although I would not hardmount the controls but have them on a cable so observers can position themselves as they see fit to control video while viewing subjects out the viewport. (high priority)

- Acoustic modem for data telemetry to the surface - If this includes a picture (2) if just data (5).

- Replace external still film cameras with digital cameras - I would not replace film cameras but add ESCs to the imaging capabilities. ESC imagery still does not approach the resolution of film. Having high resolution images on film, when needed, enhances the ability to identify small organisms. Further, ESC systems do not have the dynamic range of negative films, hence the ability to resolve details in high contrast scenes are reduced.

- Upgrade single chip video cameras - I assume this means upgrade to 3-chip cameras? There are some very good small 3-chip cameras out there. However, the best mix is to upgrade the cameras, then record images on digital format tape (full or miniDV) (if you are not doing this already). - high priority

ALVIN Overhaul - System Upgrades

The ALVIN overhaul items contained in the community survey are those items that impacted science interests. In addition to these items, the operator is considering system upgrades and changes for improved maintenance, reliability, and performance. Please review the list below and consider for endorsement.

- Trial of computer controlled power distribution (distributed control system)
- In-hull individual battery cell voltage monitor
- DC power supply for portable laptops
- Install lateral thruster and dynamic control system
- Redesign science control panel
- Replace skins with lighter composite materials
- Install variable ballast water level monitor system
- Acoustic modem for data telemetry to the surface.

Subject: Eliminate ALVIN External Stills?

Dear ALVIN Users,

At the December DESSC meeting Barrie Walden showed high resolution video frame grabs of various seafloor objects including instruments, biology, and rock and sediment surfaces. He asked the community to evaluate these and make a recommendation regarding whether these could be used to substitute for the images from the existing external still cameras (most people use the external shots for publication). This subject will be discussed at the May DESSC meeting in WHOI.

Also Barrie had asked the community for input on WHOI's desire to shift from Hi8 to digital tapes. The Hi-8 tapes need to be transferred to another media as soon as possible to avoid degradation. There is a significant difference in cost between Hi8 and digital. The Hi8 video tape costs $8.29 while the digital video tape costs $30.90. For 175 dives/year for ALVIN the estimated Hi8 cost is $17,409 vs. $64,890 for digital. WHOI would like to shift over the ALVIN to digital because they feel that it would provide a better product. They will wait to convert the Jason media until further evaluation. On the support ship, there will be a capability to convert media for the science party before they leave the ship.

Your input to the decision making process regarding this matter is welcome. Input can be submitted to the UNOLS Office at, office@unols.org. Please reply by 15 May.

Thank you very much,

Patty Fryer

Subject: Input on ALVIN Data
Date: Mon, 01 May 2000 13:06:29 -0500
From: "Jeffrey Karson" <jkarson@acpub.duke.edu>
To: office@unols.org

Dear UNOLS:

As a long-time ALVIN user I am very familiar with the external still camera and video data collected during ALVIN dives. I have the following brief comments in response to Patty Fryer's call for input on proposed changes to these 2 systems:

1. I like the still video photographs. Sure electronic stills are good and getting better all the time, but they do not have the resolution of photographs. With the other systems leaning toward digital data, I think it would be a good idea to keep the 35 mm photographic quality in this particular system. I use these in my research and they are important to my publications. One can always digitize a photo, but one cannot go in the other direction.

2. I am fully in favor of moving from Hi-8 to digital video. We used digital video on our Hess Deep Cruise last year and it is terrific. The editing and reviewing are much better than with the Hi-8. Of course the increased cost is going to hard to swallow, but considering the convenience, versatility, and more permanent quality of digital video I think it is the right way to go. There will certainly be savings in archiving digital data over periodically updating analog media. My only concern is that WHOI consult with users before committing to a particular digital format. There are significant cost issues with regard to media and to equipment for us users and before going to a more expensive format, the rationale should be clear. Right now I am using 2 different digital formats, so it does not make so much difference to me.

If you want more information, please do not hesitate to contact me.

Jeff Karson

Jeffrey A. Karson tel: (919) 684-2731
Division of Earth & Ocean Sciences fax: (919) 684-5833
Box 90230, 103 Old Chemistry Bldg.
Duke University
Durham, NC 27708-0230

EOS web page at: http://www.eos.duke.edu
EOS Structure & Tectonics at: http://www.eos.duke.edu
Hess Deep Expedition at: http://www.env.duke.edu/hessdeep.html

From: Marsh Youngbluth <Youngbluth@HBOI.edu>
To: "'pfryer@soest.hawaii.edu'" <pfryer@soest.hawaii.edu>
Subject: ALVIN and DESSC
Date: Mon, 1 May 2000 17:01:24 -0400
Status:

Hi Patty,

Go digital, nearly everyone will like it. The cost is really minor. Of course, a great monitor is essential too and the control panel for zoom and focus is crucial. But you know that. Get the best equipment possible but be ready to upgrade every 3 years or so, the camera systems keep getting better and better.

Regards, Marsh

--

From macdonald@geol.ucsb.edu Tue May 2 15:30:39 2000
Date: Tue, 02 May 2000 10:50:42 -0700
From: Ken Macdonald <macdonald@geol.ucsb.edu>
To: UNOLS Office <unols@gsosun1.gso.uri.edu>
Subject: Re: Eliminate ALVIN External Stills?

I would vote for abandoning the external 35mm and using the cost savings to go to digital for all 3 external video cameras. With time the digital tapes will become cheaper, there is a Sony digital cam and deck which records on Hi 8 tape; perhaps this should be considered.

Ken C Macdonald
Professor Marine Geophysics
University of California, Santa Barbara
web page:
http://www.geol.ucsb.edu/~ken

From clvand@facstaff.wm.edu Tue May 2 09:12:44 2000
Date: Tue, 02 May 2000 08:59:31 -0400
From: Cindy Lee Van Dover <clvand@facstaff.wm.edu>
To: UNOLS Office <unols@gsosun1.gso.uri.edu>
Subject: Re: Eliminate ALVIN External Stills?

The 35 mm sponson cameras have provided disappointing results for about 75% of the dives I have been on. The poor quality is variously related to lighting and exposure, often exacerbated by manipulators and other paraphernalia in the field of view. The images are rarely publication quality, but they do contain information. If the cameras are removed, will they be replaced with a digital system on the sponson? Or will we have to rely on the pilots for the front viewport views (which inevitably takes extra time and can irritate some pilots, so that it seems like a burden to request that an image be taken)? It should also be noted that all pilots do not have the same camera skills.

I thought the high resolution images Barrie showed were taken by hand-held digital cameras rather than frame-grabbed from video. I also thought that the spectacular photos of tubeworms from Rich Lutz's cruise were frame-grabbed from a high def video system which is not a standard piece of ALVIN gear. To further complicate my ability to evaluate the proposed option, Rich Lutz has related that he had difficulty getting the same quality image that Billy Lange was able to get. I presume this has to do with the frame grabber and software -- who is going to tell the scientists how to replicate the quality presented, and how much will the accessories cost that must go with the system?

I do think the $$'s spent on the 35 mm cameras is largely wasted. It would be good to see a really professional alternative offered, with specs on how the user can duplicate from ALVIN video the frame-grabbing quality obtained on the ship or at WHOI.

Digital video sounds great -- we should get the specs out on recommended digital replay systems for PIs to purchase if they choose. I assume that PIs do get digital tapes if they so choose, with no extra cost? This needs to be clarified.

Cindy

Cindy Lee Van Dover
328 Millington Hall
Biology Department
College of William & Mary
Williamsburg, VA 23187
tel: 757 221-2229
fax: 757 221-6483
e-mail: cindy_vandover@wm.edu

The Ecology of Deep-Sea Hydrothermal Vents:
http://pup.princeton.edu/titles/6880.html

From childres@lifesci.ucsb.edu Wed May 3 14:36:55 2000
Date: Wed, 3 May 2000 10:29:18 -0700
From: Jim Childress <childres@lifesci.ucsb.edu>
To: UNOLS Office <unols@gsosun1.gso.uri.edu>
Subject: Re: Eliminate ALVIN External Stills?

Which DV standard is being proposed? MiniDV the usual consumer version or one of the pro versions with much more expensive playback equipment?
Thanks,
Jim Childress

****
* Jim Childress E-Mail childres@lifesci.lscf.ucsb.edu *
* Ecology, Evolution, & Marine Biology, Office Phone (805) 893-3203 *
* University of California Lab Phone (805) 893-3659 *
* Santa Barbara, CA 93106 FAX (805) 893-4724 *
****

From: Dudley Foster <dfoster@whoi.edu>
To: childres@lifesci.ucsb.edu
Subject: Re: [Fwd: Eliminate ALVIN External Stills? (fwd)]

> Hello Jim,

The current thought is to use the professional DVCAM format for the originals generated in the sub. Those would end up as the archive copy. The copy provided to science after the dive would "possibly" be duped onto the consumer MiniDV format. In the main lab, the science duping station would have the capability for science to copy the MiniDV (or whatever was made from the DVCAM tape) to MiniDV, Hi8 or VHS/SVHS.

There are some advantages and features available in the DVCAM format that are not available in the MiniDV that are useful for archive, duping and editing functions.

This plan is still in the planning/review stage.

Cheers, Dudley

From: Barrie Walden <bwalden@whoi.edu>
To: childres@lifesci.ucsb.edu
Subject: Re: Eliminate ALVIN External Stills? (fwd)

Hi Jim,

We have located a third DV variety which we are leaning towards - its much more expensive and tapes are almost impossible to obtain in this country. Of course, your opinion is always welcomed. I gather you would favor the MiniDV.

Barrie

From dkb@mahi.ucsd.edu Fri May 5 16:25:06 2000
Date: Fri, 5 May 2000 11:34:25 -0700 (PDT)
From: "Donna K. Blackman" <dkb@mahi.ucsd.edu>
To: unols@gsosun1.gso.uri.edu
Subject: Digital Video for ALVIN

Dear Patty,

As a science user, digital video is really the only format that makes sense both in term of ease of grabbing stills for publication and flexibility in analysis and display of the data. (Since I have not been down in ALVIN yet, I cannot speak to how 'grabbed' frames compare with shots from the external still camera.)

The 'cleanest' approach to digital video would of course be to have the whole system converted but as a user, I don't see that it would make a big difference if the initial recording remained Hi-8 but the capability for making onboard copies for the science party included the analog-digital conversion (assuming no significant loss in image resolution). This is the approach we would like to use for our November 2000 cruise to the Mid-Atlantic Ridge. We included the cost of DVD tapes in our NSF budget for the project.

Let me know if I can provide any further input that could help speed the transition to digital recording- I have to admit that I was astonished to find out that the system wasn't already digital since I'd been under the impression that the DSOG group was pretty good at keeping up with recent, proven technologies.

Sincerely,
Donna Blackman

Subject: Alvin video and stills
Date: Tue, 2 May 2000 15:38:23 -1000
From: "Brian Midson" <bmidson@soest.hawaii.edu>
To: <office@unols.org>
CC: "Patty Fryer" <pfryer@soest.hawaii.edu>,
"Barrie Walden" <bwalden@whoi.edu>

Aloha Patty, Barrie.

We have been transitioning to digital video in the Pisces V for a couple of years now. Our continuous video has been recorded in 8mm and an alternate MiniDV camera had been provided for PIs to do a sort of running highlights tape of the best scenes. We found that the Sony VX-1000 digital camera was producing a better image than the Panasonic, even when recording to the 8mm deck. Also any capturing of images or video onto the computer is obviously better with MiniDV.

We have since changed all video to the MiniDV format, so we will have two VX-1000 cameras and two GV-D300 recording decks. There are several reasons to use the MiniDV format rather than standard DV. The quality is virtually the same. The size of decks was a big factor also. Hi8 decks fit nicely into the small racks in the sub, I could not find a "prosumer" standard DV deck that was small enough. The DHR-1000 is the best standard DV deck, we have one, but is way too big for the sub, it works nicely as an editing deck though, and reads MiniDV or DV. Price was also an issue. MiniDV tapes are about $9.50 each. The only drawback is tape length. MiniDV tapes only last 60 minutes, so you need twice as many and have to change them more frequently. We decided that this was OK considering the size and cost factors would have prevented us from upgrading to DV otherwise.

As for still images, we considered a High Definition Digital Camera, but that will have to wait for a future budget surplus... In my opinion the digital captures are very good, but less than an HDDC would produce. We are not yet ready to do away with our 35mm slides, the PIs are used to using them for presentations and publications, although the digital scans of the 35mm slides are not as good as the digital captures of the video.

The B&H catalog has good descriptions of much of the equipment we deal with, as well as comparison between media. The section about DV vs. MiniDV and DVcam, DVCpro etc. was enlightening. their website is www.bhphotovideo.com

I hope this helps, call or email if you want to discuss it further.

Brian Midson
Data Manager, HURL
University of Hawaii, MSB 322
1000 Pope Road, Honolulu HI 96822
(808) 956-6183; FAX (808) 956-2136
bmidson@soest.hawaii.edu
http://www.soest.hawaii.edu/HURL/

From esilver@emerald.ucsc.edu Mon May 1 15:37:50 2000
Date: Mon, 01 May 2000 11:44:40 -0800
From: Eli Silver <esilver@emerald.ucsc.edu>
To: UNOLS Office <unols@gsosun1.gso.uri.edu>
Subject: Re: Eliminate ALVIN External Stills?

Hi Patty,

I'm very supportive of the switch to digital. As long as NSF is on board with this concerning the cost, then it is clearly the better way to go.

I'll be out with Jason (hopefully) in January, so I should have some feeling for that change. My guess is that I will support digital also, but we'll see. Maybe we'll cross paths in Guam.

Cheers,

Eli

//
Eli Silver
Earth Sciences Department
Director, Institute of Tectonics
A112 E&MS Bldg
University of California
Santa Cruz, CA 95064
P: 831-459-2266; F: 831-459-3074
Email: esilver@es.ucsc.edu
\\\

From gold@oce.orst.edu Mon May 1 15:38:13 2000
Date: Mon, 1 May 2000 11:57:38 -0700 (PDT)
From: Chris Goldfinger <gold@oce.orst.edu>
To: unols@gsosun1.gso.uri.edu
Subject: Re: Eliminate ALVIN External Stills?

My comment is that video frame grabs are still inferior to the stills, and would not remove them at this time.

AS far as high 8 tapes, what media would replace them? Digital DV formats are also on tape for the most part, though as digital data, but this doesn't avoid the degradation problem. Would it go on DVD's?

Cheers, Chris

Chris Goldfinger
Oregon State University
Marine Geology
Active Tectonics Group

gold@oce.orst.edu
voice: (541) 737-5214 (New area code)
fax: (541) 737-2064
http://pandora.oce.orst.edu

Subject: FW: Eliminate ALVIN External Stills?
Date: Mon, 1 May 2000 15:03:45 -0400
From: Walsh Stephen T NSSC <WalshST@NAVSEA.NAVY.MIL>
To: "'office@unols.org'" <office@unols.org>
CC: "'Dr. Robert Ballard'"
<IMCEACCMAIL-rballard+40ife+2Eorg+20at+20SMTP@NAVSEA.NAVY.MIL>

For what it is worth, PMS395A3 decided last week at the quarterly NR-1 Program Managers Meeting (PMM), to commence moving the Submarine NR-1 away from Hi 8 mm towards digital recording format due to its longer life expectancy and its sharper quality. The recommendation to do so was made by the fleet and concurred with by myself and will commence the implementation process shortly.

Steve Walsh
Assistant Program Manager
Deep Submergence Vehicle Support
Naval Sea Systems Command (PMS395A3)

Subject: Re: Eliminate ALVIN External Stills?
Date: Thu, 04 May 2000 08:30:16 -0400
From: Lauren Mullineaux <lmullineaux@whoi.edu>
Organization: WHOI
To: office@unols.org
CC: office@unols.org

Dear UNOLS folks,

1. For the ALVIN work my group does, the digital external camera probably will suffice.
2. For my use over the next several years, I would like to continue to leave the ship with high quality HI8 and VHS tapes in hand. I do not have the capability to deal with digital video, but may develop it in the future. So for now, it is fine with me for the ALVIN group to use digital media as long as 1) it doesn't increase the cost to the user (none of us have current budgets that could cover this); 2) it doesn't increase the time spent by the user at sea to procure a usable video product to take home (i.e., duping onto Hi8 or video be done by SSSG - the scientists should be doing science at sea, not transferring digital images); and 3) the Hi-8 or VHS product for the scientist not be of reduced quality.

I think the science community will make the transition to digital video images in the future, but we are not ready for them yet. It makes good sense for the ALVIN group to start using digital now, but they will need to continue to make traditional media available to the users with no negative impact on the users' cost, time, and quality of product.

Sincerely,
Lauren Mullineaux

Subject: ALVIN stuff
Date: Tue, 2 May 2000 12:25:13 -1000
From: Brian Taylor <taylor@soest.hawaii.edu>
To: office@unols.org

Digital vs. Hi8 video would be a great improvement.

Still camera shots are still much better than video frame grabs and should not be removed. However, if the video was digital, this may change.

Dr. Brian Taylor
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2525 Correa Rd
Honolulu HI 96822
808.956.6649 (wk)
808.956.3723 (fax)
taylor@soest.hawaii.edu

From skim@mlml.calstate.edu Fri May 12 08:32:15 2000
Date: Thu, 11 May 2000 17:20:03 -0700
From: Stacy Kim <skim@mlml.calstate.edu>
To: UNOLS Office <unols@gsosun1.gso.uri.edu>
Subject: Re: Eliminate ALVIN External Stills?

Hi Patty,
I have not seen the hi-res frame grabs that Barrie showed, but my experience with local work from various ROV systems leaves me believing that 35 mm is still better. Though I am not a funded vent researcher, I hope to use detailed photos for identification of small gastropods at some point, and right now 35 mm is still better than video grabs. I'd like to see the external still cameras retained.

I strongly support the shift to digital tapes, despite the added expense. Digital lasts better and is definitely better quality. As long as those of us who haven't got digital players available can still get hi-8 for teaching purposes, I think this is a great idea.
Regards, Stacy

[Part 2, "Card for Stacy Kim" Text/X-VCARD 14 lines]
[Unable to print this part]

From tshank@whoi.edu Fri May 12 12:01:10 2000
Date: Fri, 12 May 2000 09:29:26 -0400
From: "Timothy M. Shank" <tshank@whoi.edu>
To: UNOLS Office <unols@gsosun1.gso.uri.edu>
Subject: Re: Eliminate ALVIN External Stills?

Dear Patty,

As part of my work on the temporal changes in biological community structure at 9°50'N since 1991, I have extensively used and help push increasing the resolution/band width of Alvin's imaging capability: from 8mm, Hi-8, BETACAM SP, High definition, and DV digital. I think that it is critical to move to the digital (although Betacam SP actually appears to be better than digital for frame-grabbing for publication...but this may change) format in Alvin. Hi-8 footage begins to degrade after only a few playbacks, and is less than acceptable for today's publication standards. As for the substituting these video frame grabs for the 35mm external still cameras, I think would be a large mistake. I don't think that the video coverage (field of view) is wide enough to come close to yielding the spatial relationships one can glean from the sponson-mounted 35mm cameras. I certainly realize that only a small portion of the external frames are typically usable from a given dive, BUT the wide angle, high and oblique view is extremely helpful when there is a good image. The reason why so few shots are considered usable (for publication or information) is that the basket and starboard arm-mounted camera is typically "blocking" the field of view. So, since I would argue that the external camera angle (high and oblique) and image clarity yield usable and important datasets, I would suggest trying to either move the cameras so that the arm and basket are not in the way of the seafloor subject area, or move the 3-chip camera off the arm (I don't know where unless there is a pan and tilt constructed for the camera that would potentially sit in the basket). The only other suggestion I would like to see discussed is to look into the feasibility of placing digital still cameras in housings to be used in a similar manner to (and replacing) the curent external 35mm cameras. On the up side his would likely cut down on a large amount of processing costs back on the beach, but on the downside the amount of money required to maintain adequate storage of all of the images (shipboard and on the beach) might be prohibitive. Anyway, that's my two cents.

If you have any questions or would like to discuss this further, please
feel free to contact me.

best regards,
Tim

Timothy M. Shank, PhD
Biology Department
MS #34 1-16 Redfield
Woods Hole Oceanographic Institution
Woods Hole, MA 02543

From - Thu May 18 09:40:51 2000
From: perfit@geology.ufl.edu (Mike Perfit)
Subject: ALVIN stills

Hi All,

Just got back from 47 days at sea on the MELVILLE with DAN! (and I survived!) Great success with ARGO and DSL120...I was very impressed with the operations, data output, data reduction and the performance of both the DSL group and the MELVILLE crew. They should be commended.

My input regarding the hi res video: Yes I think it can replace the 35 mm still cameras PROVIDED the images are easily and readily available to the scientists (as available as the 35 mm).

I also think we should make the jump to digital recording at this point. It's worth the investment and the costs will probably decrease with time. Certainly its a better media and the reproductions will be very high quality and easier to make (CD or DVD).

Hope all is well in UNOLS land. Sorry I missed the celebrations for Jack.

Mike

Michael Perfit
Professor of Geology and Graduate Coordinator

*****Please note my new address**********

Department of Geological Sciences
University of Florida
241 Williamson Hall, P.O. Box 112120
Gainesville, FL 32611-2120

Office: 352-392-2128
FAX: 352-392-9294

http://web.geology.ufl.edu
http://web.ortge.ufl.edu/explore/v02n1/geology/
http://newport.pmel.noaa.gov/nemo/logbook/cal070299/

From - Fri May 19 08:33:25 2000
From: Joris Gieskes 858-534-4257 <jgieskes@ucsd.edu>
Eliminate ALVIN External Stills?

I HAVE THREE RESPONSES

Joris, while the digital film would be more expensive to take, it's much, much less expensive to process down the line and fairly trivial to archive. Altogether, I think there would be good savings and a substantial increase in quality of the processed images.

****

>Also Barrie had asked the community for input on WHOI's desire
>to shift from Hi8 to digital tapes. The Hi-8 tapes need to be
>transferred to another media as soon as possible to avoid
>degradation.

I support the move to digital tape despite the additional cost. The excellent resolution speaks for itself, but a very important feature is that there is no generational loss of resolution. Thus a 5th generation copy of a tape will look just as good as the original.

They should be aware that digital tapes "degrade" just as quickly as analog. All tapes, whether analog or digital, should be recopied every 5 years or so. The advantage with digital tape is that the new copy has no loss of quality.

****

Both are good ideas

JORIS GIESKES

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Scripps Inst. of Oceanography
MARINE RESEARCH DIVISION
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La Jolla CA 92093-0236 NOTE CHANGE, PLEASE
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Appendix VII

R/V ATLANTIS Shipyard in 2001

Science Modifications

- Phase III bow thruster sound deadening
- Renew refrigeration units to Science boxes
- Remove seismic air compressors
- Modify Lab drains to improve drainage
- Redesign and convert Alvin dehumidification system
- Make modifications to the power distribution in Labs
- Raise starboard hydroboom to improve fairlead
- Provide additional space in the Alvin electronics workshop
- Improve access to 01 & 02 decks aft

General Modifcations

- Enlarge potable water tanks
- Replace sewage pumps
- Improve noise quality on mess deck
- Install exterior General Alarm bells
- Inspect thruster gears

WOODS HOLE OCEANOGRAPHIC INSTITUTION
1930

ATLANTIS Shipyard 2001

A shipyard period is planned for ATLANTIS in 2001. A list of improvement items under consideration is provided below. Please review the list. Feel free to share it with your colleagues. A discussion on the priorities of these items is planned at the DESSC meeting.

Atlantis Shipyard 2001

1 Inspect thruster gears
2 Two Weather Doors on 01 Lvl
3 Enlarge Potable Water tanks
4 Replace sewage pumps
5 Remove seismic air compressors and provide storage
6 Phase 3 Bow thruster sound deadening
7 Renew refrigeration units to Science boxes
8 Modify Lab Drains to improve drainage
9 Redesign and convert ALVIN dehumidification system
10 Install mods to the power distribution in Labs
11 Raise Starboard hydroboom to improve fairlead
12 Provide additional space in the ALVIN electronics workshop
13 Improve noise quality on mess deck
14 Install exterior General Alarm bells

Appendix VIII

Terms of Reference

DEEP SUBMERGENCE SCIENCE COMMITTEE
Revised: February 2000

INTRODUCTION:

The Terms of Reference for the DEep Submergence Science Committee (DESSC) are herein revised to reflect the evolving role of this committee. The Committee retains its oversight responsibilities in the use of ALVIN and includes oversight of the use of the ROV and AUV assets of the National Deep Submergence Facility. Incumbent in this is fulfilling an ombudsman role for the deep submergence community, insuring maximum participation in the utilization of these deep submergence assets. It is also the responsibility of the DESSC to promote new technology for ALVIN, the ROVs and AUVs and to maintain cutting edge capability for the National Facility.

The DESSC will continue to work with the user community, federal sponsors and the operator of the deep submergence national facility to encourage deep submergence research in traditional areas and expeditions to remote geographic regions. Additionally, DESSC will also encourage the advancement of cooperative international programs for the enhancement of multidisciplinary submersible science throughout the academic community.

SPECIFIC TASKS FOR THE DEEP SUBMERGENCE SCIENCE COMMITTEE ARE AS FOLLOWS:

1. The UNOLS DEep Submergence Science Committee shall operate pursuant to appointment by UNOLS and in accordance with Annex II to the UNOLS Charter. In addition, each funding agency will be invited to designate an official observer to the Committee.

2. Advise Regarding Proposals for Use of National Facility Assets: Proposals for the use of the National Facility deep submergence assets are regularly submitted for peer review through the three principal funding agencies NSF, ONR and NOAA. DESSC no longer reviews proposals. DESSC will however provide advice regarding optimum use of the assets to maximize operational strategy for the deployment of these assets. Deliberations will consider whether the proposed research might be enhanced by the use of ROVs, AUVs and/or other undersea research tools, or be better accomplished using other manned or unmanned submersibles. The committee will work with agency representatives and staff from the operating institution to develop schedules that will most effectively utilize deep submergence assets.

3. Deep Submergence Assets Planning:

   A. Annual Scheduling. Ship scheduling is based on funded projects and is done in part in consultation with the DESSC at the summer DESSC meeting. A preliminary

scheduling discussion is conducted in an open forum for the user community at the winter (Dec. AGU) meeting. At that time the community is provided with an indication of the potential areas in which deep submergence assets could feasibly operate well in advance of proposal submission deadlines.

B. Global Expeditions: The DESSC will work with the user community, federal sponsors and the operator to determine the feasibility of organizing deep submergence science expeditions to remote geographic regions. DESSC will work with the federal funding agencies to provide timely information regarding funded projects so as to enable potential users to better evaluate the appropriateness of submission of proposals for work in remote areas.

4. Deep Submergence Science Tools: The DESSC will, on a continuing basis, maintain awareness of new scientific tools and the needs of the users for new sensors and equipment to address important scientific questions. DESSC should encourage development and promote acquisition of these tools by the operator or interested scientists, and encourage discussion of mechanisms whereby the supporting agencies can fund these technological developments that are essential to the maintenance of state-of-the-art capabilities for National facility assets. Workshops or special sessions during the Fall AGU meeting, as well as other National Scientific meetings may be required for this task. Technical capability of the deep submergence research assets will be formally reviewed by the DESSC, with the assistance of selected outside experts, at least once every two (2) years.

5. User Concerns: On a yearly basis, the committee will review and assess comments from scientific users of deep submergence assets and identify key areas that warrant attention by the operator and recommend remedial actions as appropriate.

6. Undersea Technology: With regard to undersea technology in the broader sense, the DESSC should monitor and promote the development and application of appropriate new submersible technologies, both manned and unmanned, shallow and deep, for use in undersea scientific research. The DESSC should coordinate their efforts with the science user community, technology developers and facility operators. The DESSC shall advise NSF, ONR, NOAA and other federal agencies on submersible technology, its evolution and applications. Additionally, the committee shall include a representative(s) with expertise in the areas of undersea engineering and technology.

   In carrying out this task the DESSC will need to coordinate its efforts with the Academy of Engineering Marine Board and may need to organize special workshops.

7. Membership/Nomination of DESSC: The DESSC membership shall be comprised of individuals who can represent the various oceanographic disciplines required to advise on the effective use of submersible assets. The UNOLS Chair shall appoint the DESSC members from the nominations made by DESSC. Nominations for candidates to the committee shall be submitted to the DESSC for review.

Nominations should include the candidate's vitae. Members of the DESSC will be appointed for three-year terms, staggered so that two or three terms begin each year. Individuals may serve not more than two consecutive terms. The operating institution may designate an ex-officio member(s) in addition to those members appointed by the UNOLS Chair. With the Council's concurrence, standing committees of UNOLS may also designate ex-officio members as appropriate to DESSC.

8. Reports of activities shall be made to UNOLS.

Appendix IX

MBARI DESSC Report

May 24, 2000

Western Flyer / Tiburon System

- Operational in November '99
- Initial expeditions local
  - Seamounts off central coast
- Upcoming expeditions
  - Santa Barbara Basin
  - Mendicino Escarpment and Gorda Ridge
- 150 ROV sea days in 2000 scheduled
  - 10 NURP days

Tiburon Sampling Update

- "Toolsled" system working well
  - Midwater
  - Benthic biology/geology
  - Custom instrument (currently NMR probe)
  - Core drilling sled due next month
    (Holloway/Stakes drill adapted to Tiburon)
- Camera dome problems
  - Both main camera domes replaced

Pt. Lobos / Ventana System

- Several recent upgrades:
  - Installed HDTV camera (Sony HDC 750)
  - Added second seven function manipulator arm
  - Vibro-coring tool successfully integrated
- 153 ROV sea days in 2000 scheduled
  - 8 NURP days

Major MBARI Initiative for 2000

- MOOS project
  - Seafloor observatory connected to surface buoy
  - Collaboration to maximum extent possible with other observatory efforts
  - AUV's will be incorporated when unattended docking is feasible

Appendix X

Deep Tow Group annual report for DESSC (May 2000)

In the past 12 months, the Deep Tow Group has converted its Fish 6 instrument package and its Control Vehicle (CV) to operate on a 0.680" tow cable with optical fibers. Both vehicles retain the capability to operate on standard coax 0.680" tow cables when an electro-optical tow cable is not available. Significant improvements enabled by the high bandwidth capabilities offered by optical fibers include:

(1) real-time video for Fish 6 and the CV;
(2) taking advantage of daylight for real-time video identification of bottom type while surveying with Fish 6 at 20 m altitude in 60 m of water depth with 110 kHz sidescan sonars, a 4 kHz subbottom profiler, a 24 kHz altimeter/ sediment classifier sonar, a 40 kHz obstacle avoidance sonar, and a precision CTD sensor;
(3) a short baseline navigation capability yielding range and bearing between the tow fish and the ship, thus eliminating the guess work of fish navigation whenever bottom-moored acoustic transponders are not practical.

The Group has run two Fish 6 surveys for the US Navy offshore San Clemente Island, CA, in water depths ranging from 40 m to 1600 m. These surveys have provided an opportunity to test a new Dynacon slack tensioner, by itself and associated with an accumulator. The slack tensioner alone limits the excursions of the package in deep water to +/-2m, whereas the accumulator bring this range down to +/- 0.5 m.

In September 1999, the CV with its new fiber optic telemetry have been used successfully aboard R/V Atlantis for CORK data logger and instrument string recoveries at ODP 1024C, 1026B, 1027C, as well as logging ODP 1026B. The new telemetry provided real-time video from the tip of the logging probe to the ship, making it possible to re-enter ODP 1026B through its 9 cm ID CORK opening by visual means only. Results were presented by de Moustier et al. at the Fall'99 AGU meeting and at the Undersea Technology 2000 conference in Tokyo (May 2000).

C. de Moustier, F.N. Spiess, R. Zimmerman, D. Jabson, P. Jonke, D. Price, G. Austin, and C.D. Lowenstein, "Deep seafloor investigations with wireline instrumentation", OS21A-17, EOS Trans. Am. Geoph. U., 1999.

C. de Moustier, F.N. Spiess, D. Jabson, P. Jonke, G. Austin, D. Price, and R. Zimmerman, "Deep Sea borehole re-entry with fiber optic wireline technology", Proc. Undersea Technology 2000 Conf, May 2000, Tokyo, Japan, pp. 379-384.,

Appendix XI

CANADIAN SCIENTIFIC SUBMERSIBLE FACILITY
ETABLISSEMENT CANADIEN DES SUBMERSIBLES SCIENTIFIQUES

Promoting undersea research with Canadian technology

C.S.S.F.
c/o Institute of Ocean Sciences
P.O.Box 6000
9860 West Saanich Road
Sidney B.C. V8L 4B2
Canada
tel: (250) 363-6332 fax: (250) 363-6357
email: shepherd@ropos.com

Report to the Deep Submergence Science Committee

Summary of Activities April 1999- May 2000

1. Operations:

In 1999 CSSF supported joint US/Canadian cruises to Axial Seamount and the Endeavour Vent field, conducted a gas pipeline inspection and recovered an experimental mooring for the Canadian Coast Guard:

The objectives of the June 21 to July 14, 1999 NOAA-led NeMO'99 cruise included geological mapping of a recent volcanic eruption on Axial volcano on the Juan de Fuca ridge, sampling of hydrothermal fluids and particles from sea-floor vents and sampling of animal communities around the sea-floor vents. Operating from the UNOLS Thomas.G.Thompson, ROPOS spent 274 hours diving (more than 12 hours for each day on site). Scientific equipment carried included, hot fluid sampler, stereo camera, strobe, Imagenex scanning sonar, 2 gas tight water samplers, still camera, and suction sampler with thermocouple.

This was followed by the July 15-21 Revel '99/Deep Endeavour cruise to the Endeavour Segment vent sites. Sponsored by the University of Washington, the Canadian Department of Fisheries and Oceans and the Canadian Natural Sciences and Engineering Research Council the objectives of this cruise were to revisit earlier experimental sites, recover equipment, and obtain samples and imagery from a proposed Marine Protected Area. ROPOS was in the water for 99 of the 168 hours of the cruise Equipment carried included fluid sampler, stereo camera, strobe, Imagenex sonar, 2 gas tights, still camera, temperature probe.

From September 1-8, CSSF carried out a visual and cathodic protection system inspection of the Vancouver Island Pipeline System Marine Crossings. ROPOS operated in 'live-boat' mode in depths of up to 425m from the MV Kigoria. ROPOS was in the water for 87 of the 133 hours of the cruise, carrying a Cathodic Protection Probe, and line cutter.

At the end of September CSSF conducted two brief cruises in BC waters, operating ROPOS in live boating mode from two different support vessels within a week.. The first, conducted from the CCGS Laurier, recovered an experimental navigation buoy mooring to allow engineering studies of wear on various components. ROPOS carried a special hydraulic tool to cut the shackles connecting the mooring line to the anchor. The second trip, on CCGS Vector, collected a visual record of the bottom topography and condition of the Point Grey and Five Finger Island Ocean Disposal sites, for the Canadian Department of Environment. Total time away from the dock on these two cruises was 54 hours: ROPOS was in the water for 36 hours.

2. Data management system:

A new data management system was tested during 1999 operations, in which dive and data logs are compiled in HTML format, in real time while ROPOS operations are in progress. It quickly demonstrated its worth:

- It requires less effort during operations than earlier methods.
- The results can be used without any post-dive processing, although post-dive processing is possible if needed.
- ROV video frame-grab images are captured and included under control of the scientific team, providing a visual record of dive events and the conditions under which samples are collected. Each frame is listed and accessed from the HTML log.

- Sample lists can be printed out before the ROV is on the surface. This gives easy locating and tracking of the samples as they are recovered from the vehicle.
- No special training is required: information entry and retrieval is practically intuitive to anyone experienced in using the World Wide Web.
- The up-to-date data log is available in real-time to anyone connected to the shipboard computer network, greatly reducing the number of errors in other types of records, such as sample labels.

Every scientist can leave the expedition with a CD-ROM containing all dive logs, related navigational data, and other essential supporting data and images in a format easily read and manipulated on a variety of computer platforms. This new system was developed by the Canadian Scientific Submersible Facility (CSSF) in partnership with the Canada Foundation for Innovation and four Canadian universities (New Brunswick, Québec à Montréal, Toronto, Victoria).

3. 5000m capability restored:

CSSF has taken delivery of a new Lantech winch, which, with the new 5500m Vector Cable umbilical, will allow ROPOS to once again work at depths comparable to the 4972m achieved in 1996. The 'footprint' of the new winch is smaller than a standard container, making it easier to ship than the previous winch.

4. Major Facilities Access Funding from the Canadian Natural Sciences and Engineering Research Council.

Canadian scientists and their collaborators can now use ROPOS at lower direct costs, thanks to a Major Facilities Access grant awarded to a consortium of ROPOS users. The grant covers part of the overhead costs of the ROPOS operation, so only the direct costs of field operations must be paid from research funding. The MFA grant also provides funding for one Pacific Coast ROPOS mobilization in each of its three years as well as one Atlantic Coast mobilization in the three year period. An Atlantic Coast operation is being planned for June 2001. The result has been to significantly increase the number of ROPOS days available to Canadian scientists and their collaborators.

5. Plans for 2000 and 2001

Operations confirmed for 2000 include sea-trials of the new winch (completed), a NOAA fisheries ... cruise to the Oregon Margin, a NOAA/Canadian cruise to Axial Seamount, a German/Canadian cruise to the Oregon Margin , and a Canadian cruise to the Endeavour Ridge and the Vancouver Island Continental Margin.

Planning for 2001 includes a Canadian cruise to the Labrador Sea, Scotian Shelf and Gulf of St. Lawrence, followed by joint US/Canadian work in the North East Pacific.

Appendix XII

The Alvin Archives are current to Cruise 3-49, dive #3539.
Which means that we have added to the archives data and images for about 16 projects or cruises.

We have archived data from 8 DSL projects:

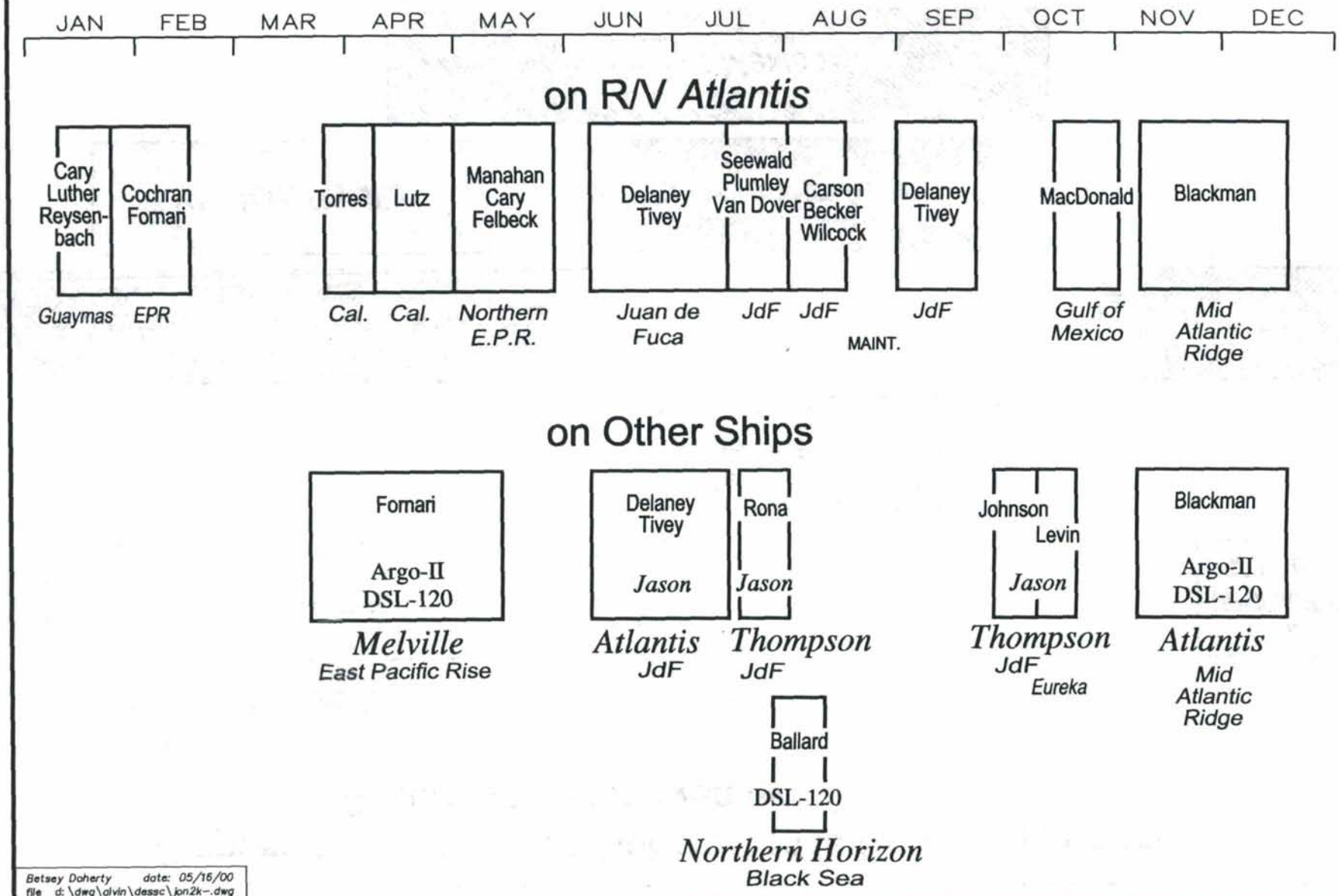
TN98 -- Cowen and Johnson
TN099 -- Chadwick
TN101 -- Chave
Atlantis 3-6 -- Bowen and Chadwick
Atlantis 3-7 -- Delaney
Atlantis 3-17 -- Yoerger
NH002 -- Ballard and Stager
Hey98 (Melville) -- Hey

We also received additional materials to add to projects for which the bulk of the data had arrived in previous years:
TN83 -- Chave
CC001 -- Ballard
TN67 -- Fryer
Johnson96(Thompson) -- Johnson
Haymon96 (Melville) -- Haymon
TN84 -- Smith
Derbyshire

Appendix XIII

Scheduled 2000 *Alvin* & ROV Operations

Deep Submergence Group
Woods Hole Oceanographic Institution



Betsey Doherty date: 05/16/00
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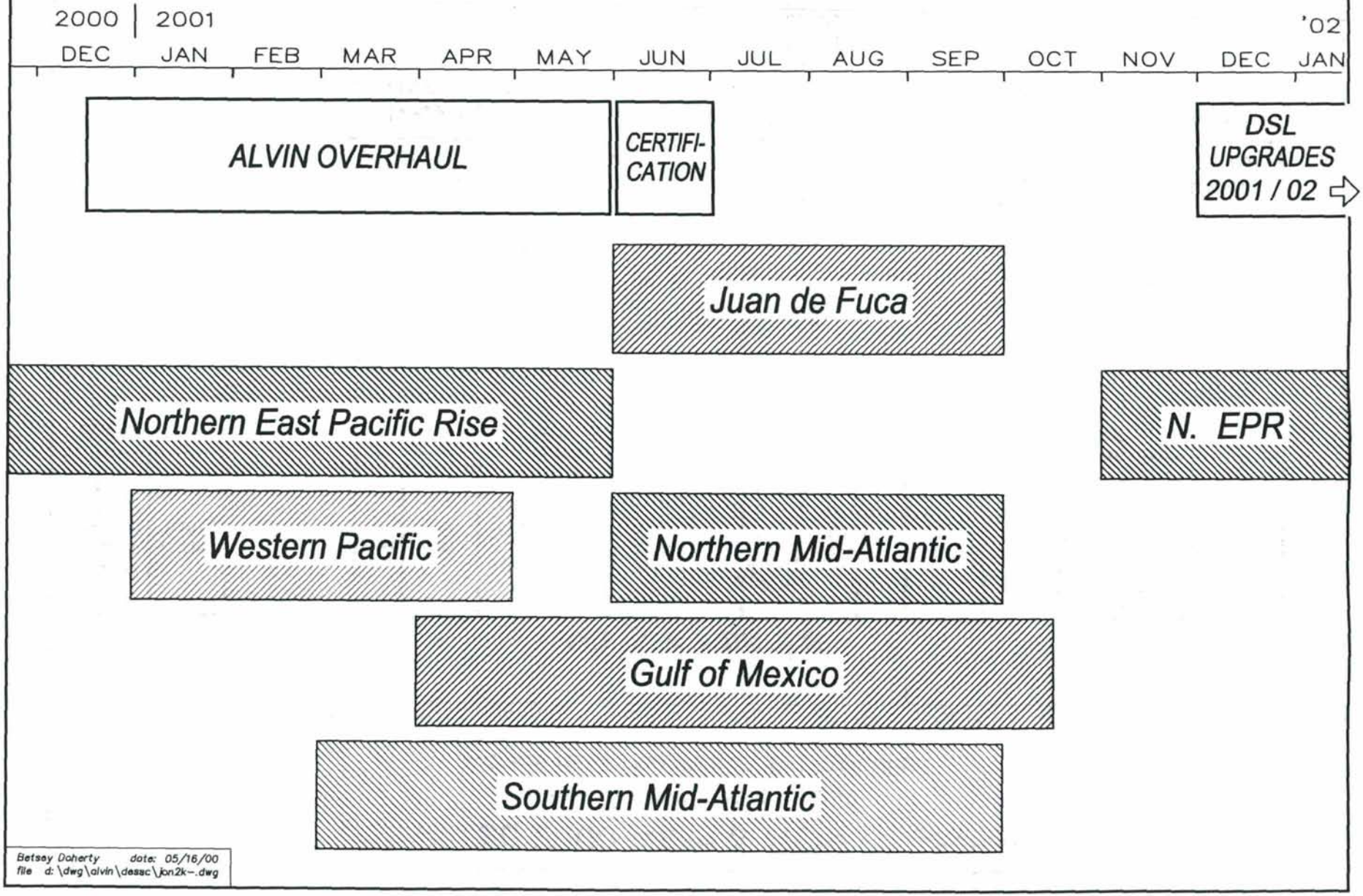
Proposed National Deep Submergence Facility Upgrades & Corresponding Weather Windows



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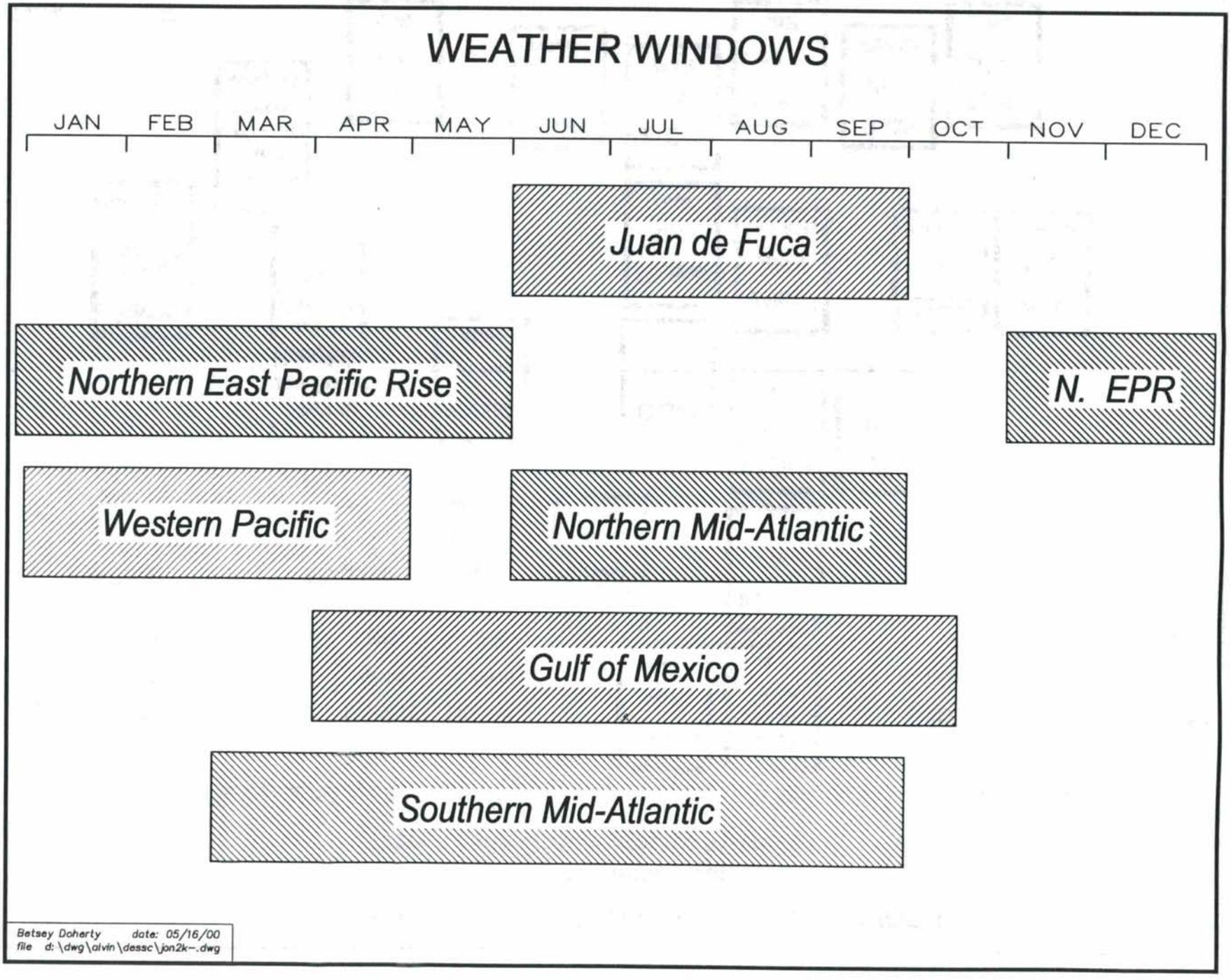
WEATHER WINDOWS



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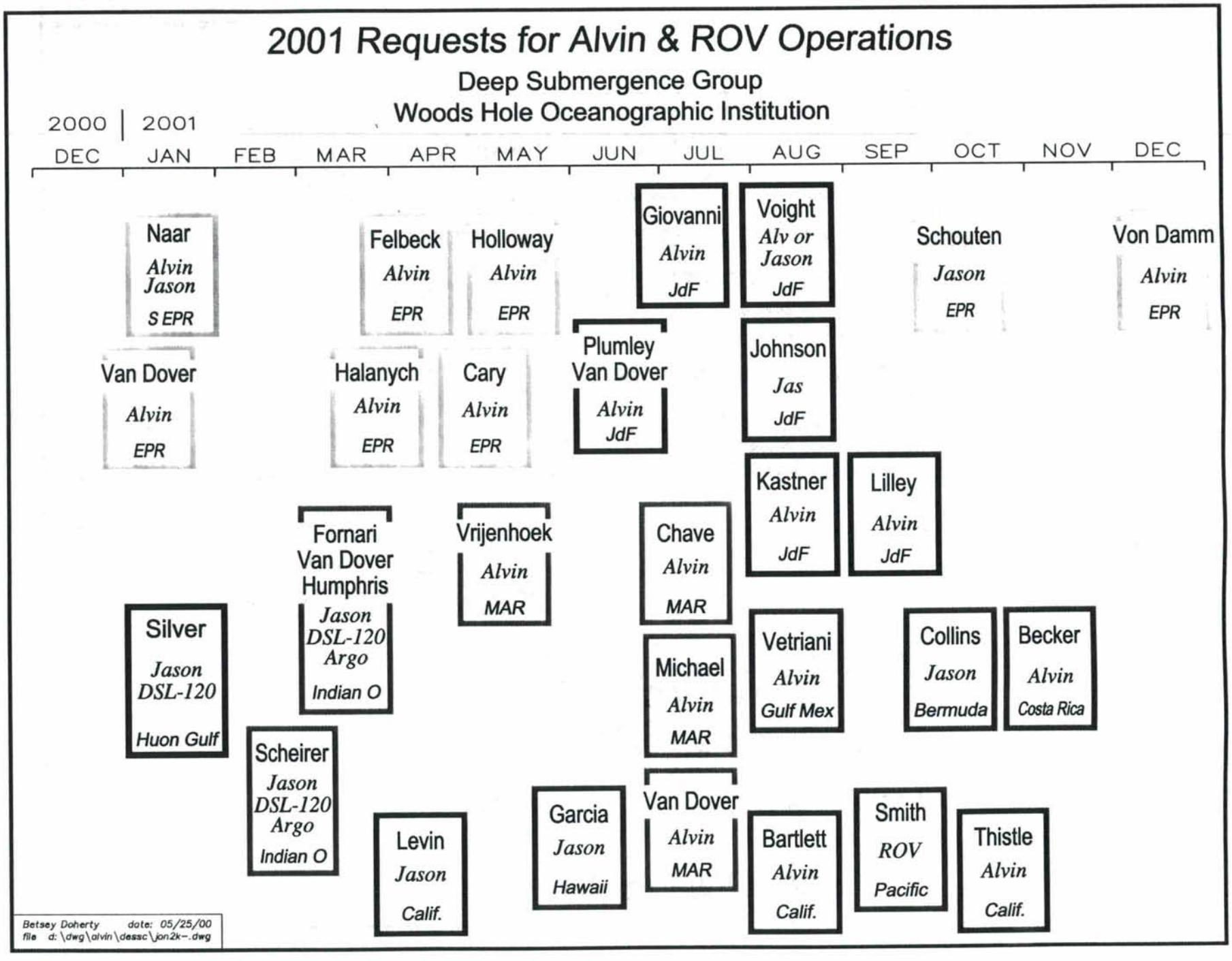
2001 Requests for Alvin & ROV Operations
Deep Submergence Group
Woods Hole Oceanographic Institution
2000 | 2001
DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Naar
Alvin
Jason
S EPR
Van Dover
Alvin
EPR
Silver
Jason
DSL-120
Huon Gulf
Scheirer
Jason
DSL-120
Argo
Indian O
Fornari
Van Dover
Humphris
Jason
DSL-120
Argo
Indian O
Levin
Jason
Calif.
Felbeck
Alvin
EPR
Holloway
Alvin
EPR
Halanych
Alvin
EPR
Cary
Alvin
EPR
Vrijenhoek
Alvin
MAR
Garcia
Jason
Hawaii
Giovanni
Alvin
JdF
Plumley
Van Dover
Alvin
JdF
Chave
Alvin
MAR
Michael
Alvin
MAR
Van Dover
Alvin
MAR
Voight
Alv or
Jason
JdF
Johnson
Jas
JdF
Kastner
Alvin
JdF
Lilley
Alvin
JdF
Vetriani
Alvin
Gulf Mex
Bartlett
Alvin
Calif.
Schouten
Jason
EPR
Collins
Jason
Bermuda
Becker
Alvin
Costa Rica
Smith
ROV
Pacific
Thistle
Alvin
Calif.
Von Damm
Alvin
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Betsey Doherty date: 05/25/00
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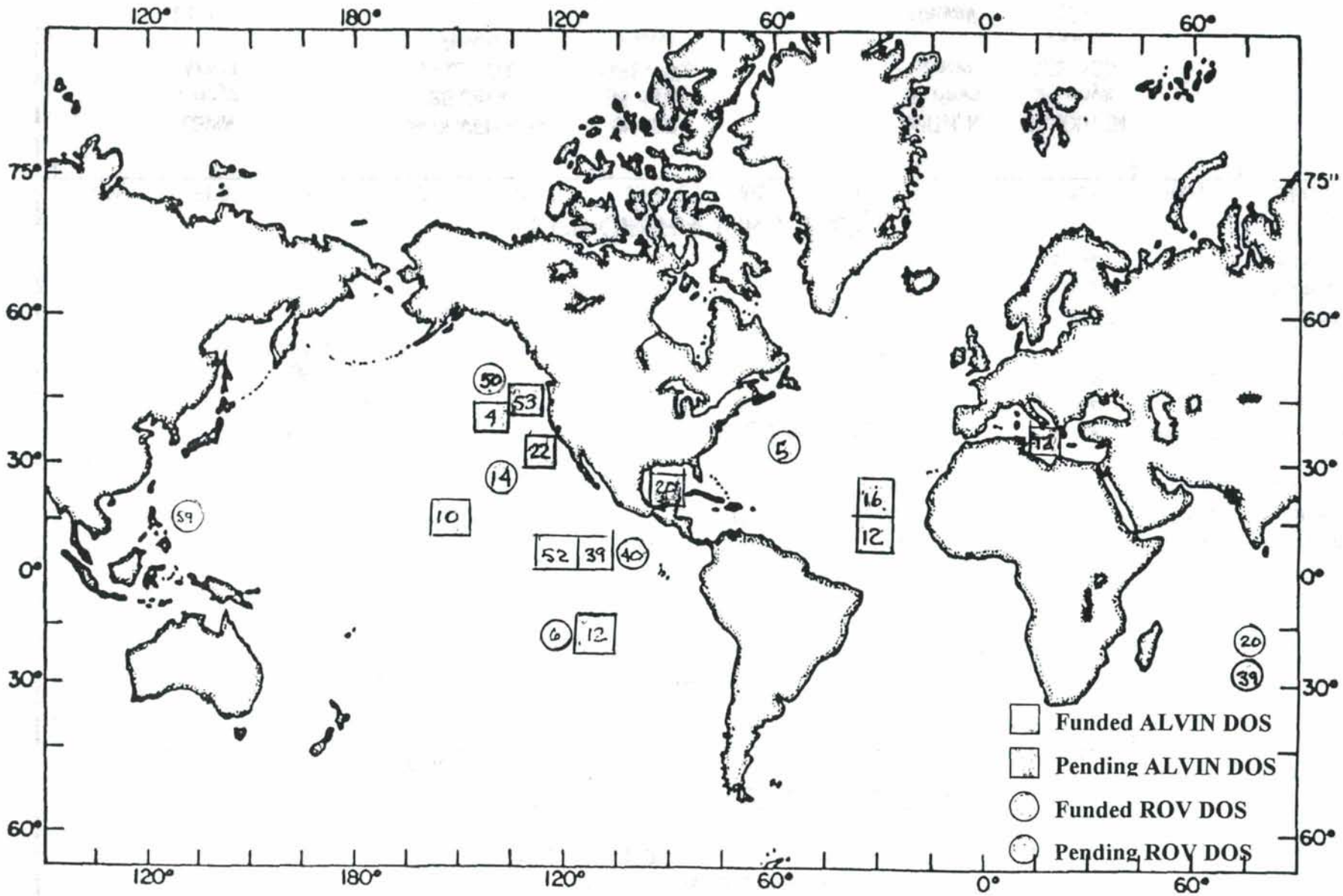
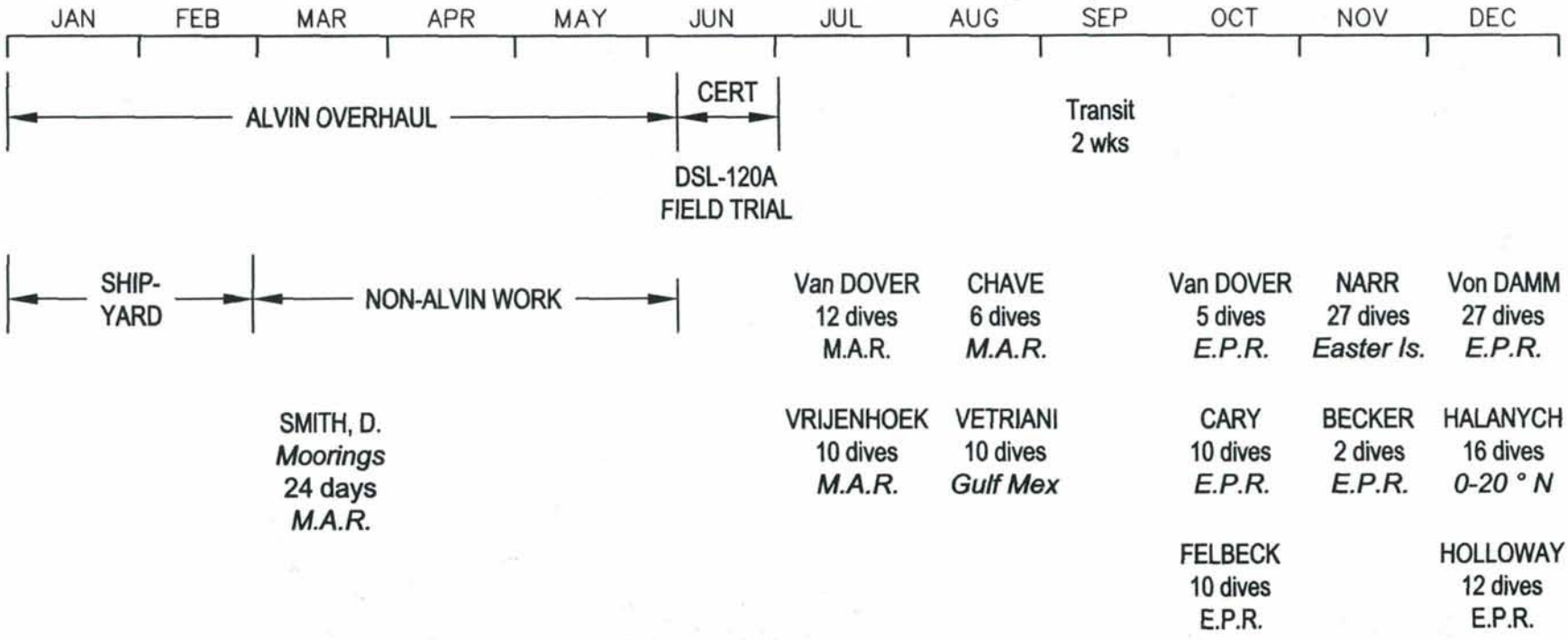
SUMMARY OF ALVIN & ROV DAYS ON STATION: 2001



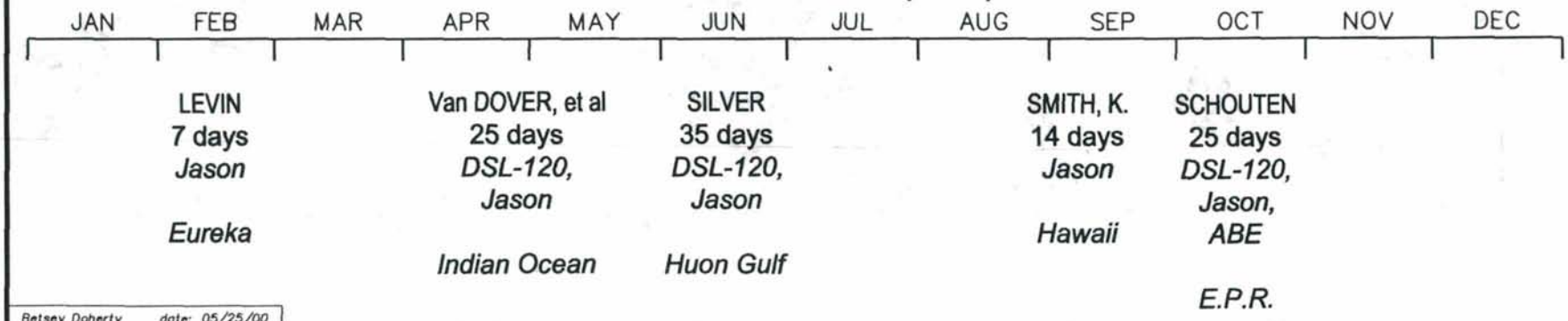
Draft 2001 *Alvin* & ROV Operations

Deep Submergence Group
Woods Hole Oceanographic Institution

ALVIN & ATLANTIS OPERATIONS (Draft)



ROV OPERATIONS (Draft)



Betsey Doherty date: 05/25/00
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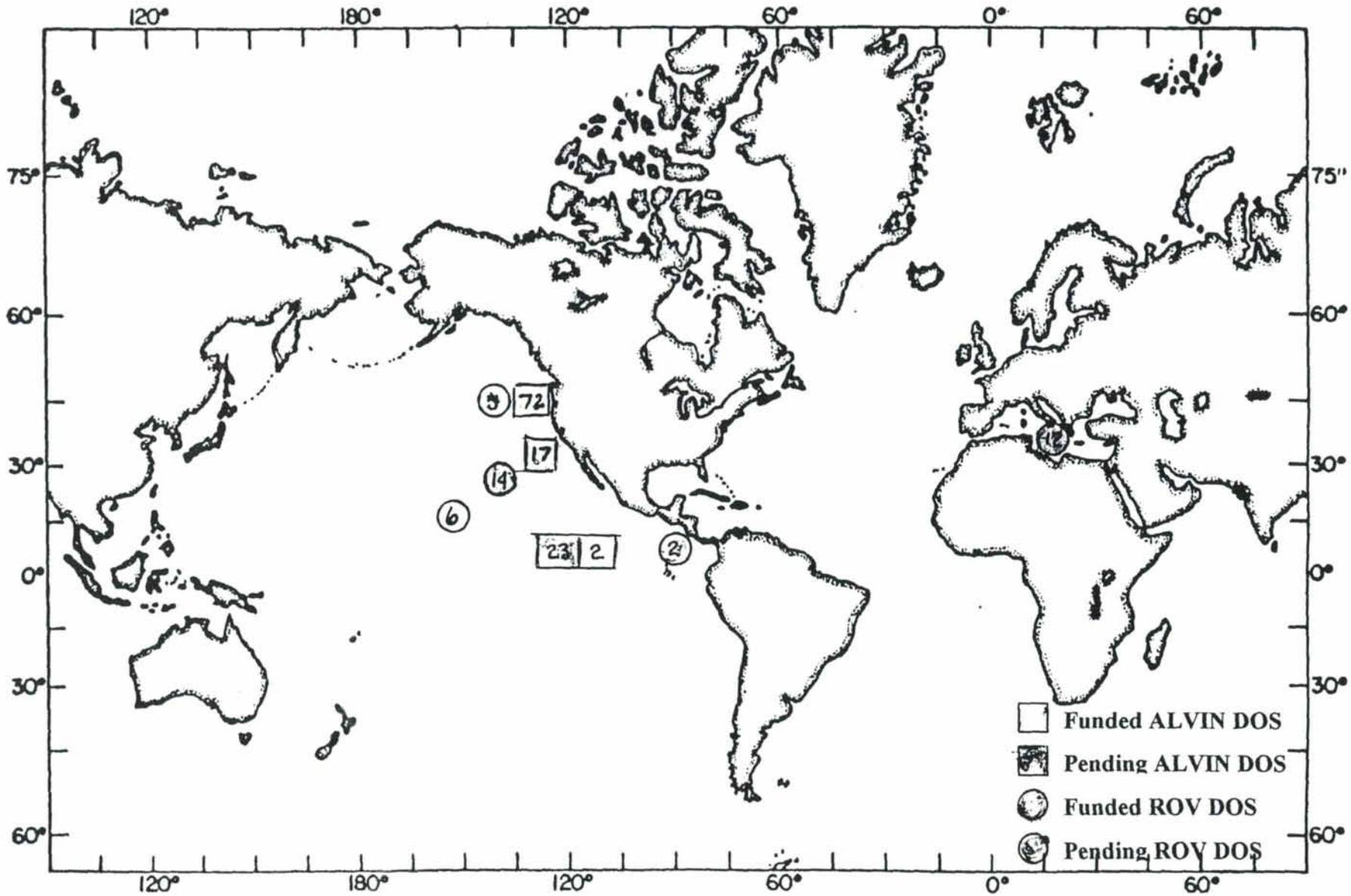
Appendix XIV

SUMMARY OF ALVIN & ROV DAYS ON STATION: 2002 and Beyond



Appendix XV

	EVENT	TS SHORT	TS LONG	GLOBAL	EXPEDITIONARY
VEHICLES	Existing 4500m sub AUVs with limited manipulation (maybe simple releasable tools) ROVs: dexterity (fine-scale and delicate samples) "smart" rocks	Existing 4500m sub Deep 6500+ sub	Existing 4500m sub Generic vehicles Observatories Robust ROV (heavy lift, long bottom time) Generic interfaces (so can use various vehicles for same task.) Dedicated AUVs (docked) Flexibility (can download at various data rates) Take up power and interact with control system/vehicles.	Existing 4500m sub Vehicles that match to tasks Both water column and seafloor vehicles - benthic crawlers - AUVs in water column - 6000+m capability - 2000m efficiency - wide range time and distance - exploratory (cheap, small, simple) - specialized -	Existing 4500m sub ROVs with inter-mediate resolution mapping capability More portable ROVs and tow sleds AUVs: - long range (gliders, solar power) - Air dropped (new nav) - Multiple - AUVs with sampling - With fiber or acoustic tether - More intelligent - Expendable Portable observatories
IMAGING	High res	- High definition digital video and telemetry - Elect. Digital still cams - red light ops		High definition video and photog	
MANIPULATORS	- Delicate sampling insitu experiments - Programmable	- More precise control for delicate work - Programmable	Generic manipulators Dexterity	Improved	

	EVENT	TS SHORT	TS LONG	GLOBAL	EXPEDITIONARY
PAYLOAD	Versatility				
SENSORS	- Insitu: optical, chem, gradients, hi temp, heat flow, long term non degradable (H2, pH,EH metals, sulfides, DNA) - survey compatibilities - bathy, grav mag, backscatter, subbottom, CTD-optical, photomasaics	- chemical and physical (may need 2+ yr grants) - porewater flow - smooth var spd pan and tilt - computer controlled sed profilers - gas-type manifold for water column sampling	-minimum suites of sensors (so all are similar?)	- presure,temp, grav mag, lights, multi spectral (low freq radiation) - current and flow - chem (both long range and detailed site specific) - acoustic and optical - insitu xray	- molecular and biochem probes and sensors - insitu mass spec
SAMPLERS	- Softside and sand/rock coring - sample preservations - fauna/larvae (slurp pump) fluid samplers(small to large volume)	- standardized tools (shareable) - coring improvement (vibracorer?) - drilling capability (subs and rigs) - standardized shareable tools	generic tools	- cores, seds - drills, rocks, etc - water (sml vol/multiple) - geol samples - biology - avoid cross-contain - preserve insitu contam - multiple chamber suction collectors - "enclosure" for delicate	

	EVENT	TS SHORT	TS LONG	GLOBAL	EXPEDITIONARY
NAVIGATION	Meter or better Simultaneous vehicles Self-contained for AUVs			Short baseline for some may be better option	Improvement
DATA	Storage			Better communication or data transfer	More rigorous data sets
POWER	Advance battery technology				
OTHER			Benchmarks needed	- environ extremes - tech training and infrastructure	