

Meeting Minutes
DEep Submergence Science Committee
Woods Hole Oceanographic Institution
Carriage House

May 24-25, 2000

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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.who.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 indicated 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 VIa](#). 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.who.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://www.unols/committees/dessc/alvinup.html>

A second survey was conducted to determine whether to eliminate the ALVIN external stills. The results of this survey are contained in [Appendix VIc](#).

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 deadening – 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 constraint. 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 cited 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.