DEep Submergence Science Committee
Woods Hole Oceanographic Institution
Meeting Locations are Provided Below
Woods Hole, MA
June 15-17, 2009

Meeting Minutes

Executive Summary

The Deep Submergence Science Committee (DESSC) met on June 15-17, 2009 at Woods Hole Oceanographic Institution (WHOI). The meeting began with a joint session of the DESSC and the Replacement Human Occupied Vehicle Oversight Committee (RHOC) to assist WHOI in their preparations for the Replacement Human Occupied Vehicle (RHOV) Preliminary Design Review (PDR). The practice PDR was conducted over the first day and a half of the meeting. The regular DESSC meeting began in the afternoon of June 16th and continued on to the next day. The regular meeting included agency reports from the National Science Foundation (NSF), Navy, and National Oceanic and Atmospheric Administration (NOAA). Representatives of the National Deep Submergence Facility (NDSF) provided reports on vehicle operation summaries, NDSF data management and archives, pilot status and personnel, and deep submergence scheduling in 2009 and beyond. Summaries of the NDSF user debrief interviews were reported. WHOI provided a summary of proposed corrective actions to the issues raised by the users. The DESSC discussed a variety of topics and issues regarding the NDSF vehicles and operations.

Action Item List

1) **First RHOV Science Cruise** – Request a document from WHOI with guidelines about the first science cruise on the RHOV. The guidelines should include cruise timing, geographic area, constraints, what to expect in terms for capabilities, etc. The data would have to be non-proprietary. Multidisciplinary research would be desired in order to fully test the vehicle's capabilities. DESSC will assist by advertising the guidelines and encouraging proposals.

2) **DESSC Membership –** the UNOLS Office will prepare a Call for DESSC Chair and distribute to the committee for comment. The Call will have a deadline of August.

3) **Ship schedules at JdF** – The UNOLS Office will evaluate ways to increase awareness of ship schedules and operation areas at JdF.

4) **Winter DESSC meeting –** The DESSC will hold their winter meeting at AGU in San Francisco on Sunday, December 13, 2009. The meeting will have the same format as the 2008 December meeting. The recommendation for the afternoon discussion topic is *Nereus* and *Sentry*.

5) **NDSF Data Archive Policy:** WHOI has requested that DESSC accept their proposed revisions to the NDSF Archive Policy. The current policy is posted at <http://www.whoi.edu/page.do?pid=11037>. A memo from Chris German was distributed to DESSC prior to the meeting and explains the proposed provisions <http://www.unols.org/meetings/2009/200906des/200906des_readlist.pdf>, Attachment 5. DESSC will further discuss this topic via phone meeting and draft a response.

6) **NDSF AUVs - ABE** – The criteria for incorporating new assets into the NDSF <http://www.unols.org/committees/dessc/CRITERIADOCUMENT_062206.PDF> requires a review of operations after a year in service. *ABE* has been in service for a year. Deb and Annette have requested the report from NDSF and will distribute it to DESSC when it is submitted.

7) **Proposal to NSF-STCI** to establish the technologies required to convert old NDSF film/images to a digital format for long-term storage and future web-accessible capability. DESSC will have a call to discuss this effort further.

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Meeting Summary Report

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The regular DESSC meeting began in the afternoon of June 16th and continued on to the next day. These minutes represent the discussions during the regular DESSC Meeting.

June 16th - DESSC Meeting – Carriage House

Introductory Remarks - Deb Kelley, DESSC Chair, opened the DESSC meeting at 1:45 pm and welcomed the group. She reviewed the agenda items and topics of discussion. The agenda is included at ***Appendix I*** and the meeting participant list is included as ***Appendix II***.

Topics for DESSC discussion:

WHOI Underwater Optical Communicators – Maurice Tivey provided a status report on the development of low and high power underwater optical communicator systems. His slides are included as ***Appendix III***. They built an optical communications system using LEDs as the light source and a silicon photodiode as the detector. IrDA (Infra-red Data Association) is the communication protocol and is a simple low power/low cost communication solution for the near field (1-5 meters). The electronics are small; about 2-inch diameter disks (size of a hockey puck) and is powered by a 9V battery. This allows for the unit to be incorporated into a sensor package. The project was NSF funded, but the funds ran out at the end of the project in the fall 2008. They would like to get funding to build a few units for use with *Jason* and *Alvin*. The unit is about $70 in material costs plus labor.

Hawaii Mapping Research Group (HMRG) Future – Dan Fornari reported that the future is uncertain for the HMRG program and mapping systems <http://www.soest.hawaii.edu/HMRG/index.php>. Dan's slides are included as ***Appendix IV***.

The 2008 HMRG vehicle schedule included numerous field programs. Two commercial contracts took a heavy toll on the HMRG equipment as well as the people. IMI-30 suffered damage to its transducers. The transducers are being rebuilt, and are expected to be ready for testing in July 2009. MR1 also suffered major damage to the tow vehicle. It is anticipated that its future operation will probably require a new vehicle due to the frame damage.

Four proposals to use HMRG sonar vehicles were submitted to the NSF MGG and OPP

programs, and one additional proposal will be submitted to the MARGINs program in July. Margo has stepped down as director of HMRG and Paul Johnson is now the director. Dan said that there is a concern about the HMRG systems going away. They have been useful tools. A group of scientists have been organized to produce a white paper to ensure that US oceanographers have ready, cost-effective access to the latest sidescan sonar mapping technologies in order to produce state-of-the-art seafloor maps over a wide depth range and with the highest resolution possible. NSF and UNOLS are aware of this effort and are supportive of the objectives. The group will review the current sidescan sonar technology and new multibeam systems with sidescan capabilities, the availability of systems with different frequency, resolution, and swath width characteristics, and the status of various vehicle systems and operations. Recommendations will be drafted into a white paper that will articulate the sidescan sonar and multibeam sonar capabilities that will be needed in the future. The group's goal is to produce the white paper over the next six months.

Cruise Mobilization/Demobilization – During the December DESSC meeting and during NDSF user debrief discussions, the issue of ship-berthing policies was raised. The issue of concern is that the policy for science party berthing while a ship is in port (pre- and post-cruise) varies from ship operator to operator. In general, science parties would like to have as much access as possible to the ship's accommodations prior to a cruise. This could offer a substantial savings in hotel costs for the science party. It also allows for better pre-cruise staging, planning, and coordination by the science party.

DESSC requested that the UNOLS Research Vessel Operators' Committee (RVOC) consider a standard Fleet-wide science party ship-berthing policy that allows for maximum access to on-board accommodations while in port. The RVOC took the request under consideration, but found it impractical to arrive at a uniform policy due to the many different security and safety issues that are unique to each ship and their port locations, both in their homeport and when away.

Susan Humphris reported that WHOI has changed their policy to allow science access to shipboard berthing two days before a cruise. People seem quite happy with the new policy.

NDSF Vehicle Turnaround Times – The NDSF policy regarding standard turnaround times between vehicle lowerings is available at http://www.whoi.edu/page.do?pid=11256. DESSC requested a better understanding of the turnaround requirements and constraints in order to determine if improvements can be implemented. WHOI provided a written report prior to the meeting that covered details of the turnaround issue and options.

For *Jason* operations a standard 12-hour turn-around time has been established that is published on-line in the NDSF web-pages at: www.whoi.edu [click on Ships & Technology / NDSF / Jason / User Manual]. The requirement for a 12 hour gap between each recovery and subsequent vehicle launch was established to ensure safety. However, the Expedition Leader will work with the Chief Scientist to shorten turn-around times, whenever possible. A specific example provided in the policy, and which is increasingly being utilized, is that if the science party were able to adopt a 24-hour cycle in which the ROV is recovered after 08h00 and redeployed before 20h00 then much shorter turn-around times (about 8 hours) could be achieved. The plan of

coordinating vehicle recoveries and subsequent launches to converge within "daylight" hours (08h00 to 20h00) seems to have met with reasonable success, thus far.

- Bill Chadwick – WHOI is being more flexible than what the turn-around policy states. Recent cruises find that there is good flexibility.

Mode of Operation for *Jason* Watches - During past DESSC meetings the issue was raised regarding personnel change-overs between watches. The watch-changes are disruptive when an entire science team and an entire ROV operations team all change at the same time. DESSC recommended that WHOI explore options for staggering the start and end times for *Jason* watches with the goal of achieving better continuity through a dive cycle. Not only is communication difficult when so many individuals are trying to relate information to their counterparts, simultaneously, but the complete replacement of every member of the control van every 4 hours can lead to a great loss of momentum in the rate at which scientific operations are advanced.

In recognition of this, Bill Chadwick (DESSC representative for *Jason*) initiated an experiment on his recent cruise in which his science party broke into two watches of 6 hours each spread across three sets of *Jason* Ops team watches (working 4h on-watch; 8h off). Continuity was maintained in a much improved way during the science-watch change-over that occurred during the middle of a *Jason* Ops team watch.

WHOI would like to invite DESSC to recommend to all future *Jason* user that both *Jason* Ops teams (Pilot, Engineer & Navigator) and Science teams (Watch Leader, Data Logger & Video-archiver + others as required) continue to work 4h watches but that the change-over between ROV Ops teams and Science teams be off-set from one another by 2 hours.

Andy – They have been trying to be more flexible. They are still trying to streamline the system to reduce the number of people required for operations. NDSF has also discussed with NSF the development of a handling system that would reduce the number of people required during launch recovery. *Jason* takes a whole team of people, while the ISIS only takes a few people because of its Launch and Recovery System (LARS) operating system.

Compile Inventory of Homer Beacon IDs – Karen Bemis is compiling a master list of Sonadyne 'Homer' beacon IDs so that the various deep submergence operators as well as PIs know what is in use and where.

Education/Outreach – Annette reported that at the last DESSC meeting it was suggested that we encourage students to create u-tube videos about the NDSF vehicles. Many cruises now have blogs and this can be an effective outreach method. Annette cautioned; however, that there should be some oversight of U-tube videos and other student outreach activities by Chief Scientists or PIs. Also, proper credits should be sited for agency support.

DESSC Letter to NSF Regarding Uniform Funding – Deb Kelley contacted Hedy Edmonds (former DESSC member and NSF Polar Programs manager) regarding NSF's policy for requesting and funding the use of the National Deep Submergence Facility assets. The policy for

funding the NDSF vehicles from OPP versus OCE differs. Brian Midson remarked that NSF is trying to do a better job of communicating the funding process to the community.

New HOV Users on First RHOC Cruise – Deb introduced that topic of organizing/promoting a cruise to encourage new HOV users and to perhaps having this effort coincide with the new sub coming on-line in 2011. One option could be a North Atlantic proposal with "mentors" to help put the proposal together. Heroes would be needed to propose science programs for the first science cruises. DESSC should work to announce the opportunity to the community.

Discussion:

- Jennifer – Post an announcement on the DESSC and RIDGE sites with information about when Alvin will go out of service.
- Annette – We would need to let the community know of any constraints about the first science cruise; such as, location, timing, etc.
- Pat – The first cruise should take place in the Atlantic.
- Bowen – The model used for the HROV *Nereus* was a good one to follow. Tim Shank and Patty Fryer were the scientists involved.
- A document from WHOI with guidelines for the first cruise and what to expect in terms of vehicle capabilities is needed. The data from the first cruise would have to be accessible and non-proprietary. A multidisciplinary research program that fully tests the vehicle capabilities would be nice.

WHOI Chief Scientist for Deep Submergence – Chris German's term runs out on Dec 31st and there is an option for a second 4 year period. WHOI is considering his renewal for another four years and will make the decision in the next few months. DESSC input can be provided to Susan Humphris.

DESSC Membership – Deb Kelley presented a certificate of appreciation to Jennifer Reynolds for her service on the DESSC. Jennifer's term will expire in the fall 2009. A call for nominations for the DESSC Chair will be announced. The new Chair will replace Deb Kelley at the end of the December DESSC meeting.

Ship Schedules at Juan de Fuca – Multi-ship operations at Juan de Fuca during the weather window has been increasing and the occurrence/potential of operational conflicts has also increased. There needs to be a mechanism for informing the public about operations in the Juan de Fuca area. Deb Kelley has brought this issue to the attention of UNOLS. Ways to post schedules will be explored. The challenge will be identifying non-UNOLS cruises.

1700 DESSC Executive Session

Wednesday, June 17, 2009 - Carriage House

DESSC Meeting - Introductory Remarks - Deb Kelley reported that the DESSC Winter meeting will be on the Sunday before the start of the AGU conference in San Francisco this year.

Agency Reports:

National Science Foundation (NSF) – Brian Midson reported for NSF. NSF received $3B of ARRA funds; $2B for science and $1B for infrastructure. Funds will be used to complete the NDSF high definition (HD) camera upgrade effort and to also support other NDSF upgrades.

National Oceanic and Atmospheric Administration (NOAA) – Karen Kohanowich reported on NOAA's new Cooperative Institute (CI) and NURP Centers. Her slides are included as ***Appendix V***.

NOAA NURP did not get any ARRA funds. The ARRA funds supported other parts of NOAA. In 2006/07, the NURP East Coast centers had a major funding cut and they had to look at how they would operate into the future. In 2007/08, there was the development of a Cooperative Institute prospectus. The CIs would be re-competed every 5 to 10 years.

Three proposals were received to host the CI. The first NOAA Cooperative Institute was awarded on May 6, 2009. The managing partners are Harbor Branch Oceanographic Institution at Florida Atlantic University (HBOI/FAU) and the University of North Carolina, Wilmington (UNCW). The CI replaces the four east coast NURP Centers. Funding for the centers ends July 1, 2009

- Liz Caporelli said that there is rumor circulating that HBOI is selling their ship. Karen - The CI announcement requested access to the sea and undersea. It didn't require that the CI own the facilities. NOAA is aware that HBOI is exploring other options and they hope to hear a resolution in the summer.

NOAA NURP and Ocean Exploration programs are now merged. Karen reviewed the research themes include the development of advanced underwater technologies by expanding the scope and efficiency of exploration and research by developing, testing, and applying new and/or innovative uses of existing technologies to ocean exploration and research activities. Another theme is to explore and research the frontier regions of the eastern U.S. Continental Shelf and beyond. Focus is on the exploration and research of ecosystems and habitats of economic, hazardous, scientific or cultural importance within and beyond the eastern U.S. Continental Shelf. NOAA will also support ocean exploration and research using advanced underwater technologies and techniques to improve the understanding of coral and sponge ecosystems. The CI will develop a research plan each year.

- Craig Young – Does this mean that there is no opportunities for outsiders to get funding for NOAA programs? Will there no longer be calls for proposals? Karen – The CI model will reduce the funding opportunities. The West Coast NURP Center will still announce research funding opportunities.

The NURP and OE budgets have been relatively level from 2008 to 2010. The combined total budget is $27.8M in 2009 and 2010.

Karen reviewed the HURL 2009 dive programs (see slides). HURL future plans include overhaul of the submersible in the summer 2009. In fall 2009 dives are planned in the Hawaii region. A possible Aleutian expedition could take place in summer 2010.

Planning has been underway for *Okeanos Explorer* discovery operations. They are developing a 5-year strategic plan. There will be workshops to determine the operational areas for the new vessel.

- Brian Midson – What is the future of NOAA's support of NDSF? Karen – NOAA is looking for ways that the CI will fund NDSF research.

Okeanos Explorer* and URI Exploration** – Catalina Martinez (NOAA) provided the report. Her slides are included as ***Appendix VI. The ship is 224 feet in length. The vessel was transferred to NOAA in 2004 and its conversion has been completed. The official commissioning ceremony occurred in the summer 2008. The vessel is outfitted to serve three primary missions: 1) Deep water (to 7,000 m) mapping, 2) Deep water (to 6,000 m) science class ROV operations, and 3) Real-time broadband satellite transmission of data. The ship will be a dedicated ROV platform with remote science capabilities. A new Kongsberg EM 302 multibeam mapping system has been installed. Images of the ship spaces are included in the slides.

Staffing for support of the ship has been very challenging. There are only 19 mission bunks, so it is very important to effectively operate remotely. Andy Bowen asked if the dynamics between shore and at sea support have been examined. Cat – NOAA did a study on this and has recognized the challenges. A communication protocol has been developed and there is a link to UNH. NOAA is also exploring intern programs and they would like the ship to be a training platform. There is an external *Okeanos Explorer* Advisory Group. Tim Shank is now a member of that group. This group gives advice to the science board.

The ROV contractor experienced a major system failure, which has delayed performance testing and final delivery of the ROV system that will be installed aboard *Okeanos Explorer*. The contractor is developing a plan of action and milestones for NOAA to consider and approve. Meanwhile, the system is in a facility in Tacoma, WA where they continue to work on it. The ROV is a dual body system and is labor intensive. For 24 hour operations, a minimum of 15 ROV pilots/engineers, video/satellite technicians, data managers, etc. are required.

The Ocean Sciences and Exploration Center (OSEC) at URI houses many offices including the Inner Space Center, NOAA, the URI Institute for Archaeological Oceanography, research space for IFE and the Ocean Exploration Trust. The URI Inner Space Center will become a shore-based facility that will function as the downlink site for various data sources and will be the central location to support NOAA and other missions enabled by telepresence technology. The ship will likely be home based in Rhode Island.

In 2010, the ship will be in the Western Pacific. The Western Pacific region of study was based on recommendations that came out of May 2007 OEAWG workshop where OEAWG solicited input from community.

Break

National Facility Operators Report:

NDSF Vehicle Operations Summary - Andy Bowen provided a summary report on *Alvin*, *Jason*, and *ABE* operations in 2009. His slides are included as ***Appendix VII***. *Alvin* completed two cruises with five remaining. Twenty dives have been completed and 81 are projected for the year. One dive was lost to weather. The average dive duration is 8.27 hrs and the average bottom time is 5.65 hrs.

Jason has completed three cruises with one more to go. Operational areas have included Tasmania, Mariana Islands, and Lau Basin. There have been 39 lowerings with the longest lowering lasting 50 hrs. A highlight of the operations was observing the real-time eruption at Lau Basin.

Two *ABE* cruises occurred in 2008. Jess Adkins, had six dives at two sites: the Sisters Seamounts (44-19S 147-14E) and the Tasman Fracture Zone area (45-17S 146-0E). Dr. Tao, COMRA and Jin Lin, WHOI, conducted four *ABE* dives using a combination of high-resolution multi-beam mapping and seafloor photography to locate and characterize new hydrothermal fields near 2S on the East Pacific Rise.

NDSF Data Management report – Slides are included as ***Appendix VIII***. Scott McCue reported that all non-video cruise data from spring 2008 forward has been copied to the on-line repository. It is protected by RAID with daily backups to tape. Earlier cruises are being copied opportunistically. All vehicle data packages will now include by-lowering organization. By-dive can be extracted from the *Jason* Virtual Van starting in June 2009. As for the future, data portal's placement in WHOI's cyber-infrastructure framework is undetermined and WHOI's Ocean Informatics Task Force recommendation is pending.

Vicki Ferrini reported on the Portal next steps. Vicky's funding for the development effort is ending. The data ingestion will migrate to WHOI /NDSF personnel during the summer 2009. AUV metadata will be added to the database. A plan will be developed to integrate 'by dive directory structure' with the relational database to make data objects (not just collections) discoverable and accessible through Data Portals. The plan will be presented to DESSC at the fall 2009 Meeting.

Discussion:

- Brian – NSF MG&G funds LDEO for the data portal. What is Vicky's perspective on this pilot? Vicky – She doesn't think that LDEO will be taking the NDSF data any further and that future efforts will fall into the hands of NDSF. LDEO is mostly involved with the science data instead of operations, so it seems more appropriate for the NDSF.
- Marsh – Will the next step be to incorporate the science data. Vicky – The Rolling Deck to Repository (R2R) initiative is helping to standardize the protocol for collecting underway data from ships.

- Deb – Is there a move towards a more standard cruise report. Vicky – They are trying to draw a line between science and operations. They don't feel it is their place to impose standards at this time.
- Andy – What is the relationship between PIs and R2R. Vicky – reviewed the protocol. Initially most of the underway data will be provided from the ship to shore with the assistance of the marine technicians.

Pilot Status and Personnel - Pat Hickey reported on the pilot status. His slides are included as ***Appendix IX***. There are three pilots at sea and Pat makes two cruises per year. Another pilot is on a contract basis for two cruises per year. There are four pilots in training and they hope to have one qualified by year end. Training is limited by short operations this year (6 months).

The new shore leave policy is now in effect. New personnel serve 8 months on, 4 off. New pilots serve 7 on, 5 off and pilots with more than six years as a Pilot earn 6 on, 6 off. Some of the *Alvin* personnel are participating in ROV legs this year due to the short HOV year. This has allowed for more cross training with the ROV.

Discussion:
- Catalina – Is shore leave paid? Pat – There is a shore leave bank.
- Pat – The RHOV project will offer opportunities to keep the pilots fully employed. The pilots can participate in site visits.
- Bill Chadwick – Does the ROV project have the same leave policy as *Alvin*? Andy – The ROV project is not as generous with leave, but the pilots don't do as much time in the field.
- Pat – This new leave policy was a work in process for a long time. It was an effort to get this through.
- Dolly –Does this present any issues with the ship's crew? Pat – The ship's crew is hourly, so they get overtime pay. The crew was making much more than pilots. Andy – The pilots were asked if they prefer money or leave and the pilots chose leave.

Deep Submergence Scheduling: 2010 and Beyond – Liz Caporelli reported on the requests for the NDSF vehicles in 2010 and beyond. Her slides are included as ***Appendix X***. For 2010, there are 50 AUV funded days, 39 *Jason* days, and 62 *Alvin* days. The pending days include 85 AUV days, 188 *Jason* days, and 47 *Alvin* days.

- Deb - What would be the *Jason* optimal days per year? Andy – It really depends on geographic range: 150 as the minimum and 220 is the upper end of the optimal range before straining the system. For *Alvin* the optimal annual days is about 220 days.
- Deb –We need to encourage the science community to keep proposal pressure high.
- Bill – There were 134 *Alvin* days in 2009. Andy – This was due to low proposal pressure.
- Liz - Typically there is more funded programs by this time of the year.

NDSF Vehicle Debrief Interviews - Feedback from recent *Alvin* cruises - Mike Tryon reported. His slides are included as ***Appendix XI***. All of the PIs were very satisfied with their *Alvin* experience and felt that their scientific goals were all met or exceeded. These were repeat users of the facility and many noted significant improvements from previous years. All personnel

from Captain to deck crew, Expedition Leader, pilots, and engineers were at various times singled out for praise. The *Alvin* team was universally praised for its professionalism.

The main point of these interviews is to track recurrent issues and make sure there is a follow-up and that ultimately there are no recurrent issues. We are finding that we are achieving that goal. Problems are being dealt with in a timely manner and equipment is being repaired, replaced, or updated as fast as is practical or budgets allow. The only truly recurrent issues seem to deal with navigation (which will likely never be totally satisfactory), mobilization/demobilization/agent issues, and dives lost to weather.

Some of the highlights and issues that were reported this year include:

- Pre-Cruise Planning - Despite the advance planning, operating in and out of Costa Rica (Puntarenas) proved difficult due to lack of docking and immigration issues
- Mobilization/Demobilization:
  - The new policy of allowing PIs to be able to get on-board ship 2 days in advance of the cruise was much appreciated. Not only did this allow the science party to prepare thoroughly but it also allowed the *Alvin* group to process all the scientists through their pre-dive briefings before leaving port – a distinct advantage when the first dive site was only 8 hours away.
  - There was insufficient time for making data disk copies during the short transit and demobilization.
- Operations - Vehicle:
  - Overall, the PIs thought *Alvin* was operating close to its very best and that *Alvin* and ship operations were very well integrated.
  - The batteries on the sub worked well throughout such that the key limitation to bottom-time was the ascent and descent times. Dives were as deep as 4400m, close to *Alvin*'s operating limit.
  - One dive was lost due to weather which the PI considered was a conservative call. The report that the Captain had in-hand was for the wrong area leading to a decision not to dive. Recommendation arising: Subscribe to "Commander's Weather."
- Operations - NDSF Equipment:
  - An outdated sound-velocity profile caused a 100m offset.
  - Navigation was hindered by the loss of the forward-looking sonar which failed early on and remained inoperative throughout the remainder of the dive-series and the following cruise.
  - The Homer Pros used routinely with *Alvin* at other sites are not rated for use at 4500m so they could not be used either.
  - On at least one dive there was no still camera working. On one dive the right hand video was not working properly and on subsequent dives the only way to record video was by having to take the overlays off.
  - There were problems generating usable data from the CTD on-board.
  - A PI recommended adding an oxygen sensor to *Alvin* with the same dynamic range as used on a CTD (0.04 to 2 mL/L)
  - There was a transponder problem.
- Data hand-over - The hand-held HD camera was used from within the sub on two dives but when the tapes were handed over at the end of the cruise, the tape from one dive was found

to be blank. If these tapes had been duped and handed-over right after the dive like normal dive-tapes the PI would have had the opportunity to try and rectify this.

- User Recommendations:
  - There should be a back-up for the Sonar on *Alvin*.
  - The ship should also maintain the 2 days prior to departure for set-up and *Alvin*-related meetings (e.g., briefing, exterior, in-hull) because that greatly enhances the ability to make full use of precious science time on-station once the ship sails.
  - Effort should be made to improve communications between the SSSGs and the *Alvin* Group.
  - More attention should be paid to the still cameras on *Alvin*.
  - Multibeam mapping from the *Atlantis* should be improved.

Response from Pat Hickey – Pat's slides are included as ***Appendix XII*.**

- Navigation was conducted using LBL for the first dive to the wellhead but a 100m offset from reality was introduced because the system had an inaccurate sound velocity profile that needed updating. Added to that, two of the transponders supplied were set up to operate at an identical frequency. – NDSF Response: The Expedition Leader stated that the offset was caused by the initial survey more than a bad SVP. The transponder frequency issue involved the elevator transponders where only one frequency was available; the wire releases and the sub emergency transponder were using the other available frequencies so 7.0/9.0 was the only set available.
- Navigation was hindered by the loss of the forward-looking sonar - NDSF Response: NDSF has requested quotations for a second spare.
- The homer probes used routinely with *Alvin* at other sites are not rated for use at 4500m so they could not be used. - NDSF Response: A deep probe has been priced, but the cost is significant, almost 3x the cost of a regular beacon. Economics and the normal dive locations dictated that four general-use shallow beacons be purchased instead of a single deep beacon.
- One dive was lost due to weather which the PI considered a conservative call. - NDSF Response: Neither WHOI nor NDSF management will second-guess the Master/Expedition Leader where safety of personnel or equipment is concerned.
- Both *Jason* and ABE/*Sentry* subscribe to a private email service providing predictions for 3-hour periods that seems accurate even in remote areas. - NDSF Response: Navy mandates 24 hr forecast not 3 hr but we will look into this agency.
- On at least one and maybe as many as three dives there was no still camera working. - NDSF Response: This camera was eventually sent to the manufacturer for a total camera replacement. A spare camera quotation has been requested and the cost is in the $25K range.
- On one dive the right-hand video was not working properly and on subsequent dives the only way to record video was by having to take the overlays off which has the potential to cause confusion when working up results from dive-tapes later. - NDSF Response: That problem was eventually fixed over several nights during the leg. The only other alternative would have been to stop diving operations for the repair.
- The hand-held HD camera was used in the sub on two dives but when the tapes were handed over at the end of the cruise, the tape from one dive was found to be blank. - NDSF Response: Tapes from this camera are normally checked post-dive and this will be done on all future legs.

- The Reson was on board and collecting data but the PI did not know it was available. - NDSF Response: The Reson sonar is brand new and is still a work in progress. If post-dive maps are required the Imagenex sonar would be installed to meet that requirement.
- There were problems generating usable data from the CTD on board *Alvin* that require more than just processing what *Alvin* collects using standard SeaBird software. - NDSF Response: Unit was sent to Seabird for refurb and it should now be more user-friendly.
- The PI would also like to see an oxygen sensor added to *Alvin* with the same dynamic range as used on a CTD (0.04 to 2 ml/l). - NDSF Response: Plans for the overhaul upgrade are to include this. The estimated spares cost is $116K.

Feedback from recent *Jason* cruise - Bill Chadwick reported and his slides are included as ***Appendix XIII***. The debrief process has been very successful and the users have been very pleased with the response from NDSF. Some of the issues that were reported include:

- The Virtual Van is still "on-line only"
- Better training is needed for renav & mosaicing software.
- There is a future need for processing non-LBL navigation.
- Weather limitations exclude half of the ocean at least half of the time.
- Focus on increased depth capability may be misplaced (weather is more limiting)
- Improved control system and pan-and-tilt for HD video camera is desired.

NDSF Response to *Jason* Debrief Issues – Andy Bowen responded to the *Jason* issues. Slides are included as ***Appendix XIV***.

- Virtual Van is still "on-line only" - NDSF response: It is now available offline and useable via web browser.
- Better training for renav and mosaicing software is needed - NDSF response: This was due to personnel changes and training is in progress.
- Future need: processing non-LBL navigation. - NDSF response: Agreed; this is a work in progress. NDSF will write code to change USBL to a useable format.
- Weather limitations exclude half of the ocean at least half of the time, and become unsafe in marginal conditions - NDSF response: Actual loss of dive time due to weather is <10% of total dives.
- Focus on increased depth capability may be misplaced (weather is more limiting) - NDSF response: Agree that weather is the limiting factor (especially when working at higher latitudes such as 46^{o}S), and suggest funding to develop a launch & recovery system (LARS)
- Improved control system and pan & tilt for HD video camera - NDSF response: Improved control of camera system will be implemented in the integration phase of the HD upgrade this year. The science observer will be responsible for operation of the HD camera, as is presently the case with the 3-chip camera.
- Do we still need a digital still camera (DSC)? NDSF response: This should be discussed by DESSC. We need more time with HD to answer this. Due to light requirements of the HD camera, we will likely continue to need a DSC with strobes. They could add strobes to HD.
- DSC in basket for close-up imagery? NDSF response: This is possible with minimal equipment purchases, but this will take a large amount of sample storage space.
- The standard turn-around time for NDSF ROV re-deployment is 12 hours. NDSF always attempts to shorten this TAT when possible. The primary consideration is operations personnel sleep/rest status. If there are repairs to be conducted on the vehicles this will affect

our ability to do a faster turn around. Changes to vehicle configuration will affect our ability to do a faster turn around. If ops personnel are concentrating their efforts on science or other equipment repairs this will affect our ability to do a faster turn around. Deployments of elevators are also a consideration because NDSF personnel build, deploy, and navigate the elevators to the sea floor. Attempts should be made to have all launches and recoveries occur at the change of watch, i.e. 0400, 0800, 1200, 1600, 2000, and 0000. This will help keep personnel on their normal sleep schedule and make it easier to do a fast turn around. Andy reviewed the Code of Federal Regulations regarding work hours and rest periods. The current mode already often violates these regulations.

Feedback from *ABE* cruise - Jeff Karson reported on the *ABE* debrief. His slides are included as ***Appendix XV***. Pre-cruise planning, mobilization/demobilization all went very smoothly. All 4 dives went entirely according to plan. Two dives made high-resolution maps of the seafloor and two dives conducted near-bottom photographic surveys, with temperature, turbidity, and ADCP data collected during both dives. All science systems worked fine. The data was reduced quickly after each dive. The *ABE* team generated first-cut SM2000 multibeam maps within 12-24 hours of each dive. There was some problem with the ability to track the vehicle acoustically from the surface ship, but it was not a major problem. The *ABE* team rigged a system to monitor the vehicle. There was an early temporary problem with the synchronization of the over-the-side transducer. An *ABE* team of four would be much more effective and provide training opportunities.

NDSF Response to ABE Debrief - Andy Bowen summarized the NDSF response which is contained in ***Appendix XVI*.**

Upgrades to National Deep Submergence Facility - Andy Bowen reviewed the NDSF upgrades. His slides are included in ***Appendix XVII***. Upgrades to *Alvin* include:

- Evaluation of the 600 kHz Doppler as a spare/replacement to the RDI units.
- USBL installation and evaluation, including SMS messaging and integration into existing navigation "pipeline"
- WHOI is evaluating options to spare DSC and obstacle avoidance sonar.

Upgrades to *Jason* include:

- Added a second Kraft manipulator to *Jason* from spares in response to DESSC concerns with manipulation capabilities
- USBL will be available later in 2009
- Testing a new strobe system to replace outdated Benthos system
- Made significant adjustments to the operations paradigm in response to DESSC concerns with turn around time.
- High Def in progress
- Increased payload

The Benthos 455 is no longer in use and the ROV is now using redundant transponder fixes (least squares). It is the same algorithm/code as used with *ABE/Sentry*.

The USBL hardware was delivered. The *Alvin* system was installed during transit from San Diego to Astoria and testing is being carried out during the current leg. The mobile system's first use is planned this summer with *Sentry*.

NDSF AUVs - *ABE* and *Sentry*:

ABE – The criteria for incorporating new assets into the NDSF <http://www.unols.org/committees/dessc/CRITERIADOCUMENT_062206.PDF>, require a review of operations after a year in service. *ABE* has been in service for a year and a written report has been requested from WHOI.

Sentry – Jeff Karson and Andy Bowen reviewed *Sentry* first cruise. Slides are included as ***Appendix XVIII***. The time between *Sentry*'s test cruise and the Delaney cruise was short, about four months. *Sentry* made its first scientific cruise on the R/V *Thompson* in support of John Delaney's work with the Ocean Observatories Initiative. Of primary interest was mapping the areas around Hydrate Ridge and Axial Volcano off of Oregon and Washington for cable and node installation. There were six dives and the total distance covered was 205 km. The average dive duration was 16.8 hrs (not as long as the PI anticipated). The navigation was erratic (INS lock-ups), not as stable as *ABE* navigation (LBL/DVL), resulting in gaps in bathymetry coverage. Because the *Sentry* team was so busy with trouble-shooting, gaps were not recognized until later and there was no time to go back and resurvey. There were shear pin failures on the propulsion system (known problem by WHOI before cruise).

The *Sentry* team was exceptional team, especially Dana Yoerger, but he had too many responsibilities which led to delays in delivery of maps. Navigation errors were experienced during Delaney's cruise. Fixes have been worked out and more robust programming has been implemented. INS has been reconfigured to prevent lock-up. A propeller to shaft connection failure resulted in slippage. This has been remedied with a robust metal hub on the propeller that mates to new thruster shafts with conical seats and keys.

The increased data processing work load from the Reson multibeam sonar has required an increase in staff until fully-tested, more automated processing can be implemented and operations staff cross trained. Multibeam pipeline is now in place and is being integrated into the larger NDSF data system.

Bathymetry gaps and navigation errors are being addressed. WHOI is still working on final bathymetry grids, etc.

Sentry was not fully ready for expeditionary mode and this raises questions about funding, data delivery, and expectations. *Sentry* has three cruises scheduled for 2009. It seems that more engineering cruises are needed instead of allowing research funds to be used for this development. Also, there should be some consideration as to whether it is okay to use the NDSF day rate for a vehicle under development.

HD Camera Status and NDSF Image/Film archives – Billly Lange reported on the status of the HD Camera Upgrade and Cruise Deliverables. His slides with full details are included as

Appendix XIX. The design goals for the HDTV upgrade are to develop an imaging system upgrade that improves the overall quality of motion and still-based imagery on *Jason* and *Alvin* without impacting the day rate. The timeline for the project is as follows:

- Endorsed by DESSC, December 2007
- *Approved* for funding by NSF, spring 2008
- *Camera* Head Completion, spring 2009
- *NSF* Phase 2 Integration funding, summer 2009?
- *System* Integration/Software Development, fall 2009
- *HD* Integration on Jason and Alvin, Early 2010

The project has a phased implementation approach. In 2008-2009 two HDTV cameras with zoom optics are being fabricated, including interface and control electronics. Testing of the prototype HDTV camera on *Alvin* and *Jason* is planned in 2009.

Full details of the HD upgrade are included in the appendix. Lessons learned from prototype HD Camera that will be incorporated into final HD integration.

Billy discussed the:

- Processing Software Development
- Still and motion imagery
- *Alvin* Image Data Storage
- Separate 7" ID pressure housings
- Motion Imagery Acquisition
- Flexible system design
- HD Upgrade Data Deliverables
- Hyper Spectral Sensor Testing
- Mini ROV / Stereoscopic Penetration ROV Development Program
- Stereoscopic Survey Program
- Misaiming Program with State of Wisconsin
- LED Lighting Evaluation Effort
- Digital HD Recorder Evaluation Effort
- Kane Fracture Zone Angus 35mm Survey Data Restoration and Conversion Effort
- USGS 35mm Film Conversion Program

Discussion:

- Bill Chadwick – At the end of the upgrade, if a PI has the recorder required to view the imagery, can they view it? Billy – yes for *Jason*, but it would have to be gas tested for *Alvin*.
- Deb – ROPOS routinely records HD onto terabyte drives and it works well.

WHOI NDSF Archive Policy – The current archive policy is posted at http://www.whoi.edu/page.do?pid=11037 . A draft proposed policy was provided to DESSC for comment and is included as ***Appendix XX.*** Deb said that the Committee had a very long discussion during their Executive Session. DESSC will formulate their recommendation and send it to WHOI.

NSF-STCI Proposal – Chris German provided a written summary of their proposal to NSF-STCI to establish the technologies required to convert old NDSF film/images to a digital format for long-term storage and future web-accessible capability. Andy Maffei reviewed the STCI proposal. His slides are included as ***Appendix XXI***. They have a four person team working with scientists to identify important institution-level data and information technology needs. Helping on the NDSF data archive image conversion proposal to NSF/STIC is one of their important efforts.

Much of the image data is at-risk as the recording media ages. Images data is not readily accessible to scientists and it lacks remote access. Fragility of media limits viewing opportunities. Descriptive data, navigation data is separated from image data.

A pilot program funding is sought through a proposal to NSF STCI. The initial focus will be upon image/video data from EPR 9-10° N dataset. The pilot scope is intended to produce a useful, complete archive suitable to address a significant science question. The pilot will provide the model for further digitization of existing holdings and processing of new image and video data.

Andy Maffei reviewed the proposed project (see the Appendix). The EPR was proposed because there is high scientific interest in this dataset. It is an area of extensive past and current research activities (~600 Alvin dives) and it involves many media types. The proposal will be submitted to NSF in August.

Discussion:

- George – What is the scope? Andy – They were originally considering one year. Now it might be longer.
- George – How many years of data and how far back would it go? Andy - Guidance is needed from DESSC both with respect to the extent and the order in which collections are preserved.
- George – Time series should be a criteria, pre and post erections. Areas with sensors could be a focus.
- Deb – DESSC will discuss the proposal further. DESSC can assist WHOI by prioritizing the film/image materials to be converted for modern storage.

HROV *Nereus* – Andy Bowen provided a report on the recent *Nereus* cruise. *Nereus* can be shipped on one 40-ft flat-rack. The system does not include a winch but it is available onboard most ships. There were some failed dives because of a cable break. The vehicle made it to the ocean seafloor at a depth of 10,902m. The scientists were very happy with the system.

The *DESSC adjourned at 1:30 pm.*
