

Meeting Minutes

DEep Submergence Science Committee Woods Hole Oceanographic Institution Carriage House Woods Hole, MA May 30-31, 2007

Executive Summary:

The Deep Submergence Science Committee (DESSC) met on May 30-31, 2007 at Woods Hole Oceanographic Institution (WHOI). The meeting included agency reports from NSF, Navy, and NOAA. Representatives of the National Deep Submergence Facility (NDSF) provided reports on:

- Vehicle operation summaries
- NDSF data and archives
- Ship maintenance updates and vehicle improvements
- Navigation and imaging upgrades
- Deep submergence scheduling in 2008 and beyond

Summaries of the NDSF user debrief interviews were reported. WHOI summarized proposed corrective actions to the issues raised by the users.

The meeting included status reports on new vehicle design efforts at WHOI. The design and construction of the replacement Human Occupied Vehicle (HOV) is moving forward and if all goes on schedule the sub would be ready for service in 2010. Meeting participants toured the WHOI deep submergence facilities including the development labs for AUV *Sentry*, the replacement HOV, and the hybrid ROV, *Nereus*.

Action Items:

Tasks from the May 2007 Meeting:

1. NOAA Request for DESSC Input – DESSC will contact Barbara Moore and request a written task statement that will explain the NOAA's request for community feedback regarding future deep submergence facility and technology needs.
2. New Control Van – Bill Chadwick will work with Chris German to develop a community survey on the design for a new ROV control van. DESSC recommends that WHOI create a full-scale mock-up van that will allow DESSC members to walk through and experience design options. WHOI is also requested to provide on-line schematic drawings of van lay-out options that could accompany the survey.
3. DESSC Biology Meeting – Deb Kelley, Craig Young, and Chris German will contact Phil Taylor (NSF) to discuss options for future DESSC/Biology meeting venues.

4. Pilot Retention and Career Advancement – DESSC recommends that WHOI prepare a document that addresses the institution’s strategies for pilot retention as well as the procedures for implementing exit interviews for those pilots who resign. DESSC recommends that WHOI management promote learning opportunities and career advancement opportunities for pilots.
5. DESSC Membership – Solicit nominations for a microbiologist to fill one DESSC member position. (Annette/DESSC)
6. Data Management – DESSC recommends that WHOI fill their NDSF data manager position as soon as possible.
7. Mode of Operation for *Jason* Watches – DESSC recommends that WHOI explore options for staggering the start and end times for *Jason* watches with the goal of achieving better continuity of the watches through a dive cycle.
8. OOI/DESSC Liaison – Deb Kelley will contact Holly Givens in the OOI office to establish a liaison process between OOI and DESSC.
9. Camera System – DESSC endorses WHOI’s Hybrid Imager/Sensor approach (see details on page 16 of these minutes).

Continuing Tasks:

10. NDSF Vehicle Debrief Interviews – In order to better track the status of vehicle and system performance, DESSC will conduct debrief interviews of PIs who use *Jason*, *Alvin*, and *ABE/Sentry* according to the pre-established procedures. The PIs will be informed on how the debrief information/reports will be used. Each report will be archived by the UNOLS Office. Debrief interviews will include the DESSC representative, the science user, and the NDSF Chief Scientist (Chris German). Agendas for future meetings will include summary reports of these debrief reports. DESSC representatives:
 - a. *Jason* – Bill Chadwick
 - b. *Alvin* – Michael Tryon
 - c. *ABE/Sentry* – Hedy Edmonds
11. Science Outfitting Survey for the Replacement HOV – A community on-line survey has been drafted. Annette will incorporate any changes. The survey will be available to the community in the fall. A summary of responses will be provided at the fall DESSC meeting.
12. Science Training Opportunities for Pilots – DESSC will formulate suggestions on workshop/training science sessions for pilots. The session(s) should demonstrate how the data from the vehicles are used for different research disciplines. DESSC will prepare an outline for different disciplines (e.g., geology, biology, chemistry) to indicate what elements of these programs would be beneficial to the pilots.
13. R2K Lectureship program – DESSC recommends that the R2K Lectureship program include an *Alvin* or ROV pilot as a distinguished lecturer. (Kelley)

14. Ocean Observatory ROV/Submersible Workshop – Organize an ROV-Submersible workshop for technology exchange and defining future facility needs. Participation should include ROV operators and engineers from WHOI, MBARI, and ROPOS. The workshop would be supported through UNOLS. DESSC, in collaboration with the agencies and UNOLS, will formulate the workshop description, objectives, and invitation list. (Kelley/DeSilva)

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Meeting Summary:

Introductory Remarks, Meeting Logistics, and Introductions - Deborah Kelley, Deep Submergence Science Committee (DESSC) Chair, called the meeting to order at 0830 on Wednesday, May 30, 2007. The meeting was held at Woods Hole Oceanographic Institution (WHOI), Carriage House. The agenda for the meeting is included as **Appendix I**. The items of the agenda are reported in the order addressed. Meeting participants introduced themselves. The list of attendees is included as **Appendix II**.

Accept minutes –The minutes of the [November 2006 DESSC Meeting](#) were accepted.

Agency and UNOLS Reports:

National Science Foundation (NSF) - Dolly Dieter provided the report for NSF and provided information about the NSF budget and personnel changes. In mid May, NSF received their FY2007 budget. The Ocean Sciences budget had a 0.7% increase for facilities.

Margaret Leinen, Assistant Director for Geosciences, left NSF in January 2007. Subsequently, there have been 32 applicants for that position. NSF is forming a short list for interviews. Larry Clark, Ocean Section Head, retired in May 2007. His position will be advertised. Currently, Eric Itsweire is the Acting Section Head. Dolly is the Acting Section Head for the Integrative Programs. NSF has interviewed four people for this position.

National Oceanic and Atmospheric Administration (NOAA) - Barbara Moore provided the report for NOAA. Her report covered three major topics:

1) There have been three organizations within NOAA (NURP, Ocean Exploration, and PMEL) that have used NDSF. Their budget was low in 2006 and 2007, and the budget for 2008 is not likely to improve. Any budget increase would likely be redirected into new facilities (i.e., R/V *Okeanos Explorer*). In FY07, three NOAA programs are scheduled to use NDSF vehicles, i.e., *Jason* in the Gulf of Mexico, *Jason* for support of PMEL's NEMO program, and *ABE* in the South Pacific.

2) Major changes are planned for the support of NOAA's undersea programs. The Ocean Exploration and the National Undersea Research Program (NURP) will be consolidated and called the Ocean Exploration and Research (OER) program. The east coast regional NURP centers will restructure into a research institute(s) under this new organization. The new OER will focus on exploration and technology research. The west coast NURP centers will continue to operate as usual.

3) Lastly, Barbara requested DESSC to seek advice from the scientific community at-large on the appropriate role of the NOAA centers and OER. NOAA has made a similar request to the Interagency Working Group on Facilities (IWGF). Barbara indicated that she is seeking input on priorities in terms of facilities; similar to what was provided by the UNOLS DESCEND workshops in the past. The committee should consider what facilities are needed and what is currently provided by the NDSF.

Discussion:

- Deb Kelley – What is the timing for the recommendation from DESSC/community? Barbara – Six months to a year.
- Deb – Are you requesting for a workshop? Barbara – Yes, a workshop funded through UNOLS.

Office of Naval Research (ONR) – Bob Houtman reported on personnel changes at ONR. Mel Briscoe retired and D. Vincent is Acting in his place. Dr Bob Gilco is moving from the Marine Life Sciences program to the Marine Mammal Commission. Jim Eckman is now Acting as program officer.

The ONR facilities budget in FY07 is about level the FY06 allocation. The FY08 budget is expected to be level. ONR shifted to a new accounting system in FY07 and as a result, processing grants has been slower than usual.

Bob reported that the Navy has been involved in the *Alvin* replacement process with NAVSEA representatives providing advice to WHOI throughout the design effort. The Navy is also involved with the development of the hybrid ROV *Nereus* with SPAWAR expertise contributing to the tether design.

In ship renewal efforts, ONR is moving forward with efforts to acquire two new Ocean Class ships. Construction for the first ship could begin in FY2011, with the second ship construction to follow in FY2012. ONR is using research funds to begin the ship design effort. Ship Construction Navy (SCN) funding will be used for construction of the ships. In order, to get approval for the funding, ONR will go through a milestone process that requires justification for the new ships at various phases. The first milestone is planned for October 2007.

UNOLS Report – Vernon Asper, UNOLS Vice-Chair, provided the report for UNOLS. His slides are contained in **Appendix III**. He discussed the following topics:

- 2007 Fleet Operations and 2008 Projections
- 2008 Non-operational periods in the UNOLS Fleet.
- Best Practices for the Collection of Data and Metadata at Sea to Promote Public Dissemination
- UNOLS Committee Activities

2008 Fleet Projections – The UNOLS ship schedulers are working to create draft schedules for 2008. The plan is to form a subcommittee that will seek input from UNOLS ship operators, the Council, and any other interested parties regarding recommendations for the 2008 Fleet operations.

Data Best Practices - UNOLS will form a subcommittee to report on best practices for the collection of data and metadata at sea to promote public dissemination. UNOLS announced a call for volunteers to serve on the subcommittee and many people responded. The subcommittee will be asked to provide the UNOLS Council with a brief White Paper on data management best practices within one year's time.

UNOLS Committee activities were reported and details can be found in Vernon's slides.

Vernon reported that there is a new web page for announcing science and education opportunities aboard UNOLS vessels <http://www.unols.org/forms/seeking_opportunities.asp>. Each year a portion of UNOLS cruises have available space for science and education opportunities. The site features a mechanism for Chief Scientists to recruit "watchstanders" to assist in their research cruise. Additionally, students and teachers who are looking for cruise opportunities can submit their availability information.

Lastly, Vernon reported that UNOLS has posted the Global Class SMRs last call for input <http://www.unols.org/committees/fic/global/GCSMR_Survey_Form.asp>.

National Deep Submergence Facility (NDSF) Operator's Report – Bob Detrick opened the NDSF Operator's report and Andy Bowen presented developments with the NDSF. Andy is the new Director of DSG/NDSF.

Introduce new structure and staff – **Appendix IV** contains the new NDSF organization chart. Barrie Walden has retired. The reorganization details under the DSG/NDSF Director are as follows:

- *Alvin* Operations manager – Bob Brown
- ROV Operations manager – Matt Heintz
- AUV Operations manager – Dana Yoerger (transitioning to Rod Catanach)
- Deep Submergence Engineering Manager – C. Taylor
- NDSF Data manager - TBD

WHOI hopes that the new administrative structure will make operations more efficient.

The at-sea organization hasn't changed much. Bruce Strickrott will serve as a relief Expedition Leader.

In other activities, the NDSF web pages are currently under revision.

***Alvin* personnel/staffing** - Bob Brown discussed staffing issues (**Appendix V**). He covered pilot qualifications, departures, new hires, training, and retention. One pilot recently departed the *Alvin* group and another pilot is on leave because of back surgery. A new pilot, Shaun Kelley, is

in the process of being certified. Currently, there are eight pilots; and as a result WHOI is in the hiring process. The new hires will require training. NDSF hopes to find ways to shorten the time required for training. As for pilot retention issues, WHOI is exploring various issues including salary, rotations, and time at sea.

Discussion followed:

- Jennifer Reynolds – In regard to the desire to reduce the amount of time for pilot training, is the plan to conduct some of the training at WHOI? Bob Brown – Yes. They will not reduce the amount of training dives conducted during science cruises.
- Jeff Karson – What is the optimal number of pilots? Bob Brown – That will depend on rotations, retention plans, time at sea, etc. There are a lot of variables. He cannot guess the optimal number.
- Catalina Martinez – Can simulators be used for training? Bob Brown – WHOI is looking into this.
- Jeff Karson – What sort of things are being looked into for retention? Bob Brown – Pay scales, time at sea, time and rotations. They would like to have more pilots qualified as Expedition Leader.
- Marsh Youngbluth – What is the Pilot turn over rate? Bob Brown – About seven years.
- Marsh – Why haven't they trained more pilots for the Expedition Leader role? Bob Brown – It was the WHOI policy to have just two. They are now changing that.
- Marsh – At Harbor Branch Oceanographic Institution (HBOI) they do a lot of cross training so that more people can fill various positions (in the event of sicknesses and other absences). Does NDSF have people available for cross training? Pat Hickey – Yes.
- Deb Kelley – Pilot retention has been an on-going problem. What tracking method will WHOI use to assess pilot retention? Bob Brown – Pat Hickey will keep track of the pilots in training. Deb – Will there be exit interviews for pilots leaving the program? Bob Brown – They did one.
- Bob – WHOI's goal is to improve pilot retention so that NDSF can provide a better service to the community.
- Matt Heintz - In the *Jason* group they face similar problems with retention. The problem is largely due to budget constraints.
- Deb Kelley – Will it be standard practice to do exit interviews? Bob Brown – Yes.
- Bob Brown – In the past, once a person became a pilot, there were no steps for future advancement – WHOI would like to provide the pilots with a next step for advancement.
- Bob Houtman – What is the optimum number of pilots? Bob Brown – NDSF would like to have a team of 11 pilots.
- Pat Hickey - Many of the people that are hired as pilots never make it through the training program to the pilot stage. It turns out that it isn't what they expected. Quite a bit of attrition is due to the fact that they often hire engineers as pilots, and once the pilots are at sea, they don't do much engineering work. The engineers want to practice engineering that they were

educated in. WHOI would like to be able to increase the pilot team size so that when the pilots are on shore they can be involved with engineering projects.

- Two months ago, NDSF posted a job advertisement. They received a good response from mechanical engineers, but not good from electrical engineers.
- Marsh Youngbluth – Is salary level a problem when hiring? Bob Brown – Yes. Matt Heintz added that this factor is also a problem with *Jason* pilots. New hires can get more money from industry.
- Chris German – As part of the NDSF restructuring of the facility, WHOI will be vigilant about pilot retention issues.

NDSF Vehicle Operations Summary - Rick Chandler provided a summary of NDSF vehicle operations (**Appendix VI**).

Alvin - There have been three *Alvin* expeditions since the last DESSC meeting in November 2006. Principal Investigators (PIs) were Karen Von Damm, Jim Ledwell and Tim Shank. All of the dives occurred at the East Pacific Rise 9N area, and the sub made a total of 45 dives. The cruises were followed by a 4-month layup of the sub. *Atlantis* made two more voyages before entering a maintenance period in San Diego in late April. Two *Alvin* technicians participated as watchstanders on the Klein *Jason* cruise. Two *Alvin* engineering dives are planned off San Diego in late June 2007 for equipment testing.

Regular *Alvin* operations are scheduled to resume in early July 2007, with seven cruises and 75 dives scheduled through December 2007. These trips will take the ship from California to Juan de Fuca, then south to Guaymas and ending on the East Pacific Rise (EPR).

Jason – *Jason* operations included work off Hawaii and on Loihi Seamount in the fall 2006. Support ships included *Melville* and *Kilo Moana*. In January/February 2007 *Jason* was used from the German research vessel, *Maria S. Merian* on the Mid-Atlantic Ridge. There were 11 *Jason* lowerings with 105 hours of data were collected. In March/April 2007, *Jason* was used from R/V *Atlantis* at EPR 9-10N with five lowerings and 290 hours of data collected. There were also three *DSL-120* lowerings with 135 hours of data collected. Other collections included 303 rock samples (2,400 lbs of rocks were obtained).

NDSF Support Ships:

Atlantis - Al Suchy reported on *Alvin*'s support ship, *Atlantis* (**Appendix VII**).

Projects underway during the May/June 2007 ship maintenance period include:

- Dynamic positioning system replacement
- Switchboard overhauls
- Engine control and safety shutdown wiring replacement
- Engine overhauls (#2 and #4)
- #1 generator exciter installation
- Wet Lab deck replacement
- Winch monitoring system replacement

- Crane monitoring system replacement
- Work and rescue boat replacement

The switchboard overhauls included a new voltage regulator installation. The installation wasn't planned for this overhaul, but during Emily Klein's cruise a failure was experienced, so it was decided to include the new regulator installation in the shipyard period. To accomplish the installation more time than originally planned will be needed for the ship maintenance period.

The #2 and #4 engine overhauls were needed because of a catastrophic failure. WHOI is trying to determine the cause(s). The #1 generator exciter also experienced a catastrophic failure and they think this breakdown was linked to the engine failure.

Alvin - Test dives are planned for June 29 and 30 following the maintenance period.

Other Support Ships - Andy Bowen reported on the other ships that have been used to support NDSF operations (**Appendix VIII**).

In October/November 2006, ROV *Jason* was deployed from *Melville* off Hawaii. The Scripps Institution of Oceanography (SIO) winch and wire were used to reach a depth of 5,100 m. There were no problems and great support from both the ship and SIO's marine facility was provided. Next, *Jason* dove off of Hawaii to verify the ship-fit of equipment, launch/retrieval procedures, dynamic positioning and acoustic navigation with *Kilo Moana*. This testing was the first installation of *Jason* on *Kilo Moana*. The shipboard traction winch was utilized for operations to 5,000 meters (recovered several instruments). No substantive operational issues were identified. Bruce Applegate and the ship captain were very accommodating.

Question – Was the height from the deck to the water an issue during *Jason* operations from *Kilo Moana*? Matt Heintz – Not really, the increased distance from the water was about 7.5 ft more than on other ships. Andy added that the unique features of the SWATH vessel (*Kilo Moana*) must be considered when operating *Jason*, but there are no limitations. Working from a SWATH vessel might open weather windows for *Jason* operations. However, during their test cruise, they didn't experience any major seas or weather.

In January 2007, *Jason* was operated off the RV *Merian*, a new Class 3 ice-strengthened German vessel. These deployments represented the first use of the *Jason* system on a European research vessel. A 60Hz dedicated generator was required and this gear posed some challenges. The SIO winch and cable was used. The ship's crane was utilized for ROV launch/retrieval. Dynamic positioning, navigation, and elevator operations were satisfactory.

NDSF Data Management:

Status of Data Management Position - Andy Bowen reported that there is a position open in the NDSF for a data manager. Andy's slides are in **Appendix IX**. With Vicki Ferrini's departure, WHOI is looking for a replacement; however, funding will only allow half-time support. NDSF will seek additional support for data management through WHOI's Shipboard Scientific Services Group (SSSG). NDSF/SSSG posted a job opening in April and this

opportunity remains active. Several well-qualified applicants (both internal and external) are presently being interviewed. They hope to have the position filled by August.

Vicki Ferrini left WHOI for Lamont-Doherty Earth Observatory (LDEO) in the fall 2006, but remains a key player with NDSF and is under sub-contract for 2007. Vicki's ongoing involvement will provide continuity and direction for future data activities.

Update of the *Alvin* FrameGrabber & *Jason* Virtual Van - Chris German provided a brief overview of the systems, the current status, recent updates, and future plans (**Appendix X**).

The virtual van was developed and built by Steven Lerner, Andrew Maffei, and Danielle Fino in September 2000 (Keck Foundation funded). The goal of the system is to snapshot all the information happening in the control van in real-time and provide easy web browser access to the integrated information on ship and on shore (for post-cruise work). The system consists of an acquisition system, video capture system, 4dGeoBrowser server, web-based user-interface, and web-based event logger. This system runs on Linux. The user interface can capture video displays, navigation, vehicle telemetry, science instruments, and user events.

The FrameGrabber was developed by Steven Lerner, Barrie Walden, and Dan Fornari. The Windows' production system was built and installed in April 2003 (NDSF funded). The goal of the FrameGrabber is to snapshot all the information in the submarine in real-time and give easy web browser access to the integrated information on ship for pre- and post-dive synopsis and for onshore post-cruise work. The system consists of an acquisition system, video capture system, web-based user-interface and the capability to process historical cruises. User features of the FrameGrabber include: a scrolling/clickable map, image highlight/annotation, interactive time-bar, summary icons (proof-sheets, time-series plots), and VCR-style navigation buttons.

The *Jason* virtual van has been operational since September 2000 and has been used on 33 cruises. 2,369,738 images have been collected. The *Alvin* FrameGrabber has been operational since April 2003 on 51 cruises (518 dives). 647,486 images have been collected.

The renav capability for the *Jason* virtual van is operational. There are four *Jason* cruises (39 lowerings) of renavigated data in the database. The *Alvin* FrameGrabber renav capability is in the test phase. Ten *Alvin* cruises (136 dives) of renav data is processed and ready. The shore web server has been updated. A FrameGrabber system for *ABE/Sentry* is in the design phase.

The fundamental difference between the virtual van and the FrameGrabber is that the virtual van data are available on the internet (password protected) for up to two years. On the *Alvin* FrameGrabber, the data have to be uploaded after each cruise. The *Jason* data are available on the internet, but are not available by CD. WHOI is considering the best way to move forward with this technology.

Update on the new NDSF event logger - Vicki Ferrini provided an update on the NDSF event logger (**Appendix XI**).

The new event logger was funded through MGDS. The goals are to improve the ease with which digital metadata are captured and to improve the functionality of NDSF event loggers. The system has been compatibility beta-tested. Events and configuration files are emailed to LDEO after each dive. The metadata are extracted on shore and transmitted back to the ship. Future plans for the new NDSF event logger include continued beta-testing during the upcoming Fisher cruise. They anticipate a modified interface for *Jason* operations this year and will explore options for an *Alvin* interface. There is a controlled vocabulary for use with the event logger. The science party can have their own controlled vocabulary and this vocabulary can be changed on a dive-by-dive basis.

Vicki reported on the *Alvin* navigation/Imagenex. Bathymetric errors (meter-scale offsets) were identified during the Marine Geosciences Data System (MGDS) R2K-funded processing of *Alvin* navigation and Imagenex data. The source of problem was identified as a timing issue and loss of bottom lock. Software modifications have been made to prevent recurrence of the timing problem. New operational guidelines call for bathymetric surveys to be conducted at an altitude less than 20 m.

NDSF navigation and sonar software tools were discussed. At-sea processing during the *Atlantis* cruise (T15-17) was successful. At-sea renav data was ingestion into the virtual van and high resolution SM2K maps were generated. NDSF dive renav data is currently available through MGDS and includes 136 *Alvin* dives (renav and Imagenex data) and 39 *Jason* dives (renav). There is MGDS access to NDSF navigation data through Data Link and GeoMapApp / GoogleEarth. There are live links to the virtual van/FrameGrabber images via GeoMapApp and GoogleEarth.

Vicki discussed at-sea Quality Control (QC). For *Jason* data, there is navigation QC via trained *Jason* data processors. Additional QC script development and DVD write error checking is planned during the summer 2007. For *Alvin*, the potential for SSSG to implement comparable QC functionality for *Alvin* navigation & FrameGrabber data will be investigated.

Discussion:

- Marsh Youngbluth – Can other parameters be displayed (Vicki had showed temperature)? Vicki – basically anything that is logged can be displayed.
- Marsh – Can voice recognition be added? Vicki – A user can type things in. They have looked into voice recognition, but with accents, etc. it is too challenging.
- Marsh – Can live video be added? Vicki – It is doable, but would be a big undertaking. They are looking into this option.
- Catalina – Is this QC planned for all cruises? Vicki –RIDGE would like to do this QC for all cruises.
- Bill Chadwick – Does the long-range Doppler work? Andy – they just went through a \$12k overhaul and it should work. Dana – the Doppler 300 had a hardware problem, but is now working.

Archiving Status – Chris German reported that there have been numerous requests for visual NDSF materials for publications and exhibits (**Appendix XII**). Journalists visiting WHOI and NDSF vehicles during the past year included representatives from the WHOI & MIT Journalism Fellowship, USA Today, Boston Globe, Monterey Times, Science Daily, and The Times of India. Income for 2006-07 is \$24,338. The support needed for managing and distribution of the archive material is approximately 25-30 hours per week.

Upgrades to National Deep Submergence Facility

Overview of Vehicle Upgrades being undertaken in 2007:

Alvin - Bob Brown reported on the *Alvin* upgrades (**Appendix XIII**).

Near term (June 2007) *Alvin* upgrades include:

- Install Adept / Lotus Notes
- Provide Network Time Protocol (NTP) to *Alvin* computer bank
- Provide timing signals to *Alvin* navigation system
- Allow for synchronized LBL navigation with *Atlantis*
- Install Frangibolt release devices
- Install RTD temperature instrument designed by Lane Abrahms
- Test LED lighting - 3,000 to 4,000 lumens as compared to 2800 lumens
- Test new LBL data acquisition system /trigger system
- Install Precision time standard – The Precision time standard provides timing signals to *Alvin*'s navigation system. It allows for synchronized LBL navigation with *Atlantis* (a more reliable navigation).

Upgrades planned later in 2007 include:

- Install PHINS (inertial navigation) - They have one on hand, but PHINS has too many serial ports for use on *Alvin*. They hope to have a solution later this summer.
- Test rate-controlled hydraulic control system for starboard manipulator
- Test digital still camera controller – WHOI is working with Jim Varnum for development of a digital still camera.

Jason - Matt Heintz reported on *Jason* upgrades (**Appendix XIV**).

Upgrades include:

- Imaging and lighting upgrades - On the upcoming Chuck Fisher cruise; the data will be sent ashore for second level processing. NDSF hopes that the need to send data ashore will be reduced in the future.
- Sonar and data upgrades
- New LBL navigation, USBL tests
- Address payload issues that include effer crane modifications and identifying places for incremental gains in payload via redesign – Over time the air weight of the vehicle has increased as instruments have been added. Adding flotation to the vehicle would help with buoyancy, but then the crane will not be able to lift the vehicle because of the extra foam

weight. This payload issue has been a difficult problem. Five vans are now required for shipping the vehicle and associated equipment.

- Motor controller pod modifications to address corrosion issues
- Manipulator upgrade and/or spares
- Development of a preventative maintenance program due to lack of overhaul time
- Organizational procedures for documenting failures and repairs, and better spares management
- Longer tethers to increase transit and operational speed
- The *Jason* control vans must be replaced at the end of the 2007 season due to age. WHOI would like input from DESSC on the redesign. Input is needed soon. WHOI would like to have the funds in hand by end of the year.

Prioritization of key items identified in Bill Chadwick's 2006 letter on *Jason* operations - Chris German provided the report (*Appendix XV*).

Bill Chadwick's letter addressed nine key issues regarding *Jason* operations:

- 1) Long Baseline Navigation
- 2) Video Imaging
- 3) Digital Still Imaging
- 4) Audio Recording
- 5) Suction Sampling
- 6) Virtual Van/Event Logging
- 7) Payload
- 8) *Medea* Maneuverability
- 9) Control Van Layout/Ergonomics

The first three items were the highest priority and the status is reported later in the minutes. Items 4 and 5 have been addressed and are running well. Vicki reported on item 6, the event logging. Matt reported on the payload issues (item 7) and what is being considered. As for item 8, *Medea* maneuverability, the thrusters on *Medea* haven't worked well, so a longer tether between *Jason* and *Medea* will be tried.

Item 9, the *Jason* control van layout/ergonomics is the area that WHOI has requested DESSC's input. WHOI plans to transfer to the new *Jason* control vans in the Winter 2007/2008. Updating equipment is preferred over cross-decking from the old van. Chris recommended that a van questionnaire be circulated via the UNOLS/DESSC mailing list. Chris could work with Bill Chadwick to draft the questionnaire. Jennifer suggested sending a direct email message to the past *Jason* users. Marsh Youngbluth suggested that figures/schematics of proposed van lay-outs be developed and accompany the questionnaire. Matt Heintz indicated that feedback is needed over the next few months.

NDSF Navigation Update - Chris Taylor provided the navigation update (*Appendix XVI*).

The plan for upgrading navigation included replacement of the acoustic signal processor and replacement of the software. Since the November DESSC meeting, the prototype ship box has been built. Its test on *Melville*; however, was unsuccessful due to hardware problems. Tests

were then carried out on *Kilo Moana* and were successful. Two transponders surveyed in deep (5km) water.

The PRV box has been developed and includes two DR boards in a single rack mount chassis. One board (*Medea*) triggers the other, as well as a subsea trigger. The Benthos 455 emulation software has been developed.

Next the ship box was tested on *Atlantis*/ROV. It was the same box that was successful in the *Kilo Moana* test surveying transponders. In port, the ship box and DSL Benthos 455 worked. At sea, the box and Benthos were unsuccessful at obtaining travel times using *Atlantis* Straza ducers with either the ship box or DSL Benthos 455. The cause of failures was not determined but believed to be electrical noise related to the use of the transducer junction box in the computer room aboard *Atlantis*. The same ship box, when returned to Woods Hole and used with a spare Straza transducer, worked fine. Additional testing had mixed results. Troubleshooting in Woods Hole then revealed an intermittent failure in a *Jason* board. The board was replaced and the system continues to operate satisfactorily.

Future plans call for both boxes to be sent to R/V *Ron Brown* for more testing. NDSF is also building a new ship box to take to *Atlantis* for *Alvin* engineering dives. The purpose is to troubleshoot issues from previous *Atlantis* ship box tests.

Lastly, Chris reported on implementation plans. The Benthos 455 will be replaced as soon as feasible/practical in 2007 (ROV and *Atlantis*). The DR boards are compatible with *Alvin* in-hull navigation and should be able to integrate without huge difficulty. The DR boards are also compatible with AUV requirements planned for use in both the AUV *Sentry* and the HROV *Nereus*.

NDSF-wide imaging update - Bill Lange gave a review of NDSF imaging and a preview of possible future directions (**Appendix XVII**). He started by describing the NDSF Underwater Imaging Program. The Advanced Imaging and Visualization Laboratory at WHOI has developed imaging systems for scientific and filmmaking projects; specializing in high resolution imaging for underwater, aerial, 3D, and spacecraft/monitoring applications. Since 1995 the lab has been working with HDTV ITU 709 format imaging. Deep submergence underwater imaging is very complex and differs greatly from other imaging environments. Deep submergence imaging platforms can be broken down into two main categories: AUVs and HOV-ROVs.

AUV imaging platforms use fixed lighting with still image-based data collection. HOV-ROV imaging platforms have lighting systems that are variable: intensity, position, number, color temperature, and beam patterns. The cameras can move independent of lights; lights can move independent of the cameras. Cameras typically have variable focal length lenses. There are three main categories of underwater imagers: motion cameras, still cameras, and hybrid cameras. Bill presented the current state of high resolution motion imaging sensors on *Alvin* and *Jason* and the overall camera complement on *Alvin* and *Jason*.

The 3CCD Cameras on *Alvin* and *Jason* are complicated and are designed to be used by operators who have experience with camera operations. Basic video guides and fundamental training should be provided to improve the skill levels of both NDSF operators and scientific users. Some controls should be disabled to discourage untrained tweaking of the control options.

One display in the *Jason* control van was converted to Y/C in 2007. This conversion was done to improve the quality of monitoring for the camera operators and the scientific users. The *Jason* van has video test equipment. When used with the Y/C monitor, with the control knobs defeated, the video test equipment should provide proper indication to the user of the true recorded signal. *Alvin* currently is using composite and Y/C monitors in the sphere and SDI-component monitoring in the science duplication station. Y/C viewing on *Alvin* is currently accomplished via the VTR display or in the future via the pilot display.

Both *Jason* and *Alvin* vehicles currently have configurable lighting systems. Lighting is critical for the success of any imaging operation. Bill reviewed the lighting modes.

Bill made the recommendation that NDSF develop and distribute lighting configuration information to DESSC, Chief Scientists and operations personnel and through the web user manual. Included in this information will be impacts on time, payload and dive time/power. Both vehicles have lighting “booms”, which can greatly improve survey style imaging. Users need to be made aware of these options.

Bill discussed lighting geometries. Greater light to camera separation reduces back-scatter and improves the illumination field for underwater imaging. Geometries on *Alvin* and *Jason* are optimized for vehicle operations, not for imaging applications. Scientific users can find themselves attempting to conduct imaging operations in areas around the vehicle where insufficient lighting is available. Bill’s lighting recommendations are that for the short term, better communication and exchange between operations groups and the scientific users, perhaps through meetings at WHOI with an imaging specialist involved at the pre-cruise planning stage, may contribute to improved and more efficient use of the vehicles and ship-personnel time at sea. Current NDSF digital still cameras are mostly modified, re-packaged consumer grade still cameras. Common factors limiting image quality are complicated user menus. Short-term recommendations for obtaining better digital still images include: Conduct image/data collection logistics meetings with operators and develop camera simulators for pre-dive training design lighting and user configuration guides for *Alvin* and *Jason*.

Long-term recommendations for digital still imaging include incorporation of hybrid, still-motion imagers and using HDTV and hyper definition imaging systems. Hybrid sensors can acquire motion and still images of sufficient quality suitable for scientific exploitation, publication and documentary/ broadcast distribution.

There are currently more than 38 HDTV standards and formats. There are more than seven consumer and HDV standards and formats; in other word, there are many choices.

Bill explained that HDV is not HDTV. HDV data rate is equal to DVCam. HDTV systems use intra-frame compression at low loss levels. NDSF supports ITU-709 HDTV format, and has

successfully deployed HDTV camera systems on deep submergence vehicles for over a decade. They currently have two HDTV camera systems that are *Alvin*-friendly (arm mountable), and numerous other HDTV and hyper definition camera systems for use by the scientific and documentary community, including macro and 3D cameras.

The Lab has a number of hyper definition motion and still cameras currently under development and testing.

Bill presented the hybrid imager concept. The hybrid sensor approach has many benefits:

- Allows for high quality stills to be acquired simultaneously with high quality video
- Improves the resolution of the existing video cameras
- Does not require an immediate change to the motion recording infrastructure
- Allows for wide dynamic still images to be collected and processed post collection
- Provides an upgrade path to HDV or HDTV systems while minimizing the effects of the compression schemes
- *Alvin* and *Jason* could be converted without immediately changing the motion video infrastructure on both platforms
- A majority of this work has already been developed at the Advanced Imaging and Visualization Lab for Navy programs.

In the next 1-2 years, optical technology may offer NDSF a cost effective manner to record HDTV signals at costs more in line with DVCam rates. Currently, NDSF is limited to \$60/hr or greater tape costs for recording HDTV video. In the next few years the optical HDTV rates are expected to decrease to about \$25/hr.

NDSF Vehicle Debrief Interviews:

Update on new procedures implemented in 2007 - Chris German reported on the new procedure in 2007 for conducting NDSF user debriefs (*Appendix XVIII*).

In November 2006 DESSC agreed that DESSC should conduct debrief interviews with the NDSF Chief Scientists. Standardized questions would be used for objectivity between the vehicles. The interviews would include the DESSC 'best friends', the NDSF Chief Scientist (Chris) and the Chief Scientist for the cruise.

The debrief topics include:

1. Pre-cruise planning
2. Mobilization
3. Operations - Vehicle
4. Operations - NDSF provided equipment
5. Operations - User provided equipment
6. NDSF Personnel - Expedition Leader
7. NDSF Personnel - Team as a whole
8. Data hand-over
9. Demobilization
10. Recommendations

Four debrief interviews have been performed. After each interview, Chris has prepared a written summary report that he shares with either Bill Chadwick (for *Jason*) or Mike Tryon (for *Alvin*).

The issue of confidentiality of the PI's comments was discussed. Confidentiality is a sensitive issue and a policy is needed.

Summary of debrief interviews conducted to date:

Jason – Bill Chadwick provided a summary of the *Jason* debrief interviews (**Appendix XIX**). User de-brief interviews were conducted for four cruises between July 2006 and April 2007. Bill summarized the user comments according to the following systems/topics:

- 1) Navigation (LBL)
- 2) Video Imaging
- 3) Digital Still Imaging
- 4) Audio Recording
- 5) Suction Sampling
- 6) Virtual Van/Event Logging
- 7) Payload
- 8) Medea Maneuverability
- 9) Control Van Layout/Ergonomics
- 10) Overall / other issues

NDSF Response to Jason Debrief Interviews - Matt Heintz reviewed the proposed corrective actions in response to the *Jason* debrief interviews (**Appendix XX**).

Proposed actions include:

- 600W strobes lights have been rented for testing improved lighting (some users commented on darkness issues). All lights and cameras were sent out for repair during the recent maintenance period.
- NDSF is evaluating grip versus speed tradeoffs for the manipulator arms.
- The virtual van will be left up and running during transits until the end of the cruise (this practice is in response to a comment that the system was shut down before arriving in port).
- NDSF will also look into SM2K processing improvements.
- Tradeoffs for *Medea* are being evaluated. The system is slow because of the tether between *Jason* and *Medea*. A longer tether will allow *Jason* more time to sample on the bottom. The control system for the Schilling manipulator arm allows good grip. There is another manipulator available that will work with a long tether and allow quicker transit speeds.

Deb Kelley asked what will be the upgrade priorities for the future. Matt replied that the cameras are in good shape with no major reliability issues. There are plenty of spares. The LED lights use less power (useful for *Alvin* and the HROV). There was discussion on the HDTV system. If funds are available, the HDTV system will be tested on Bill Chadwick's summer cruise.

Each manipulator arm is different. The Schilling and Kraft arms make a nice complement. Pat Hickey commented that the Schilling T4 has a better range of motion and now has a longer reach. There were grounding problems with *Alvin*'s Kraft arm and that arm has been transferred over to *Jason*. The Kraft arm has a delicate touch and the grip pressure can be controlled. The Schilling arm doesn't have pressure sensors. However, for dexterity and strength, the Schilling arm is preferred.

LUNCH BREAK

Alvin – Mike Tryon couldn't be at the DESSC meeting to report on the *Alvin* user debriefs. Chris German gave Mike's report (**Appendix XXI**). *Alvin* user feedback was collected from two cruises in early 2007. More details are shown in the slides, but some comments of interest included:

- Slurp gun - Particular success with the implementation of a slurp gun using it for catching fish (not a normal requirement) using spare *Alvin* thruster.
- Mobilization - More disruption in shipping gear (to/from container port) than usual.
- Operations - NDSF provided equipment:
 - CTD on *Alvin* is good but needs more systematic calibrations for physical oceanography applications.
 - Magnetometer, slurp, Imagenex (incl. timing) all worked well.
 - DSC image quality not as good without lighting booms from Multidisciplinary Instrumentation in Support of Oceanography (MISO) facility.
 - Software problems in the sub that crashed the system.
- Operations - User provided equipment:
 - New sensors & HD cameras all interfaced extremely well and with great success. The *Alvin* Group worked hard to implement multiple changes in basket configuration.
 - A big key to success was the ability to have an in depth pre-dive meeting with the entire *Alvin* piloting team (rather than just the next day's pilot) each night at 7 pm. What seemed a sacrifice of precious time to do this so early in the evening proved extremely valuable by the cruise end.
- Data hand-over:
 - The pre-cruise briefing left confusion over how many blank DVDs the science party should have brought on the cruise. There needs to be greater clarity over what should be expected at the cruise end.
 - Key issues identified included:
 - Lack of quality assurance conducted by the Shipboard Scientific Services Group (SSSG) routinely at sea
 - Data need to be accessible at sea for scientists wanting to do quality assurance checks.
- Final Recommendations - *Alvin* CTD has no spares and should be considered for replacement.

Deb Kelley added that after Marv Lilley's cruise, he lost samples while shipping them back to the States. Other samples have been lost in Iceland, Mexico, and Brazil when being shipped

back to the States. It is suspected that the samples may be lost as they go through Customs and it is feared that this problem will be a growing trend.

NDSF Response to *Alvin* Debrief Interviews – Bob Brown reviewed the proposed corrective actions in response to the *Alvin* debrief interviews (**Appendix XXII**).

Proposed actions:

- The *Alvin* CTD has been placed on the calibration tickler. Consideration will be given to replace the CTD with permanently-mounted, NBOSI CT sensors.
- Dive science requirements will be included in the “night before” pre-dive meetings and dive loading suggestions will be included in pre-cruise brief
- WHOI will update the *Alvin* User Manual and pre-cruise brief to clarify the required data media.
- *Alvin* sampler – A shorter version of the *Jason* sampler is under construction (might test in June, if finished).
- User Manual update for seafloor mosaicing and development of a ‘button box’ for DSC lighting and operation.
- NDSF will investigate the current practices regarding data hand-over and QA and the ability to make these available on a daily basis.

Deep Submergence Scheduling: 2007 and Beyond - Liz Caporelli reviewed the 2007 NDSF schedule and requests for 2008 (**Appendix XXIII**). In 2007, the total operating days for *Atlantis* was 293 (NSF 274, NOAA 18, ONR 1) with 98 *Alvin* dives. A map of the *Alvin* work areas and cruise track was displayed. All work was in the Pacific Ocean. The 2007 *Jason* schedule included 207 days (NSF 125, NOAA 55, and German 27).

Liz presented the 2008 *Alvin* requests. There are 82 funded dives and 85 pending dives. UNOLS ship schedules, on the whole, are light and there are some triple bookings. The 2008 proposed *Jason* schedule includes 68 funded days and 149 pending days.

Looking further into the future for the period of 2009 to 2011, there a total of 111 funded days. Maps and vehicle request summaries are included in Liz’s slides.

Discussion: Dolly stated that for 2008 there are no NOAA requests for use of the NDSF and this lack of participation has serious financial implications. ONR and NOAA will each support 1 engineering dive in 2008. Consequently, NSF will have to support all NDSF operations.

Science pressure for use of the NDSF must remain high or the day rate will be too expensive. Deb commented that within RIDGE scientists continue to hear from NSF that there are no funds for field work, so people are not submitting proposals. Dolly replied that Julie Morris is trying to keep Core funding high. Deb suggested that NSF send a message to the community to keep science proposal pressure high.

AUV *Sentry* Update –Dana Yoerger provided the *ABE/Sentry* update (**Appendix XXIV**). *Sentry* trials are scheduled for September 2007 and the vehicle will be ready to enter NDSF in 2008.

Meanwhile, *ABE* has passed dive #200 with over 3000 km of bottom tracks. Dana reported on *ABE*'s cruise Expedition 115-19, Search for Hydrothermal Vents on the Southwest Indian Ridge. The first active vent discovery was made on the Southwest Indian Ridge. The cruise was sponsored by China Ocean Minerals and R & D Association (COMRA). The 3-phase plume search/survey technique used in the cruise was successful. All vent structures showed evidence of hydrothermal activity. The science party used the *ABE* generated map and "TV grab" images to locate and recover samples from active smokers.

Sentry development and upgraded elements were described. They include:

- New batteries (*Nereus* packs)
- Multibeam sonar (Reson 7125)
- New frame, weight droppers/anchor system
- PHINS inertial navigation
- New CT sensor
- New camera/LED strobe
- Dual magnetometers
- Instrument bay (Tethys mass spec as placeholder)

The *Sentry* timeline and mechanical overview is provided in the slides. The vehicle battery capacity was upgraded to 13 KWH. *Sentry*'s speed will double that of *ABE*'s speed. *Sentry* testing will be on *Oceanus* in the fall 2007.

Replacement HOV Update - Bob Brown reported on the replacement HOV (RHOV) project status (**Appendix XXV**).

Titanium for the RHOV sphere has been purchased, received, and passed the chemical receipt inspection. More titanium than originally planned had to be purchased for the forging process. A contract has been let with a sphere forger, Ladish Co., Milwaukee, WI. The forging should start in the fall 2007 and be finished in March 2008.

WHOI has considered options to reduce RHOV project costs. These options include:

- Loosen/modify technical specifications - Options to loosen/modify technical specifications include removing the requirement for a training simulation system and removing the requirement for a whole vehicle pressure test.
- Reduce programmatic requirements - To reduce programmatic requirements, options include:
 - Focus hazard analysis based on WHOI experience
 - Emphasize models versus 2D drawings
 - Eliminate or scale back low value-added analysis/documentation.
- Shift more work to WHOI - Options for shifting more work to WHOI include:
 - WHOI purchase and provide as owner-furnished equipment, high cost material and equipment (saves pass-through fee)
 - WHOI contract with ABS for vehicle certification (saves pass-through fee)
 - Design and build atmosphere control, fire detection and suppression, emergency breathing systems

- WHOI managerial costs – WHOI has been able to reduce managerial costs based on the fact that expenditures to date have been less than expected.
- Cross-deck more *Alvin* equipment - Another cost savings option is to cross-deck more *Alvin* equipment. Potential items for cross-decking are listed in the slides.
- Change contract structure/approach - A revised contracting strategy is under consideration. The proposed new contracting approach uses the Alpha Contracting Methodology. The approach calls for collaboration between WHOI and the contractor in developing specifications and cost estimates. The advantage of Alpha contracting is a clearer understanding by both parties of the requirements. The procedure will reduce risk to contractor and mitigate potential cost overruns. The anticipated savings from these cost reduction actions is about \$7.5M.

The final viewport configuration for the RHOV is five viewports of the following diameters (in inches) 5-7-7-7-5. This layout was recommended by the community survey.

Deb Kelley asked - How does the timeline between the next required *Alvin* overhaul and the RHOV completion match-up? Bob Brown – The next *Alvin* overhaul would be in 2011. WHOI would like the sub transition to fall within the same time span as a typical overhaul period. It won't take long to cross-deck equipment from *Alvin* to the RHOV. So the plan is not to do an *Alvin* overhaul, but instead to introduce the replacement vehicle.

Science Outfitting and Sensors for the Replacement Human Occupied Vehicle (RHOV) – It was recommended that the community survey on science outfitting and sensors for the RHOV be put on hold until after the control van survey is complete. Also, when the survey is ready, it should be sent to Cindy Van Dover, RHOV Committee Chair.

Establishing Safety Standards for the use of Human Occupied Vehicles (HOVs) - Craig Young reported on the efforts to establish Safety Standards for HOVs (*Appendix XXVI*). Craig reviewed the committee membership. There are eight chapters:

1. Introduction
2. Definitions
3. Procedures
4. HOV Operations
5. HOV Support Ship
6. HOV Handling Systems
7. Training of HOV Crew
8. HOV Science User Guidelines

A revision of the Research Vessel Safety Standards is currently underway and will include a chapter on “Ship Operations with HOVs.”

The Committee has been very active and most chapters have been drafted.

Transition of the *DSL-120A* out of the NDSF – Paul Johnson (University of Hawaii) reported on the status of *DSL-120A* (*Appendix XXVII*). He reviewed the letter from Margo Edwards and Chris German sent on July 13, 2006 to the community regarding the transition of *DSL-120A* to

Hawaii Mapping Research Group (HMRG). The HMRG deep submergence mapping tools include *DSL-120A*, *IMI30*, *MR1*, and *IMI12*.

Paul reviewed the current status of the *DSL-120A*:

- The 120A sonar was deployed at two sites on the EPR (9°50'N and at the 9°N Overlapping Spreading Center (OSC)) in March 2007 during a Klein/White/Perfit cruise (AT15-17).
- The 120A collected roughly seven days of data for site reconnaissance before *Jason* was deployed for sampling.
- The system worked well collecting sidescan, phase bathymetry, and SM2000 multibeam bathymetry which were all used to generate mosaics of the recent flows at 9°50'N and the two limbs of the 9°N OSC.
- Following the cruise, control of the 120A was transferred from DSL to HMRG. Gear was divided at sea and the system was then shipped to its new "home port" of Hawaii. Examples of *DSL-120A* data from Klein cruise were displayed.

Paul reviewed the past use of the sidescan systems and provided a list of proposed and funded *DSL-120A* and *IMI30* cruises for 2006 through 2009. There have been 19 proposed surveys for the period from 2006 to 2009: but only one was funded and five are pending. The lack of agency funding has not led to a drop-off in proposal pressure for these systems.

Paul presented the future plans for *DSL-120A* and near bottom high resolution mapping:

- HMRG has purchased a new magnetometer, CTD to replace those kept by DSL.
- Towed navigation system is being developed by HMRG, which should aid in correctly navigating the 120A data (for when LBL is not available).
- Continuing work on integrating LBL and DVL navigation into *DSL-120A*'s hardware and processing methods.
- Some modification of the telemetry of the 120A required to converge with other HMRG mapping systems: would allow for a common spares kit for all vehicles, exactly the kinds of economy of scale envisaged in the July 2006 letter.
- Ixsea Octans was not transferred to HMRG. Replacement (and hopefully a spare as well) is a very high priority. The Ixsea Octans is needed to collect the high precision attitude information essential for generating high quality data mosaics - and that is what the scientific community requires.
- \$60K has been requested in 2007 to make sure the 120A is able to continue collecting data at the same high level that the community expects.
- The real-time display developed for the *DSL-120A* has shown its adaptability. The display is being used for IMI-30 and the multibeam of the *Kilo Moana*. Continuing development of this tool would allow real-time display of laser line scanner data.

Paul provided an update on *IMI30* and reported that field trials were a success. During the summer 2006 cruise on the R/V *Kilo Moana*, paid for by the University of Hawaii, the system was lowered on the northwestern slopes of the Big Island of Hawaii. Sidescan, bathymetry, and sub-bottom data were all successfully acquired.

Future work on the *IMI30* includes:

- Engineering work to increase the signal strength to the arrays & widen swath-width.
- Integration of magnetometer and CTD
- At least one more sea trial in the summer 2007
- Possible work for the system includes survey around the island of Oahu as well as survey work in the Indian Ocean for NIO.

Discussion:

- The *DSL-120A* and *IMI30* systems offer a great nested survey capability. The *DSL-120A* is a 1 km, high-resolution system. The *IMI30* has three times swath width of the *DSL-120A* and is good for mapping a much larger area, but with lower resolution. Chris added that although the system was transferred to Hawaii, it is important to the NDSF.
- Deb Kelley commented that HMRG is requesting \$60K to maintain the *DSL-120A* system. This commitment equates to the cost of two days of mapping. Dolly replied that since the system is no longer in the NDSF, its support now comes out of a different pool of funds within NSF. With no funded requests for use of the system, there is no need to upgrade the system just to keep it on the shelf.
- Dan Fornari stressed the need to have the system ready for use.
- General opinion of DESSC – The committee thought that there would be some operating funds or transition funds to support the system once it was moved out of NDSF to HMRG.
- Jeff Karson asked if the \$60K would just support transfer costs of the *DSL-120A*. What is the annual cost? Dan – An estimate on annual operating costs might not be available yet.

DESSC Recommendations regarding Pilot Training and Advancement:

- Science Training Opportunities for Pilots - During last year's DESSC meeting it was recommended that the pilots should be given more science training opportunities. This recommendation is still an action item and can be discussed further during the executive session.
- R2K Lectureship program - Deb reported that she sent a letter to Donna Blackman regarding the R2K Lectureship program and suggested that the pilots be added as lecturers. This option is still open and we are waiting for a reply from Donna.
- Career Advancement /Learning Opportunities for Pilots - Bob Brown discussed this (in part) earlier in the meeting with the desire to implement a shorter training period.

Ocean Observatory ROV Workshop for Technology Transfer, Looking towards Future Needs – Deb Kelley reported that a small workshop was held with the ROV operators from *ROPOS*, *Tiburon*, and WHOI. This meeting provided an opportunity for operators to share information. At the workshop, there was a recommendation to get a similar group together to

address OOI ROV facility requirements. NSF has indicated that they would support a small workshop. Dates and locations for a workshop will be considered. The workshop will most likely occur in early 2008. It was suggested that the designers of the observatories also attend.

Meeting Action Items – Deb reviewed the action items from day one. See list at the top of these minutes.

1630 Day 1 of the DESSC meeting adjourned.

Day Two: Thursday, May 31, 2007

0800 Tour of Deep Submergence Facilities – The DESSC meeting participants visited the NDSF facilities in Woods Hole village. This included tours of *Sentry*, the Replacement HOV, and the HROV.

0915 Return to Quisset Campus

Alvin Video Mosaicking - Stace Beaulieu provided a report on efforts to develop an *Alvin* video mosaicking capability (**Appendix XXVIII**). Co-PIs on the project include Stace Beaulieu, Tim Shank and S. Adam Soule from WHOI, and Yuri Rzhano and Larry Mayer from UNH. The main objective of the effort is to develop software to create image mosaics from video and navigation data collected during *Alvin* dives.

Reasons for video mosaicking include:

- Dive planning and reports during the cruise
- Science (during or post-cruise)
- Identification of features on larger scale than single images
- Visual confirmation of features in side-scan sonar or bathymetric maps
- Habitat mapping and density of benthic fauna.

The capability already exists for the French IFREMER vehicles.

Manual processing is useful for transect mosaics when you have limited or no navigation data, or when you want to quickly make a mosaic for a targeted video segment. Manual processing is required for panorama mosaics. Automated processing produces transect mosaics for the entire dive track, using video frames extracted from DVCAM tapes based on vehicle navigation and altitude data.

Video mosaicking was tested during three *Alvin* cruises: EPR, Feb. 2004, Galapagos Rift, May 2005, and EPR, Oct./Nov. 2006. In the 2006 cruise, automated mosaicking was performed during the cruise for 7 of 15 dives. Many of the mosaics were satisfactory (did not require manual post-processing). The amount of data storage necessary per dive is 30 to 40 GB.

For the best quality video mosaics, starboard lighting and the starboard arm 3-chip camera is recommended. The camera should be as normal to seafloor as possible and zoomed all the way out, with the port observer recording the video transect.

Together, *Alvin* video mosaicking software and *Alvin* FrameGrabber provide a similar capability to proprietary software.

The PIs on the grant are currently delivering software at sea and online. The PIs are also recruiting scientists to try the software. They would like to identify an online “home” for the software. By 2008, the PIs expect to publish the User Manual as a WHOI Technical Report.

Dan Fornari added that if you use *Jason*, you will get DVCam footage and can use the procedures outlined by Stace to get the video mosaicing.

For now the video mosaicking system is PC based only (as is the French system). It would be quite a different step making it work for a Mac system.

Jeff Karson – Do you need to do a nice linear transect for video mosaicking? Stace – Yes.

Benchmarks at the Ridge2000 EPR ISS - Dan Fornari provided a report on benchmarks at R2K EPR ISS (*Appendix XXIX*).

The EPR-ISS benchmark surveys provide high-resolution mapping using sidescan and bathymetric sonars. Dan showed the *DSL-120A* survey post-eruption results during AT15-17, *Jason* Dive 268. He also showed the Ridge2000, EPR ISS DSL-120a sidescan sonar surveys from 2001 (pre-eruption) and 2007 (post-eruption). The lava flows are clearly visible. The SM2000 surveys during *Jason* dive 268 were displayed with overlays from the AST surveys, benchmark surveys, and benchmarks. Dan showed pictures of the benchmarks that were deployed and a picture of the benchmarks on the seafloor. The markers that Dan had deployed in 1992 were almost all gone (only about 2 of 100 remain). From now on when a researcher visits an ISS site, a transponder array with benchmarks will be already installed. Images of the OBS units stuck in the lava were shown. There is footage on the web of the OBS recovery.

Winter Meeting Strategies - There was discussion on the November DESSC Meeting held at the Western Society of Naturalists (WSN) 2006 meeting. On the positive side, over 100 students attended the post-meeting mixer and there was good feedback from students. On the down side, the actual DESSC meeting was poorly attended by the community and students.

The winter DESSC meeting in 2007 will be held at the Fall AGU meeting on Sunday, December 9, 2007.

Some potential biology venues for the next DESSC meeting include the 2008 Benthic Ecology Meeting in Providence, RI on April 9-12, 2008 and the Deep-Sea Biology Symposium in 2009 (the exact dates and location have not been announced). It isn't clear which meeting would be best. Also the timing isn't a good match with the traditional winter meeting dates. Dolly suggested that someone from DESSC talk to Phil Taylor about options. Deb indicated that she

would contact Phil. The problem is that there is no one Biology meeting that all deep submergence scientists attend annually. Another suggestion was the Society for Integrative and Comparative Biology meeting to be held in 2009 in Boston. There was a comment that deep submergence scientists don't attend the Ocean Sciences meeting.

Long-Range Planning Issues:

Ocean Observatory Initiative (OOI) Status - Bob Detrick reported OOI received FY07 funding and the Initiative is in the budget for FY08. There is an RFP on the street for the third element, the Coastal Observatory.

There is a new OOI Office Director, Holly Givens. OOI is no longer referred to as "ORION."

OOI continues efforts to rescope/descope the observatory designs. The number of nodes planned continues to go down. The first assets probably will not go in the water until 2009. In the short term, the demand on deep submersible assets isn't going to tax our present suite of facilities. However, an assessment on the suite of tools that the observatories should have to service the nodes should be made.

Deb Kelley added that there is some good news. Another \$20M was added to the MRE account for inflation. Neptune Canada is also thinking about installing the observatory cable sooner to avoid inflation costs.

Neptune Canada – Deb Kelley reported on the status of Neptune Canada. Their cable is 800 km long. Alcatel won the contract and the system will go in the water next year. There are nodes at Mid Valley, gas hydrate, ODP holes, and Endeavour. Neptune Canada was able to get \$20M more for added costs.

Andy Bowen asked if DESSC should establish a formal liaison between OOI and DESSC. With an OOI design review in the fall, now is the time. Deb will contact Holly Givens to discuss this matter. It would be beneficial if the OOI group representative attended DESSC meetings.

Bob Brown suggested that someone from the *Alvin* group should be involved with the ROV workshop.

InterRidge – Chris German provided an InterRidge update (**Appendix XXX**). The InterRidge Office will be hosted at WHOI from Jan 1, 2007 to Dec 31, 2009 with Chair, Jian Lin. Co-Chair is Chris.

The InterRidge (IR) Working Groups have five current projects:

- Biogeochemical Interactions
- Biology => Vent Ecology
- Deep Earth Sampling (w/IODP)
- Monitoring & Observatories (MoMAR w/R2K)
- Ultra-slow ridges

Chris provided information about each of these programs. He showed a map of the research areas (**Appendix XXX**).

RIDGE2000 – Deb Kelley reported that there was a R2K meeting in April. RIDGE is coming up for review. The outcome is still evolving. It has been decided that EPR and Endeavour are mature sites and should be transitioned from ISS to core sites. EPR could become a core site in 2008. Endeavor would possibly transition in 2008 as well. Lau will stay as is. When ISS sites were selected, it was decided that there should be an Atlantic site, so MoMAR was selected. If MoMAR is going to be the next site to transition to Core, a new plan for the Atlantic will be needed. There is concern that high cost seismic cruises will consume the RIDGE funds.

Outreach and Education Programs:

RIDGE Lectureship Program – This year’s lecturers include Mike Perfit, Doug Toomey, Gary Massoth and Jim Childress.

MATE Program – There will be another Mate intern in the *Alvin* group and a couple of interns on WHOI ships.

Ocean Exploration - Catalina Martinez reported on NOAA’s Ocean Exploration education programs (**Appendix XXXI**). Catalina also described a new potential application of telepresence technology to conduct scientific research, exploration, and outreach. She discussed web-based alternatives to deliver information and products. The alternatives offer:

- Live expedition coverage
- Daily logs, video, images
- ‘Ask the Scientist’ live link
- National Curriculum
- Virtual Workshops
- Online courses
- List Serve
- Lesson Plans
- OceanAGE
- CD ROMs

Lastly, Catalina discussed telepresence technology. Remote video feeds from the seafloor and ships at sea can be transmitted anywhere in the world in real time.

NOAA plans to convene a workshop to discuss its new Ocean Exploration vessel, *Okeanos Explorer*. There was a call for suggestions on where should the ship should operate and what should projects it could pursue. The recommendations will be provided to the NOAA science advisory committee.

Operational Summary and Collaborations with Other Deep Submergence Activities:

NURP & Ocean Exploration – Catalina provided a report (**XXXII**). She summarized the NOAA NDSF efforts in FY2007. There were three NDSF cruises: Expedition to the Deep

Slope - PI: Chuck Fisher, *Jason* (Ron Brown), Area: Gulf of Mexico Submarine Ring of Fire - PI: Bob Embley, *ABE* & German ROV (*Sonne*), New Zealand NeMO - PI: Bill Chadwick, *Jason II* (*Atlantis*), Juan de Fuca.

Catalina reported on NOAA's OE ship *Okeanos Explorer*. The vessel was acquired from the Navy in 2004. It is undergoing a phased conversion at Todd Pacific Shipyard in Seattle:

- Phase I: Major vessel infrastructure modifications and select mission systems (Oct 06-Jul 07)
- Phase II: Most science/mission systems (Sep 07 – Apr 08)
- Phase III: Additional science/mission systems, auxiliary vessel systems (TBD)

Operations are planned to begin in spring 2008. Details are contained in the Appendix.

A dedicated ocean exploration ROV will be constructed to support operations. Phoenix, Inc. has been contracted to build the vehicle. NOAA hopes that the ROV will be ready for operations at the time the vessel conversion is complete.

The Ocean Technology Center (OTC) at URI is involved with the integration of the telepresence capability for the vessel and they hope to have the system ready for science in mid-2008. OTC preparation of the telepresence system includes development and integration, staffing and training, testing and evaluation, and refining. There is a lot of challenging work to be completed.

Catalina showed pictures of the ship in the shipyard. The University of Rhode Island will likely be the vessel's homeport. The ship is not large and has a range of 30 days. It will be NOAA operated with their Corps.

In 2008, NOAA will focus on bringing the ship on-line. They hope that in 2009, they can focus on science planning.

HBOI Operations – Marsh Youngbluth reported on ship and submersible operations at HBOI. The *Johnson Sea Link* (JSL) vehicles have been underutilized and as a result only one is in operation. For 2008, there is about 20 JSL days pending. The ship, Seward Johnson, is also underutilized this year with about 124 days.

Other business:

DESSC Membership – Deb Kelley proposed revised term end dates for some members to avoid losing too many Committee members in the same year. The proposed revision modifies the term-length of the second term. The Committee endorsed the revised term lengths.

The ex-officio DESSC membership was discussed. The ex-officio members are from WHOI and currently include Bob Detrick, Tim Shank, and Chris German. Tim hasn't been able to attend the past couple of meetings. WHOI will ask Tim if he wants to stay on.

Review Meeting Action Items – Deb reviewed the action items from the meeting. The list is included at the beginning of these minutes.

Discussion:

- RHOV science outfitting survey – Deb expressed concern that if WHOI has already defined the sensors for the RHOV, why is a survey needed? DESSC had thought that there would be an opportunity for community input. Bob Brown explained that WHOI is providing the sensors. The basic vehicle design is frozen, but the design will hopefully allow for future flexibility in sensor compatibility. A community survey would still be useful and should be carried out in the fall. Deb added that the survey can ask the question of what tools are needed for a vehicle that will provide support for the next 30 years. The survey can provide information on the instrumentation/sensors that will be furnished, and then ask, for a vision of what is needed.
- Status of merging NDSF facilities at Blake and Smith – WHOI is working on this project. There is more integrated coordination now, but the physical move is a challenge.
- Recovery Vehicle - Dolly stated that NSF funded a recovery vehicle – what is the status? Bob Detrick said that he will show Dolly the system in the afternoon. The recovery vehicle should be discussed at a future DESSC meeting.
- FrameGrabber system – Deb said that there is some confusion regarding the FrameGrabber. Chris replied that WHOI will come up with a plan for move forward and will present an overview to DESSC.
- Deb gave a heads up to WHOI and reminded them that as part of the criteria for bringing in new assets to the NDSF, a report is required after one year. Chris replied that he will look into this requirement.

The DESSC meeting adjourned at noon.