UNOLS NEWS

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A Safety Message from the UNOLS Chair

Dear Colleague:

UNOLS is entering its 25th year in 1996. These past 25 years have seen dramatic changes in the profile of the academic fleet. As we enter our second generation, the fleet has evolved from one that was composed primarily of surplus vessels converted for oceanographic research to one that is almost completely purpose-built for oceanography. At the same time, the work that is conducted on these platforms has become more interdisciplinary and shipboard instrumentation has grown more intricate. The science operations that are now conducted on UNOLS research vessels represent nearly the entire spectrum of the work done in our nation's premier scientific laboratories. This work may range from deploying large instruments such as Remotely Operated Vehicles and deep-sea moorings, to probing the atmosphere with laser-based instruments, to studying trace elements under clean room conditions.

Each of the many types of operations performed by scientists on UNOLS ships bring unique safety issues with them. One of the primary functions of UNOLS is to ensure the seagoing facilities can support this work in a safe manner. The Research Vessel Operators' Committee periodically reviews and revises the *Research Vessel Safety Standards*. The latest edition was just released in January 1996. The safety standards set for ships of the UNOLS Fleet and for performance of the crews is in excess of the regulations set by the U.S. Coast Guard. The standards include at sea tests of ship and crew performance. These benefit the overall operating efficiency and reliability of the vessels. The requirements have lead to the establishment of high safety and operating standards for the entire fleet. Any ship that cannot meet these standards does not remain in the fleet.

It is the captain who bears ultimate responsibility for safety onboard ship and who must make all final safety-related decisions. However, the science operations conducted onboard ship are so complex that the science party must provide major assistance to the captain. The Fleet Improvement Committee has recently written a White Paper that reexamines the role of the scientist in shipboard safety issues. It is reprinted in this issue of the UNOLS News. The issues that it raises should be considered carefully by each Chief Scientist and discussed with members of the science party. Each Chief Scientist needs to carefully consider their role in supporting safe operations onboard ship. This includes ensuring that the ship's crew is fully informed of any hazards involved in ship board operations well in advance of the cruise. In the case of multi-institutional cruises, it means that each group must work with the Chief Scientist to ensure that the safety issues are well understood by all and that they are communicated to the crew. If not, the scientists may ultimately find that their research cannot be safely supported and not allowed to proceed after the ship has set sail.

Safety briefings are traditionally left until just before or after the ship sails. However, this may not be the best time because the science parties' attention is often focused on last minute details. The RVOC and FIC are considering the development of training videos that could be viewed well ahead of departure, allowing the science party to focus on safety needs before the hectic prevailing period. It may be that we are forced to move the traditional safety briefing on cruises to a time period before the ship sails, to ensure that we have the full attention of the science party. One important step in making this information available is to utilize the Internet more effectively. The UNOLS Office has put the *Research Vessel Safety Standards* and Chapter 1 of the *RVOC Safety Training Manual* on their Home Page (http://www.gso.uri.edu/unols/unols.html). The resources should be used by seagoing scientists to ensure that they are prepared to conduct safe science

operations.

UNOLS will continue to move forward to ensure the safe operation of ships and seagoing science. Offshore sailing has been called long periods of total boredom, interspersed with a few moments of shear terror. We should limit oceanography to long periods of boredom, interspersed with moments of intense scientific discovery.

Ken Johnson
UNOLS Chair

Safety Responsibilities aboard UNOLS Vessels

by Suzanne Strom with contributions from Jack Bash, Joe Coburn and the Fleet Improvement Committee

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Safe operation of UNOLS vessels is an issue of fleet improvement. During recent discussions of the Fleet Improvement Committee (FIC), various safety issues were raised. These issues may be particularly timely for several reasons: 1) the fleet profile is changing, with increased inclusion of smaller vessels and more specialized platforms; 2) scientific operations at sea are continually evolving, often in the direction of increased complexity and expense; and 3) fleet users are changing. Multi-institution and multi-national user groups are now the norm on the larger vessels. Use of research vessels by students and other first-time or inexperienced users may be increasing; certainly NSF now stipulates that even the large vessels be used for undergraduate education on a regular basis. Due to the changing nature of national and international support for ocean science, these changes are likely to accelerate. This position paper will outline some safety issues and pose potential solutions. It should be a starting point for future discussions and policy decisions on the part of UNOLS.

A. Responsibility and liability for safety at sea: Historically and currently, the captain and his/her institution have been held 100% responsible for safe vessel operations. This includes responsibility for safe conduct of scientific operations. In practice this assumes a more detailed involvement in scientific activities than is practical or desirable on most cruises. Research cruises are perhaps unique in that they involve a mix of typical ship operations and scientific operations that may be technically and logistically complex. The current situation could cause the captain to play a much larger role in the conduct of science than the scientists want. Conversely, the chief scientist, who in actuality oversees the details of daily and hourly scientific operations, currently may not take an active part in safety-related training and decision-making.

Is it fair and proper to hold the captain completely liable for scientific operations at sea? To what extent should the chief scientist be responsible for safety? What are the trade-offs between liability and autonomy in the conduct of safe science? To what extent can or should UNOLS be involved in formalizing this partitioning of responsibility?

B. Actual and potential safety problems: It is important to determine whether UNOLS safety issues stem from actual or merely potential problems in conduct, training, and operation. Qualitative information suggests that the UNOLS fleet is actually quite safe relative to other fleets (though this viewpoint is not shared universally). The Fleet has not been criticized for being unsafe, and the results of the last questionnaire indicated that the Fleet was perceived as very safety conscious. According to Jack Bash, there have been five fatalities in the past 20 years. Three occurred during routine ship operations/maintenance and two during transit at night. Two small research vessels, GULFSTREAM and HOLA HOLA, were lost at sea without a trace in 1975 and 1978, respectfully. These vessels were from UNOLS institutions and, though technically they did not come under UNOLS rules, in at least one case the courts held their activity to the UNOLS safety standards. It is not clear how this safety record compares with that of other fleets, e.g. in

terms of accidents or fatalities per hour of vessel operation time. A quantitative comparison may not be possible as records of exposure time, the denominator of the equation, apparently are not kept.

Potential safety problems may exist. These arise from the unique organization of a science mission. Ship time is expensive and scientists tend to work extremely long hours while at sea. Science operations may equal or exceed routine ship operations in logistical complexity, e.g. putting large pieces of expensive gear over the side in rough seas. Scientific personnel change frequently and nearly every cruise has untrained and inexperienced people in the scientific party; identification of potentially unsafe situations tacitly relies on more experienced crew members or scientists. Currently there appears to be no mechanism or program that explicitly addresses the safety issues arising from these features of a research cruise. Should UNOLS be involved in developing such a program?

Some Considerations:

Pre-cruise training - This currently consists of a safety lecture by the captain or first mate, generally on the first day of the cruise, as well as a fire and boat drill. The safety lectures are generally thorough, but can be mystifying to the seasick first-time sailor with no knowledge of the jargon. They may or may not cover aspects of scientific operations. Should a more rigorous safety training program be required? How can safety training be carried out in a manner more conducive to taking in and retaining information?

Safety information - The RVOC *Safety Training Manual*, Chapter 1: Research Party Supplement, published by UNOLS) should reside in every stateroom of every UNOLS research vessel. This manual is admirably free of jargon and touches on the major safety issues of sea-going research life. An informal census suggests, however, that some sea-going scientists have never heard of the Supplement, while others had never taken the time to read it. How widely distributed is the Supplement in actuality? How can the research party be made aware of its existence? How can we ensure that everyone reads it amidst the rush to load, set up, and get underway? Small placards in the labs might be a simple way to emphasize the existence and importance of the Supplement.

Diving operations model - The dive community has addressed the safety issue by instituting a set of training and procedural standards (Chapter 16, UNOLS *Research Vessel Safety Standards*). Research dives do not occur until the dive master has met with the captain and presented a dive plan and evidence of qualification for each of the divers. A single lead institution is designated for each cruise; the procedures and regulations of this institution govern the diving operation and this institution approves the dive plan of any scientist involved in diving work. Should this be a model for safety training for all ocean-going scientists? Training could consist of a short CPR-type class that explicitly addresses safety issues arising during oceanographic cruises. This could tie in specifically with the chief scientists' responsibility for the safe execution of scientific operations. It would also separate the safety training issue in space and time from the activities of loading and getting underway on the actual cruise.

C. Safety inspections: Non-Navy owned UNOLS vessels currently undergo safety inspections once every two years. These are conducted by NSF Inspection, under the auspices of the Facilities Section (headed by Dick West). The inspections are contracted out to a team of inspectors selected by NSF. Navy-owned UNOLS vessels are inspected every three years by the Navy's Board of Inspection and Survey (INSURV). ONR is working to alternate the NSF and INSURV inspections on Navy-owned ships.

Based on the NSF Inspection report of the 18 May 1995 inspection of R/V OCEANUS, the NSF inspections are extraordinarily thorough. Integrity of hull, tanks, piping and electrical systems are examined, as well as operational condition of all machinery (engines, ventilation systems, pumps, hydraulics, booms, frames and winches). Safety gear and crew safety training are assessed; realistic fire and man-overboard drills are conducted. A sea trial is conducted to evaluate the ship's performance under demanding conditions. Condition and functionality of living and working quarters are evaluated. The technical services in support of scientific operations are evaluated in a general manner. Finally, a detailed list of recommendations is

provided. The information in the inspection report is a useful summary of the ship's capabilities and weaknesses.

Ability of the crew to assist with scientific operations is not evaluated except through UNOLS cruise assessments. It is probably inappropriate to include such evaluations in an already lengthy inspection process that deals primarily with the integrity and safety of the ship as a platform. This issue is intimately related to the issue of crew turnover (below).

D. Crew experience and turnover: One of the major strengths of the UNOLS fleet is the experience and dedication of the ships' crews. This relates closely to safety issues: experience with the range of scientific operations performed on research vessels translates directly into increased safety and better science. While most UNOLS vessels have retained a stable cadre of experienced, highly trained crew members, a few have not. How can high rates of crew turnover be dealt with? Is there some means of training new crew members to deal specifically with the requirements of working on a research vessel? Should there be some crew turnover rate beyond which a ship is reviewed regarding inclusion in the UNOLS fleet? How is this type of information obtained and who would keep track of it?

RECOMMENDATIONS:

1) Potential safety problems do exist, especially with regard to scientific operations. UNOLS should be involved in creating or revamping safety standards for science at sea.

2) A copy of the *RVOC Safety Training Manual*, Chapter 1: Research Party Supplement should be sent to each chief scientist well before each cruise. UNOLS should also prepare a guide to safety training for the scientific party. This should cover general shipboard safety training as well as training in procedures that may be unique to a particular cruise (e.g. coring operations, deployment and recovery of large gear). Safety training information could be presented on video or CD-ROM; review of the information should be required before and perhaps at regular intervals during each cruise.

3) Communications between the chief scientist and ship's captain (and other key personnel) should be open and frequent prior to the cruise. As the ship's captain and home institution are likely to be held responsible for activities and accidents on shipboard, institutions should devise a means of evaluating the preparedness of each scientific party before the cruise. This might involve mandatory physical examinations as well as the above-mentioned safety training. UNOLS should be involved in designing this evaluation procedure.

4) Some level of crew stability should be required for inclusion in the UNOLS fleet. UNOLS should put forward specific recommendations on this issue, and consider the most effective way of tracking crew stability and experience. This may be a simple matter of looking at employment records during existing inspections.

The Naval Oceanographic Office hosts the UNOLS Fleet Improvement Committee and Council Meetings

by Commander Darrell Smith, Naval Oceanographic Office

Recently the Naval Oceanographic Office, located at the Stennis Space Center, Mississippi, hosted the Fleet Improvement Committee (FIC) and the UNOLS Council meeting on 5-7 February and 7-9 February, respectively. Captain Dieter K. Rudolph, Commanding Officer, Naval Oceanographic Office, provided the welcoming remarks for both meetings (due to unforeseen circumstances RADM Paul G. Gaffney, Commander Naval Meteorology and Oceanography Command, was unable to give the opening remarks for

the UNOLS Council Meeting). CAPT Rudolph provided an excellent overview of NAVOCEANO and their worldwide survey operations and capabilities. Specifically, he addressed the fact that NAVOCEANO has over seven hundred ship years of validated requirements and only eight oceanographic ships to fulfill these requirements.

Based on this large backlog of data collection, CAPT Rudolph proposed using UNOLS ships based on their availability and funding. Regardless, he stated that the Naval Oceanographic Office is developing two survey plans to utilize UNOLS ships to conduct surveys for the U.S. Navy. These surveys will take place in the North Pacific and Central Pacific (off of southern California), actual survey specifications will be finalized when funding has been identified.

Pursuant to these surveys CAPT Rudolph noted that UNOLS and NAVOCEANO conduct similar surveys and operate in areas of mutual interest. Based on this, he proposed sharing the data in these instances, however, CAPT Rudolph cautioned that data collected by NAVOCEANO in foreign Exclusive Economic Zones (EEZs) are not authorized for public release. These restrictions notwithstanding, there are a significantly large number of areas remaining which can be mutually exploited.

CAPT Rudolph also pointed out the need to exchange shipriders with a view towards exchanging data collection techniques. All agreed that UNOLS and NAVOCEANO personnel are experts in their own right, however, there are many lessons learned by both sides which could and should be shared in order to avoid "reinventing the wheel" as well as fostering professional camaraderie between the two institutions.

On Wednesday, 7 February, members of both the FIC and Council were treated to tours of NAVOCEANO in the morning and the research vessels ATLANTIS and ROGER REVELLE in the afternoon. The tours of NAVOCEANO included the Supercomputer Center (one of five national Major Share Resource Centers), the Warfighting Support Center (data infusion and product support to the fleet) and the new Survey Operations Center. In closing, CAPT Rudolph emphasized that NAVOCEANO really wants to be a key participant in UNOLS committees and offered to host future UNOLS meetings.

NAVOCEANO provided a list of personnel to serve as points of contact for interaction with each of the UNOLS Committees. The list is as follows:

UNOLS Committee NAVOCEANO POC Phone

DESSC	Mr. Carey Ingram	(601) 688-4145
FIC	CDR D. Smith	(601) 688-4370
	Mr. George Madden	(601) 688-5293
Ship Scheduling	Dr. Darrell Milburn	(601) 688-4553
	Mr. Marshall Paige	(601) 688-4129
General	CDR D. Smith	(601) 688-4370

SeaNet is Installed on R/V THOMPSON

by Andrew Maffei, Woods Hole Oceanographic Institution

The primary goal of the SeaNet project has been to encourage collaborative efforts to integrate existing data communications systems, developed independently by others, into an Internet-like communications mesh for use in oceanographic research.

NSF recently funded the SeaNet project to install one of the first maritime INMARSAT-B terminals on R/V THOMPSON during the JGOFS Process 6 Cruise this past November. The system provided 64 kbit/second

Internet connectivity to the ship. Andy Maffei and Steve Lerner (WHOI), Dale Chayes (L-DEO), Rex Buddenberg (Naval Postgraduate School), Ellen Kappel (JOI), and R/V THOMPSON's technicians and crew (University of Washington) were all part of this SeaNet effort.

Equipment included in the THOMPSON installation were an ABB/Nera Saturn-B Antenna and Saturn-B below deck equipment (with HSD option). The 64 kilobit per second High Speed Data (HSD) interface was connected to a SUN SPARC5-based SeaNet Communications Node. A Livingston Portmaster terminal server provided serial ports for the SPARC-5 to perform data logging and equipment control. The below deck equipment was enclosed in a single 19-inch rack transit case. Magnavox has recently announced an upgrade path for the Magnovox 2400 series to INMARSAT-B. Although software would have to be modified, this may be a less costly path than buying a new Standard-B system in the future.

The first distribution of the SeaNet Communications Node (SCN) software package (this version supports INMARSAT-B and shipboard LAN connectivity) was designed and built collaboratively during the project. It is based on common UNIX packages such as Morningstar PPP, httpd, perl, ncftp, Netscape, etc. We are currently porting the SCN environment to a PC-LINUX platform. We hope to incorporate new modules for cellular phone and RF-LAN connections as time and funding permits. Future interfaces we hope to incorporate include VHF radio, LEO satellite systems, and underwater acoustic modems. We also hope to deploy the SCN on a buoy with an RF-LAN communications link.

After some initial problems connecting the Saturn-B to the ships gyro, the system successfully connected the ship to the Internet. We were quite pleased with the performance of the system. The link transferred files via FTP in the 5 kilobyte per second range. World Wide Web connectivity appeared to be faster than my 28.8k modem connection from home. All other Internet applications ran as expected. Rough estimates show that file transfer costs for various types of files and e-mail could be decreased by at least a factor of three.

Some advantages promised by the combined INMARSAT-B/SCN system over current INMARSAT-A configurations are (1) the higher speed (64 kilobit/second) data link resulting in some lower operational costs for applications such as e-mail, (2) the SCN's ability to support different communications interfaces and applications such as e-mail and WWW-caching, (3) the shorter setup time for the connection (5-7 seconds) compared to 30 seconds or longer via an INMARSAT-A acoustic modem connection and (4) the ability to monitor link costs and operations automatically and report them using e-mail and WWW interfaces.

We had hoped to leave the system running in an automated mode. Unfortunately, metallic structures near the Saturn-B antenna caused "shadows" between the antenna and the satellite. Some ship headings resulted in excessive packet retransmissions or complete link failure. Although voice calls showed no degradation on such courses, the HSD link exhibited very poor throughput. This is the expected behavior since small numbers of bits lost in a voice transmission are not noticed, whereas small numbers of bits lost in data packets cause packet retransmission. The link showed a very low bit error rate on headings where there were no obstructions. Given the cost of the link ($11-$17 per minute) and the high probability of excessive retransmissions over the link we decided not to leave the link in an automated mode.

Possible solutions for the shadow problem include: (1) placing the antenna in a better location (might not be possible on some ships), (2) using a link protocol other than PPP that better supports forward error correction, or (3) writing an application that uses ship heading, position and satellite position as inputs to determine when to bring the link up or down, or (4) have the ship always steer a favorable course during transmissions (sometimes not possible).

The next step for this SeaNet project will be to work with R/V THOMPSON technical support staff and others to solve the shadow problem. We would like UNOLS/RVTEC to consider joining us in this next phase of our project to help us review the operational aspects of the shipboard SCN. We are hoping that together we can create a common network communications platform that can be useful to UNOLS vessel

operators.

The INMARSAT-B/SCN system funded by NSF was designed to be portable enough to install on other UNOLS vessels. It is available to science projects that require high speed connectivity between a UNOLS vessel and shore. Please contact Lisa Rom (erom@nsf.gov) at NSF if you have such a requirement. The SeaNet project is coordinated by Ellen Kappel at the Joint Oceanographic Institutions (JOI) Incorporated. Please contact Ellen (ekappel@brook.edu) or myself (amaffei@whoi.edu) if you're interested in knowing more about SeaNet.

UNOLS Ship News

R/V ROGER REVELLE - Work is progressing rapidly toward completion. Pierside testing of equipment and systems is in progress. Tests and trials are going well in preparation for sea trials. The Chief Engineer has been on site since September 1995. The Master will arrive in early March with other crew members arriving in April and May to participate in the Crew Familiarization program required by the contract.

Builder's Trials are scheduled for 7-17 March with Navy acceptance trials scheduled for 15-17 April. Delivery to Scripps remains planned for 8 June. After delivery, the ship will remain at Halter's facilities for a one month fitting out period. In July, ROGER REVELLE will sail to San Diego conducting tests of scientific equipment enroute.

R/V ATLANTIS - ATLANTIS was launched on schedule on 1 February. Builders trials are scheduled for December 1996. Delivery of the ship with the ALVIN modifications installed is planned for 15 April 1997.

R/V KNORR - The debugging and refining of software on KNORR's SeaBeam is being completed. The final check out took place on the Mombassa to Durban leg (29 Jan. - 5 Feb.). A full SeaBeam cruise began on 10 February.

R/V NEW HORIZON - Upon completion of final 1995 science operations, NEW HORIZON was placed out of service on 7 December. A bid package for mid-life refit work was prepared, reviewed and released. In early January, bids were received and evaluated. Southwest Marine Inc. (SWM) of San Diego was the successful bidder for the shipyard work and a contract was awarded. Work continued at Nimitz Marine Facility until 1 February when the ship was moved to the SWM yard. Major structural work to resolve stability restrictions and for installation of a LIPS tunnel thruster will commence after dry-docking on 6 February. It is anticipated that shipyard work will be completed about 15 March. The ship will be moved back to Nimitz Marine Facility for additional dockside work before returning to service on 1 May.

R/V POINT SUR - POINT SUR left the ship yard in early February after undergoing an overhaul period and is now back at the Moss Landing pier. Every tank was inspected with no major problems revealed. Overhaul efforts will continue in Moss Landing. Salt water piping is being replaced with copper-nickel and fresh water piping is being replaced with copper. A new crane will be installed. The vessel will resume operations on 2 April.

Share Your *ATLANTIS II* Stories

This year will mark the end of an era; ATLANTIS II will be taken out of service at the completion of ALVIN's 1996 operations. Woods Hole Oceanographic Institution wishes to send the ship off in style. They have requested that anyone with interesting experiences or tales regarding the vessel, to send them in. These

stories will help to make the sending-off ceremonies a truly special occasion. You can send your stories to Dick Pittenger at his e-mail address, rpittenger@whoi.edu, or by mail to: RADM Richard Pittenger, Associate Director for Marine Operations, Woods Hole Oceanographic Institution, Woods Hole, MA 02543.

UNOLS Large Vessels Achieve High Success in Global Operations

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The large UNOLS ships, EWING, KNORR, MELVILLE and THOMPSON, spent the major part of 1995 in oceanographic regions far from their home ports in the states. Most operations took place in the Southern and Indian Oceans. Over the past year, both the JGOFS and WOCE programs have logged over 9,000 science days. All of the operations were very successful with no lost science. In 1996, the ships will all make their way back to the U.S.

The table below provides a summary of the impressive cruise statistics from these expeditions. The missions for the various cruises and ships many times were very different and this is reflected in the types of data collected and measurements taken. The statistics are proof that the UNOLS large vessels can provide the oceanographic research community with the state-of-the-art facilities required to meet today's science needs. Thanks goes out to Rose Dufour, Robert Hinton, Michael Rawson and Dick Pittenger for providing the cruise statistics.

VOYAGE STATISTICS	KNORR	MELVILLE	THOMPSON	EWING
Dates	Dec 94 - Jan 96	Dec 94 - Dec 95	Oct 94 - Jan 96	Jul 95 - Feb 96
Miles Steamed	50,531	49,180	54,454	30,653
# of Cruises	13	10	18	7
Days at Sea	367	298	393	182
Days on Station	148.5	n/a		
Days in Port		23		
Number of Stations	1244	n/a	450	
# of Bottles Tripped	39,619		25,445	
Water Samples Drawn	>400,000		>100,000	
Multibeam		49,180 nm		14,235 nm
Gravity		26,484 nm		17,076 nm
Seismic		1,860 nm		
Magnetics		32,683 nm		17,076 nm
IMET		16,652 nm		
Multi-channel Data				7,221 nm
Single-channel Data				9,855 nm
Dredges		80		1
Cores		11	50	3
OBS Deployments		52		48
Electromagnetic Deployments				64
Elect. Field Free Vehicle		17		
Free Vehicle		11		
Casts		447	1,290	
Moorings/Buoys Deployed		13	10	
ADCP Measurements		12 Stations		
Acoustic Studies		18 Stations		
XBTs		143		
Net Tows			318	
Surface Samples			>500	
Total Science Party	273	143	444	71
Univ./Organizations	26	25	47	20
Nations Participating	7	7	18	8
Foreign Clearances	21	12	1	8
Foreign Observers	21 from 9 countries	2 from 1 country	16 from 4 countries	3

Shipboard Diving Safety Workshop Update

In October, a small working group met in San Diego to review *Final Report of the Workshop on Scientific Shipboard Diving Safety* of 1991. The group recommends that the original report not be rewritten but that changes to the "Findings and Recommendations" section be made and forwarded to the community. The first draft of these changes is now being circulated for review and should be published in the next month or two. The plan is to publish a hard copy of the revised Findings and Recommendations along with a background and lead-in remarks.

The main theme of the original report remains unchanged. Operators as well as divers must communicate effectively at all levels before diving operations begin. This is a complex problem in many cases particularly when divers are from institutions other than the operators'. It is of paramount importance that complete dive plans are written and that all concerned are aware of the details of the plan. The marine superintendents become a control point in this process and are key to the safe diving procedures. All UNOLS ships involved in diving must scrupulously follow the procedures outlined in the *Research Vessel Safety Standards*, Chapter 16. Ken Johnson has written a letter which has been distributed to ship operators expressing the need for diving safety. The letter is included below:

Dear UNOLS Operator:

A workshop on Scientific Shipboard Diving Safety was held on October 23, 1995 to reexamine the issues raised in the 1990 UNOLS report on the same topic. The October 23 meeting reaffirms many of the basic premises of the 1990 report. One issue that was raised in the 1990 report was the need to collect shipboard diving statistics. Scientific diving is now performed under a clause in OSHA regulations that exempts diving for scientific purposes from the much more demanding commercial diving regulations, which require hyperbaric chambers on each ship. This exemption was granted because the science community was able to demonstrate that scientific diving had an extremely low accident rate, less than that for bankers. It is very likely, based on recent events, that OSHA will again review the diving regulations issue. This may put the scientific diving exemption at risk.

It is essential that the UNOLS Operators collect high quality statistics for our diving operations to address concerns about diving safety. These statistics have been collected in the past by Mike Lang for the American Association of Underwater Scientists and they were presented to the operators at the annual Research Vessel Operators' Committee meeting. The National Science Foundation has requested that UNOLS continue to collect statistics on scientific diving which can be used to calculate and accurate incident rate. It was determined at the October 23 meeting that a designated representative of the AAUS (currently Mike Lang) will continue to collect these statistics and report them to UNOLS. AAUS, rather than UNOLS, was selected to collect the statistics because they have the expertise to best interpret them and to respond to critical situations.

Section 16 of the *Research Vessel Safety Standards* requires an On-Board Diving Supervisor to be present and responsible for the execution of each research diving operation. It is the obligation of the On-Board Diving Supervisor to promptly present the appropriate scientific diving statistics, including the occurrence of any hyperbaric incidences, to the operator institution at the conclusion of each cruise. It is incumbent upon the operators to report a full set of statistics to ensure that the science community can continue to conduct efficient science diving operations. It is required through either charter party agreements or grant vehicles that all operators immediately report any incidences to the appropriate program managers at the agency funding the research. To ensure that we have an unbiased set of statistics, we must have full reports for all cruises, including the vast majority of shipboard diving cruises that involve no accidents.

Thank you for your attention to this issue.

Sincerely yours,
Kenneth S. Johnson
UNOLS Chair

Status of the Deep Submergence Support Vessel and Science Opportunities

by Mike Perfit, DESSC Chair

Editor's Note: Below is a Memorandum sent in late January from Mike Perfit to the Deep Submergence Community. It announces the selection of a new deep submergence support platform along with plans for future operations.

I am pleased to announce the welcome news that ONR, NSF and Woods Hole Oceanographic Institution (WHOI), the National Deep Submergence Facility Operator, have agreed to convert AGOR-25, R/V ATLANTIS, to be the new UNOLS deep submergence support vessel to service ALVIN, the ROV Jason, ARGO-II and the 120 kHz deep towed sonar system. All of these UNOLS National Facility deep submergence vehicles will be available and able to be launched and recovered from ATLANTIS. The contractual agreements between the Navy and Halter Marine (the ship builder) pertaining to the conversion of ATLANTIS were finalized in December, 1995. WHOI is advancing the funds on behalf of NSF and ONR to cover the cost of the conversion which will be split roughly in thirds between the three parties funding the conversion. Among its many attributes ATLANTIS will have: 1] over four times the laboratory space of ATLANTIS II, 2] accommodations for up to 36 science personnel (22 scientists and up to 14 ALVIN/ROV technicians), 3] a SeaBeam 2112 multibeam sonar system and capability for routine geophysical data acquisition (towed magnetometer and gyro-stabilized gravimeter), and 4] a P-Code GPS navigation system and dynamic positioning of the vessel for ROV work.

The timing of the conversion effort dovetails with the need to carry out a major overhaul of ALVIN which will take place in Fall/Winter 1996 and into the Spring of 1997. The converted ATLANTIS is planned to be delivered in April 1997 and will transit to Woods Hole in May 1997 to begin the process of post delivery shakedown, and ALVIN and ROV/towed vehicle engineering dives. If the engineering dives begin in May-June 1997, limited science operations in the traditional operating areas (e.g. US East Coast, North Atlantic, Gulf of Mexico, Eastern Pacific, California Borderland and Northeast Pacific, etc.) would be possible from the summer of 1997 until the first few months of 1998. These operations would occur during the ship's warranty period, to be followed by a Navy (NAVSEA) requirement for a post-shakedown yard period at a U.S. shipyard in early 1998. Following that yard period, ATLANTIS, with combined ALVIN/ROV facilities, will be available for global deep submergence science and other oceanographic expeditions.

Tentative long range planning by DESSC and WHOI suggests that ATLANTIS, and the suite of ALVIN and ROV/towed vehicles could be available for science at sites along the southern East Pacific Rise, in the western Pacific, and Indian Ocean starting in late 1998 and into 1999 depending on the availability of funded field programs and facilities logistical support from the federal funding agencies. Two currently funded ROV/towed vehicle programs will be carried out in the south Pacific in late 1996 and into early 1997. There will continue to be the capability for conducting ROV and towed vehicle based programs from any of the large UNOLS vessels.

With respect to long-range planning, and a stated desire of many scientists for a global U.S. deep submergence expedition, it is critical that researchers submit proposals to their supporting agency as soon as possible so that there is time for the proposal to cycle several times through the funding process which

appears to be the trend in Washington recently. Proposal pressure is the prime driver for allocation of deep submergence assets and future facilities planning. In addition, it is obvious that if we are to take advantage of the global capabilities of ATLANTIS in conducting deep submergence experiments, research in many disciplines and over a wide geographic range will need to be proposed and funded so that long, non-science transits between operating areas are avoided or minimized as much as possible.

One of the unfortunate downsides to the current funding climate is that the 1996 operational schedule for ALVIN is minimal. Attempts are being made by WHOI and the funding agencies to minimize the impact of the limited 1996 schedule on the ALVIN operational and shore based groups. In order to take advantage of a potentially longer overhaul period, attempts are being made to identify additional science and operational equipment upgrades that could be accomplished during the next overhaul. Drs. Dan Orange and Cindy Van Dover of the DESSC have compiled suggestions from interested scientists. A preliminary list has been drawn-up based on suggestions received by e-mail and will be circulated to the DESSC, the National Facility Operator (WHOI) and funding agencies shortly. However, given the present funding uncertainties at NSF, it is unclear to what extent these upgrades can be accomplished in the near term. Scientists who have not already done so, and are interested in providing input to this process are encouraged to contact D. Orange and C. Van Dover at the following e-mail addresses:

dano@mbari.org
vandover@ims.alaska.edu.

In summary, 1995 was an excellent year for deep submergence science and vehicle operations. 1996 promises to have a reduced ALVIN operational schedule, however on a positive note, the ROV/towed vehicle systems of the National Facility will be used on three NSF funded research programs on three different large UNOLS vessels. The advent of the new support ship for deep submergence, the overhaul of ALVIN, the more routine and integrated operations of the submersible and ROV/towed vehicles of the National Facility, and the programmatic need of deep submergence assets of various kinds to accomplish a wide variety of basic and applied science in the abyss, promise to usher in an era of increased demand for deep submergence resources. I urge you to submit your proposals for deep submergence research and to coordinate your investigative approaches with the vehicle operator to ensure that the proposals are technically sound, and that integration between submersible and ROV/towed vehicle assets, where required, is coordinated and appropriate to the science problem, so that the proposals are as competitive as possible in this tight funding climate. The DESSC is actively working on the community's behalf on a wide range of deep submergence issues, but ultimately it is your science proposals, their implementation by the PIs and the vehicle operator, and the feedback from the community that provide the impetus for expanded facilities and resources to explore the abyss.

ALVIN in 1995

At the December Deep Submergence Science Committee Meeting, Rick Chandler from Woods Hole Oceanographic Institution presented the following impressive ALVIN Statistics for 1995:

Assigned Operating Days 282
Hours Submerged 1,084
Days at Sea 278
Avg Dive Duration (hr) 8.1
Dives 170
Scientific Cruises 13

ALVIN Celebrates 3000th Dive!

On September 20, 1995, ALVIN conducted its 3000th dive. The dive took place on the Endeavour Ridge (47-59.05N, 129-04.74W). John Delaney was Chief Scientist.

Woods Hole Oceanographic Institution Tests the Jason Manipulator

by Andy Bowen, Woods Hole Oceanographic Institution

During 1995, the Office of Naval Research funded a program to test and demonstrate the Jason ROV's manipulative capabilities. The DEep Submergence Science Committee (DESSC) had recommended such a program as a means of providing examples to the user community of Jason's ability to handle various sampling tasks in a working environment. During this past year, a suite of tests involving both the manipulator and vehicle have been accomplished in simulated environments representing actual conditions. The first action was operational testing of the manipulator to its maximum rated test depth of 6,800 meters. This was successfully accomplish by using the large pressure test chamber available in Woods Hole. Results from this step indicated the fundamental design was sound but improved screening for pressure tolerance on position resolvers was needed.

With basic pressure testing of the arm successfully completed, the next step was to refine the vehicle system's ability to work in a sampling configuration. To do this, a full size hydrothermal vent mockup was designed and fabricated using guidance from scientists involved in vent research. Once complete, this "vent" was placed in the water adjacent to the WHOI dock and a series of tests accomplished. The primary objective was to ensure the vehicle system functioned as an effective sampling tool.

Aside from the manipulator, key components refined during this phase of the project were Jason's sampling basket and a new "elevator". The basket is designed to serve as a storage area for up to four hydrothermal vent fluid samplers and one removable general purpose sample container. Buy using a free fall sampler delivery devise such as an elevator, it is possible for Jason to exchange full or triggered samplers for empty ones thus using the vehicle efficiently as an unmanned sampling tool. Once the elevator is loaded with samples an acoustic signal can be sent from the ship commanding a ballast weight to be released thus giving the assembly positive buoyancy for its return to the surface. After the elevator has been recovered and the samples removed, the cycle can be repeated. Two of these assemblies are now available for use and have been designed to work in the difficult terrain typically found at vent sites. Dock trials have successfully demonstrated a complete cycle of deploying a loaded elevator, transferring hydrothermal vent fluid samplers to the vehicle, maneuvering into position on the vent, handling and triggering successive samplers while holding the nozzle in the vent orifice and then transferring the triggered samplers from the Jason basket back into the elevator. The collection of other samples such as rocks, biology and temperature probe data has also been demonstrated during these dock trials.

The third part of this year's program involved a complete Jason system test in the large pressure test chamber of the Deep Ocean Pressure Simulation Facility at the Annapolis Detachment, Carderrock Division, Naval Surface Warfare Center. This pressure chamber has an interior space that is approximately three meters in diameter and is eight meters long. Both the Jason and Medea vehicles as well as the neutral fiber optic cable were place inside the chamber for testing. Electrical and optical penetrations of the chamber walls allowed full vehicle operation during the test. The manipulator was operated continuously during the test which reached a maximum depth corresponding to its design pressure of 680 bars or 6,800 meters. All vehicle systems functioned correctly with the exception of one thruster motor and the manipulator gripper which became unreliable after several hours at maximum pressure. The thruster motor failure has been traced to the collapse of an encapsulated electrical component and the gripper failure to a

pressure related loss of retaining compression on its motor. This was a redesigned gripper not tested during phase one of the program. A simple fix has already been implemented and the assembly will be retested at WHOI this spring. Thorough post test inspections of all the vehicle's subsystems is currently underway as they are readied for the coming operational season. A video tape documenting the tests is available upon request.

Department of Commerce Conducts Fishing Vessel Buyout Program

by Jack Bash, UNOLS Office

In 1995, the Department of Commerce Office of Sustainable Development and Intergovernmental Affairs conducted a $2 M pilot program to buyout fishing permits and fishing vessels. The purpose of the program is to reduce the pressure on fish stock by removing successful fishing boats (and their permits) from plying their trade and also providing financial relief for the fisherman involved. Thirteen vessels were bought out and destroyed in the pilot program. DOC is now planning to expand the program by allocating an additional $26 M.

DOC has a formula for selecting which vessels to buy. The most attractive vessels are those yielding the biggest catches. Ships can vary in age and size; from two to 40 years old and 60 to 220 feet in length. UNOLS has been working with DOC in an effort to transfer appropriate fishing vessels, accepted by the program, to institutions for research needs. DOC has been very receptive to this idea. So far 15 institutions have expressed interest and have forwarded "needs/desires" information to the UNOLS Office for coordination with DOC. Other institutions interested in the program should contact the UNOLS Office, (401)874-6825.

Telecommunications Act Passes

The Telecommunications Act has passed both the House and Senate and on 8 February was signed by the President. One significant measure in this bill eliminates the requirement for ships over 1600 gross tons to carry a Radio Officer if equipped to comply with GMDSS. Also included in this act was a section permitting the FCC to privatize their inspections.

What's New on the UNOLS Home Page

by Al Maybach, UNOLS Office

The UNOLS homepage has been significantly redesigned over the last two months. The UNOLS Charter is accessible from the opening paragraph. The demonstration UNOLS Ship time Request Form has been moved from the end of the page to the beginning. This test form is in the final stages of evaluation. The meeting minutes are now broken down by year, with each meeting having a specific indicator. Since December we have posted the minutes for the Annual Meeting, the September Council, the Fall DESSC, and RVOC Meetings. Under "Newsletters", Vol. 21 of the RVOC Newsletter, less all of the clippings, and both issues of UNOLS Vol. 12 have been posted.

In the new "UNOLS Reports and Manuals" section, we have posted the Research Vessel Safety Standards and Chapter 1 of the RVOC Safety Training Manual, which was initially downloaded from Robert Hinton's

University of Washington homepage.

We welcome comments and suggestions on how to improve the UNOLS homepage and it's contents. Just drop us an e-mail, unols@gso.uri.edu.

Call for UNOLS Council Nominations

Four members of the UNOLS Council have terms which will expire in September. These members are Ken Johnson, UNOLS Chair; Peter Betzer, Vice Chair; David Karl and Tom Royer. Ken and Tom are completing their first term and can run for second terms. A Nominating Committee of Peter Betzer as Chair, David Karl and Bob Knox was appointed to prepare a Slate of Candidates. The Slate will be presented to the membership 30 days prior to the UNOLS Annual Meeting.

Candidates can be nominated to fill the following positions:

Position	Term	Remarks
UNOLS Chair, Operator Institution	2 years	Ken Johnson is eligible for re-election
Vice Chair, UNOLS Member At-large	2 years	
UNOLS Operator Member Institution	3 years	
UNOLS Member At-large	3 years	Tom Royer is eligible for re-election

Nominations can be submitted to any member of the Nominating Committee:

Peter Betzer - e-mail: prb@marine.usf.edu phone: (813) 553-3940
David Karl - e-mail: dkarl@soest.hawaii.edu phone: (808) 956-8964
Bob Knox - e-mail: rknox@ucsd.edu phone: (619) 534-4729

UNOLS Committee Appointments

At the February UNOLS Council Meeting, the committee nominations for Patty Fryer and Marc Willis were approved. Patty is replacing Karen Von Damm on DESSC and Marc Willis is replacing Tim Pfeiffer as Vice Chair of RVTEC. Thanks goes out to Karen and Tim for their many hours of dedication to their respective UNOLS Committees.

Publications

Nuclear Submarine Report - The report, *Nuclear-Powered Submarine Dedicated to Earth, Ocean and Atmospheric Research,* is at the printer's and is expected to be ready for distribution in late March. The report was prepared by Lloyd Keigwin and workshop participants. It reports the findings of a September 1994 workshop to identify the science needs which can best and sometimes only be met by a submarine.

Projections for UNOLS' Future - Substantial Financial Challenges - UNOLS has published and distributed the report, "*Projections for UNOLS' Future - Substantial Financial Challenges*." The fundamental questions that the report attempts to answer is whether there will be sufficient science and operational funding in the future to support the UNOLS Fleet as currently configured. If not, what actions might be taken to maximize the effectiveness of the Fleet. A committee chaired by Peter Betzer and

including Dennis Hayes, Robert Knox, Chris Mooers, Richard Pittenger and Robert Wall was formed to address these questions and report their findings in the report. The committee was given a specific charge to address. The charge included five elements: (1) review Don Heinrichs' budget projections, (2) assess a general model for the UNOLS Fleet requirements for supporting science, (3) if an imbalance exists between requirements and resources, offer suggestions as to how to remedy the situation, (4) investigate what UNOLS operational/fiscal changes would work best, and (5) could Fleet realignment lead to a more effective use of our ships? UNOLS Fleet operations support is projected to be level into the future. Under this scenario, by 1997 there will be a shortfall in funding of approximately two large ships and one intermediate vessel.

Recommendations of the report include: (1) If NSF budget projections persist, consider limited numbers of lay-ups, (2) Expand federal participation in UNOLS, (3) develop new modes of ship support and operations, (4) Explore alternative uses of Class I vessels and (5) Continue planning for new facilities.

Research Vessel Safety Standards - A 1996 revised version of the Research Vessel Safety Standards has been distributed to the Marine Operators.

UNOLS Meeting Calendar

Meeting	Date	Locations
Fleet Improvement Committee	20-21 June (tentative)	ODU - Norfolk, VA
Ship Scheduling Review	25 June (tentative)	NSF - Arlington, VA
DESSC	April-July	WHOI - Woods Hole, MA
Council	25-26 July (tentative)	Orlando, FL
Ship Scheduling Committee	September	NSF - Arlington, VA
Ship Scheduling Review	September	NSF - Arlington, VA
Council	September	NSF - Arlington, VA
UNOLS Annual Meeting	September	NSF - Arlington, VA
RVOC Meeting	22-24 October	FIO/USF - St.Petersburg, FL
RVTEC Meeting	11-13 November	HBOI - Ft Pierce, FL
DESSC	December	San Francisco, CA

I would like to extend a thanks to all who contributed information and articles for this issue. Articles for the newsletter are always welcome and encouraged. Copy can be submitted via e-mail, FAX or mail. The next newsletter is planned for June 1996.

Thank you,
Annette DeSilva
Editor, UNOLS News

Please Note: The phone numbers for the UNOLS Office have changed to the following:

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