

**UNOLS Arctic Icebreaker Coordinating Committee**  
**18-20 November 1998**  
**National Science Foundation, Room 365**  
**420 Wilson Boulevard**  
**Arlington, VA**

Appendix:

- I. Attendees
- II. Agenda
- III. Potential Science Users of HEALY
- IV. Report from Phil McGillivray

**INTRODUCTION** – The Arctic Icebreaker Coordinating Committee (AICC) met in Room 365 of the National Science Foundation on 18–20 November 1998. Jim Swift, AICC Chair, opened the meeting at 0830 hrs. on 18 November and welcomed the attendees. A list of all attendees is included as *Appendix I*. The agenda, *Appendix II*, was introduced by Jim along with an explanation of how the meeting will be structured for the two and a half days.

Al Sutherland provided a report on OPP and Antarctic science support issues. Dr. Karl Erb has been named the new director of OPP. The contract for support of the U.S. Antarctic Program is presently out for re-bid. Proposals are due in April with a contract award set for October. PALMER's contract will be up in the year 2002. A re-competition of this contract will start soon. GOULD came on line 16 January 1998. Serious acoustic problems have been fixed. The ship continues to address a winch problem.

Mike Ledbetter, continuing the OPP report, announced that the SHEBA field program has ended and was very successful. This ice camp drifted much further north than expected. This caused logistic problems in crew rotation since it drifted out of aircraft range. The USCG provided logistical support at the behest of the Canadians. Congress appropriated \$22M new money for Arctic logistics for 1999, and hopefully continuing. Candidates for the 1999 money will be Thule site upgrades, Barrow infrastructure enhancements and Summit of Greenland ice camps with possible international involvement. The Shelf Basin Interaction (SBI) phase I panel has met. No field work is planned for this phase, however, phase II scheduled for 2002 should have significant HEALY involvement.

Linda Duguay, OPP, provided a summary on SCICEX. The last cruise in this five year series will be scheduled for 1999. The swath mapping capability used in the 1998 program will be again available in 1999. A workshop is being planned to look at the future of this program. There is a possibility for cruises of opportunity on nuclear submarines in out years.

Mike Ledbetter said that a team is being put together for the Study of Environmental Arctic Change (SEARCH). This new program, looking at change in the Arctic, will be the subject of a workshop in the near future.

Garry Brass added that the InterRidge group is involved in the Nansen Arctic drilling program that could have implications for HEALY work.

John Freitag provided a summary of RVTEC activities. The 1998 annual RVTEC meeting was held in conjunction with the International Marine Technician Symposium (INMARTECH '98) workshop held at SCRIPPS in La Jolla, CA. It was very successful with over 100 participants representing 12 countries. The meeting was well attended by the USCG.

Jack Bash reported that the UNOLS Fleet Improvement Committee has been working on Mission Requirements for a replacement of ALPHA HELIX. The ship will have an ice capability and will be designed for traditional academic as well as fish research. The operating profile is intended to complement HEALY's capability. UNOLS has also submitted a proposal to NOAA to be involved in the AMLAR project off Antarctica. Jack added that a NSF Fleet Review study is underway.

## **HEALY CONSTRUCTION**

Jim Swift praised the Coast Guard and particularly Captain Greg Johnson for the very effective progress in preparing HEALY for the scientific community. The opportunity for the science community to test the science systems of HEALY should enhance this working relationship and result in a ship that will be friendly to the scientists.

Captain Johnson provided an overview of the HEALY contract. The ship is scheduled for delivery 30 June 1999. The shafts will be rolled before 1 January 1999. Dock trials are scheduled for 2-4 weeks in the January – February timeframe with builder's trials in mid March. A 14-month warranty period will start after delivery. The final acceptance will be based on the ice trials. Because of late delivery the ship is expected to transit to its homeport of Seattle after completion of warm water trials in the Caribbean and Gulf of Mexico. In the February-March 2000 timeframe the ship will sail to the western Arctic for ice testing followed by science testing. The transit via the Northwest Passage, after delivery and warm water testing, has not been ruled out.

The tour of duty for Captain Johnson could end in the summer of 1999. If this happens CDR Ian Grunther will take over Captain Johnson's duties. LCDR Al Gaiser's tour will be extended to enable him to complete the HEALY project.

Warrant Office Sam Niehardt narrated a video of a walk-through of HEALY. The video provided the Committee with an opportunity to see a current state of construction for the ship.



## HEALY TEST AND TRIALS

LCDR Al Gaiser provided an update of the schedule for HEALY test and trials. The next planning meeting is scheduled for February in New Orleans. HEALY web site is up and can be reached at <<http://www.uscg.mil/hq/g-a/healy>>. Minutes of the ice trial meetings are posted there. The Ice Trial Objectives are to "Evaluate ship's operational performance; ice breaking and ship performance and evaluate science systems equipment performance". Al explained the four phases planned for the trials. Phase I would be a two week warm water operation in the Gulf of Mexico and Caribbean for the testing of the SeaBeam and coring. Phase two would be the transit to Seattle. Phase three would be six weeks and would test the icebreaking efficiency and hull strength of the vessel. The final test period, Phase four, has been devoted to science systems testing and will be four weeks in length. Phase I is scheduled for September 1999; Phase II, October 1999; Phase III, February-March 2000; and Phase IV, May 2000. The phase IV testing is planned for four legs. All tests are expected to be completed by June 2000.

The evaluation process must be composed carefully and provide acceptable levels of performance. The results will be posted on the web.

A discussion followed concerning the possibility of HEALY making a public relations visit to the Washington area in the Oct/Nov '99 timeframe. Baltimore would be the likely port. The AICC will need to coordinate with the Arctic science community to develop posters and demonstrations for the visit. This is an excellent opportunity for the community to expose the policy makers to Arctic science.

CDR Grunther charged the Committee with the need to set standards with respect to science systems testing. It is important that the science equipment on HEALY operate on par with other UNOLS ships. It is clear that all scientists will not be 100% satisfied with the performance of some equipment. A library of sample data should be developed to judge the acceptability or rejection of a system or piece of equipment. Minimum standards for each system need to be developed. Not all problems will be fixed during the testing period but will be a continuing joint effort. Discrepancies will need to be prioritized.

Coring will be tested first in a warm water environment to exercise the equipment and to train the ship's deck crew. Further coring tests will take place in Arctic waters. WHOI is developing the coring system that will provide a maximum 30-meter core from starboard side deployment and a 20-meter core from deployment from the stern. The shipyard will demonstrate the capability of coring from the starboard frame in March.

**Antarctic Research Vessel Oversight Committee (ARVOC)** – Stan Jacobs provided the Committee with a report on the recent ARVOC meeting. ARVOC is developing an equipment inventory differentiating between ship equipment and project specific equipment (does it stay with the ship or the PI?). The Committee is discussing the pros and cons of collecting continuous underway data such as ADCP, SeaBeam and other

systems (with or without a PI) onboard PALMER and GOULD. ARVOC continues to evolve in its mission and scope.

**Ocean-Atmosphere-Ice Interaction Committee (OAI)** – Kelly Falkner reported on the latest OAI committee meeting. A Shelf Basin Interaction (SBI) program is gearing up for work in the western Arctic. Proposals are being solicited. The field program is planned for 2002. The program envisions three 30 day cruises per year for five years. A Study of Arctic Change is also in the startup stage.

Larry Lawver reported on the International Conference on Arctic Margins, ICAM III in Celle, Germany and the Arctic InterRidge meeting in Hannover, Germany. The ICAM meeting is rapidly becoming THE International meeting for Earth Sciences in the Arctic region. Lots of interesting science is planned. Almost all shipboard science to date has been done on other countries' vessels with the exception of Art Grantz's work off the Polar Class vessels.

The InterRidge meeting was concerned with planning for international study of the active ridge system in the Arctic. Wilfred Jokat of AWI talked about the planned MG&G cruise of POLARSTERN to the Nansen-Gakkel Ridge in 2001. It is a cruise of approximately six weeks but POLARSTERN needs an ice escort vessel. In the past they have worked with either a Canadian icebreaker or chartered a Russian one. They would very much like to work in consort with another icebreaker/research vessel, sort of double your pleasure type deal. Larry suggested that a joint venture with HEALY might work.

**SCICEX** – Jim Swift reported on the workshop entitled "SCICEX 2000". The five-year program that permitted academic scientists to ride an operational nuclear submarine into the Arctic will come to an end with the 1999 cruise. This program has provided the science community an excellent opportunity to have access to the Arctic in a unique platform. The science community is exploring with the Navy the possible options for future cruises. It is important that the Navy understands that science interest is also Navy's interest. It may be possible to have a jointly coordinated cruise with a nuclear submarine and HEALY.

**Coast Guard Icebreaker Operations** - CDR George Dupree thanked the UNOLS community for the cooperation in getting USCG technicians out on UNOLS ships and including them in both the RVOC and RVTECH meetings. The NSF/USCG MOU is close to being signed. George discussed the suggestion from OMB that HEALY be transferred to NSF. Both the USCG and NSF strongly disagree with this proposal.

The USCG is looking into ways to provide increased tours for MSTs to establish more continuity in their shipboard activities. Repeat tours in icebreaker operations are being encouraged. The Coast Guard plans to arrange contract technician support when needed. The foundation for this process is being laid and will be executed as the conditions arise.



## **EXPEDITIONARY PLANNING**

Jim Swift led the discussion on expeditionary planning for HEALY. He explained the need for advanced planning to establish projected geographical areas for HEALY operations that can stimulate scientific proposals. It is important to involve foreign participation in the planning. Jim suggested a Town Meeting at the fall AGU that would permit community input. This would be modeled after the DESSC meeting. The AICC will write up a very general operating profile and format for expeditionary planning. Ship Time Requests will be handled through the UNOLS web site just like any UNOLS vessel. The schedules of all three icebreakers will likewise be posted on the web. Attached, as *Appendix III*, is a list of potential science users developed from a November survey.

## **SCIENCE OF OPPORTUNITY FOR 1999**

POLAR STAR will be operating in the western Arctic in the May through July timeframe and will be available for Science of Opportunity (SOO). An announcement to the community will be written and distributed soon. A brief discussion followed about the 1998 SOO program. Lisa Clough discussed an incident on the 1998 SOO cruise where one participant brought aboard isotopes without appropriate permission and licensing. The incident pointed out a need for more communication and familiarization of cruise participants.

## **REPORT FROM PHIL MCGILLIVARY**

Phil provided the committee with a report on the activities of USCG PACAREA's icebreaker operations. The complete report is included as *Appendix IV*. Phil explained personnel changes in PACAREA, budget issues with the icebreakers and the icebreaker's involvement in international affairs. He discussed the 1998 and future operations of both POLAR STAR and POLAR SEA.

## **UNIVERSITY OF WASHINGTON TECHNICAL SUPPORT CAPABILITIES**

George White, University of Washington provided the Committee with a summary of the technical support capabilities. These include the technicians, pooled equipment, engineering services, machine shop and an EPA certified chemistry lab. Also available is the science staff of the Applied Physics Lab. UW stands ready to provide a broad range of technical support to the Seattle based HEALY.

## **MISCELLANEOUS DISCUSSION**

The Committee reviewed the various discussion points of the past two days including expeditionary planning, the Baltimore public relations visit, MST training and tour length, future HEALY operations including international cooperation and multi-ship operations.

## **MEETING WITH DR. ERB AND RADM HULL**

On Friday 20 November the committee met with Dr. Karl A. Erb, Director Office of Polar Programs and RADM Hull, Director of Operations and Policy USCG. An open and informative discussion followed. A cooperative spirit was evident in the discussions. The USCG and NSF have been developing an effective working relationship for Arctic science and exploration.



# **APPENDIX I**





AICC - November 18-20, 1998

<u>NAME</u>	<u>AFFILIATION</u>	<u>PHONE</u>	<u>E-MAIL</u>
John Bash	UNOLS	401-874-6825	unols@gso.uri.edu
Jon Berkson	USCG HQ (G-OPN-1)	202-267-1457	jberkson@comdt.uscg.mil
Garry Brass	USARC	703-525-0111	g.brass@arctic.gov
Lisa Clough	ECU	252-328-1834	cloughl@mail.ecu.edu
Joseph Coburn	WHOI	508-269-2624	jcoburn@whoi.edu
Linda Duguay	NSF/OPP/ANS	703-306-1045	lduguay@nsf.gov
George DuPree	USCG HQ (G-OPN-1)	202-267-1456	gdupree@comdt.uscg.mil
Kelly Falkner	OSU	541-737-3625	kfalkner@oce.orst.edu
John Freitag	URI/RVTEC	401-874-6579	jfreitag@gso.uri.edu
Al Gaiser	NAVSEA	703-602-3097	GaiserAO@NAVSEA.NAVY.MIL
Jeff Garrett	USCG	206-217-6901	jgarrett@pacnorwest.uscg.mil
Ian Grunther	HEALY	703-602-3097	GruntherI@navsea.navy.mil
Tom Heitsstuman	USCG HQ (G-OCU)	202-207-0362	theitstuman@comdt.uscg.mil
Stan Jacobs	LDEO	914-365-8326	sjacobs@ldeo.columbia.edu
Greg Johnson	HEALY	703-602-3097	johnsonwg@navsea.navy.mil
Lawrence Lawver	UTIG	512-471-0433	lawver@ig.utexas.edu
Michael Ledbetter	NSF/OPP	703-306-1029	mledbett@nsf.gov
Dan Lubin	UCSD	619-534-6369	dlubin@ucsd.edu
Phil McGillivray	USCG	510-437-5355	pmcgillivray@d11.uscg.mil
Sam Neibardt	USCG	504-436-5750 x227	
Bob Parsons	NCSS	425-401-9414	rparson1@aol.com
Tom Pyle	NSF	703-306-1029	tpyle@nsf.gov
Gary Smialek	HEALY	202-267-6415	gsmialek@comdt.uscg.mil
Bill Strong	CG-COMDT(G-OCU-4)	202-267-1452	wstrong@comdt.uscg.mil
Al Sutherland	NSF/OPP	703-306-1032	alsuther@nsf.gov

Jim Swift  
Dave Vaughn  
George White  
Terry Whitledge

SIO  
HEALY  
U of Washington  
U Alaska

619-534-3387  
206-217-6702  
206-543-5648  
907-474-7229

jswift@ucsd.edu  
dvaughn@pacnorwest.uscg.mil  
gwhite@ocean.washington.edu  
53447@ims.uaf.edu



# APPENDIX II





UNOLS Arctic Icebreaker Coordinating Committee  
18-20 November 1998  
National Science Foundation Room 365

**AGENDA**

**WEDNESDAY, 18 November 1998**

- 0830 Welcome & agenda review (Swift)  
Remarks from NSF hosts
- 0840 Reports & news from UNOLS & Council (Bash, Swift)  
Reports & news from NSF (NSF representatives)  
(including status of support for ship daily rate costs)  
Reports & news from other agency representatives (open)  
Report from Polar Research Board / Congressional actions (Brass)  
Report & news from RVTEC (Freitag)
- 1000 BREAK
- 1020 Review of past AICC business regarding HEALY (Swift)
- 1030 Reports from Healy construction oversight team (USCG reps)  
topics to include:  
current status of construction & pending issues  
schedule  
in port, post delivery schedule  
virtual walk-through  
lab layouts and outfitting  
test program: warm water trials, ice trials  
science systems test program  
specific areas of concern (SeaBeam, science seawater)  
additional topics at discretion of USCG reps
- 1200 LUNCH
- 1330 resume Healy oversight team presentations & discussion
- 1445
- 1500 BREAK
- 1520 resume Healy oversight team presentations & discussion
- 1545 Discussion of science participation in HEALY test programs.  
science staffing on tests and trials  
how to gauge performance; reporting requirements  
development of milestone criteria; performance evaluation  
re letter from Glenn Cota  
Coast Guard requirements for science participants
- 1615 Opportunities for "grand tours" of USCGC Healy (Johnson, Garret)

- 1630 Healy coring systems - discuss "coring brief" & letter from Piasias
- 1645 AICC review of Day 1 business. (Swift)  
AICC/USCG summary discussion, including preliminary  
AICC recommendations and action items.
- 1700 End of business, Day 1.

**THURSDAY, 19 November 1998**

- 0830 Reports from recent meetings:  
Report from ARVOC (Jacobs, Swift)  
Report from OAI (Falkner)  
Report from German meetings (Lawver)  
other meetings
- 0915 Report from USCG Icebreaker Operations (Dupree; Bergson)  
Report from PacArea operations (McGillivray?)
- 0945 Science-of-opportunity 1998 review (Garret, Clough, McGillivray)  
  
Discussion of changes needed for 1999 S.O.O. guidelines  
and schedule of announcement and AICC review.
- 1000 BREAK
- 1020 Expeditionary planning for use of USCGC Healy  
  
Review of community plans and ideas  
Western Arctic Shelf/Basin (Falkner)  
other OAI initiatives  
geology (Michaels)  
ROV/AUV interests in Arctic work (McGillivray)  
marine mammal surveys (see letter from Hild)  
seismic surveys (Lawver)  
European Arctic marine initiatives (Lawver)  
  
First results from November 1998 Healy user survey (Swift)  
  
Draft plan for expeditionary planning process.
- 1200 LUNCH
- 1330 Review of science support equipment  
  
Healy equipment list (Grunther)  
letter from Robin Muench (Swift)  
  
present inventory of Coast Guard science equipment (McGillivray)  
items, location, condition, prognosis

- 1500 BREAK
- 1520 Marine tech support on USCG icebreakers, including Healy  
MST training for USCGC Healy (Garret)  
University of Washington marine technical support (White)  
personnel, areas of expertise, equipment, support facilities  
"skills lists" for common activities (CTD ops, nets, coring, etc.)  
re letter from Doug Martinson
- 1640 Review of Day 2 business. (Swift)  
AICC/USCG summary discussion, including preliminary  
AICC recommendations and action items  
AICC membership review  
Date and location of next meeting
- 1700 End of business; Day 2.  
End of open sessions at this AICC meeting.

**FRIDAY, 20 November 1998**

- 0845 AICC meet in committee session to discuss specific  
recommendations and actions growing out of the previous  
two days' discussions.
- 0930 BREAK
- 1000 AICC meeting with USCG and NSF senior officers and staff  
to review prospective Healy science programs for 2001-  
2002, to consider USCG/NSF/AICC interactions regarding  
expeditionary planning, vessel outfitting, funding, and to  
discuss other matters of mutual interest.  
  
This is a nominal one-hour meeting. If needed, the AICC  
will meet afterwards to consider action items.
- 1200 AICC meeting will adjourn by no later than noon.





# **APPENDIX III**





**RESULTS OF NOVEMBER 1998 SURVEY OF POTENTIAL SCIENCE USERS FOR USCGC HEALY**

(W='WESTERN')

REGION	YEARS	# OF CRUISES	DAYS/ CRUISE	TYPE OF WORK	PI	# IN PARTY	EEZ's	COMMENTS.
Central	2000-2005	2-3	20	Microbial dynamics	Hollibaugh, James T.	≤ 10	Canada, Russia	25-35 stations along transect
Northern Labrador	ASAP		21	Glacial geochronology	Clark, Peter; Brook, Ed	3-4	Canada	Helicopter supported
Gakkel Ridge	2001-2006 even years preferred and odd years alternatively	3	30	Mantle melting & crustal genesis @ slowest rate	Dick, Henry et al.	15-40	Denmark (Greenland), Norway (Svalbard), Russia	Mesoscale & biological studies to follow for 10+ years; detailed petrological studies, anticipate 1/3 coverage per year; use of MAPR tool; preservation of hydrothermal vent community fauna, determination of rock compositions; seismic refraction studies; underway geophysical measurements
Alpha Ridge	2001		14	Early history	Clark, David	5	NA	Take sediment cores where previous work has documented the presence of Mesozoic sediment to help solve the problem of age & origin of the Arctic Ocean
Central Canadian basin				Thorium & protactinium isotopes as tracers & circulation in basin	Edmonds, Henrietta N.			6 stations across the Basin; the concomitant collection of box cores
Chukchi Sea & Shelf, Barrow Canyon (W)	2002-2003	2	14-16	Shelf & shelfbreak processes in Chukchi Sea	Plueddemann, Al; Gawarkiewicz, Glen	6	Russia	Seasoar/CTD/ADCP survey of mesoscale and sub-mesoscale features; deployment of moored array spanning shelf break
Chukchi Sea (W)	2001-2004		14	Ice-edge survey: Pacific walrus pop.	Garlich-Miller, Joel	6-8	Russia	Determination of age-sex composition of walrus
Chukchi Sea (W)	2001		45 max	Population estimate of Bering/Chukchi Seas polar bears	Schliebe, Scott	10 max	Russia	Surveys of polar bears along ice-edge
Eurasian / Central	2000-2003		30	Stratu cloud microphysics & chemistry	Borys, Randolph D.	2-3	???	Monitor effects of long range transport of Arctic haze aerosol on cloud microphysics & radiative properties

REGION	YEARS	# OF CRUISES	DAYS/ CRUISE	TYPE OF WORK	PI	# IN PARTY	EEZ's	COMMENTS
East Siberian & Chukchi (W)	2001-2003		50	Shelf-basin exchange & modification	Smethie, W; Schlosser, P.	20	Russia	~100 stations along shelf crossing slope regions at right angles; envisioned to be coordinated w/ Western Shelf Basin Interaction Expt
Western boundary north of Denmark Strait - Greenland Sea; Iceland Basin	2002		50	Origin of the Denmark Strait Overflow Water	Pickart, Robert; Mauritzen, Cecilie	15	Denmark, Iceland	CTD/LADCP survey ~100 stations along boundary north of Denmark Strait - Iceland Basin; deployment of profiling CTD moorings
Bering, Chukchi & Beaufort Seas (W)				Surveys of cetaceans & pinnipeds	Moore, Sue			
Long transects along route of SHEBA drift (W)	In 3-5 years		40	Spatial distribution of snow & ice characteristics	Sturm, Matthew	3-5	Not sure yet	Proposing a series of traverses in which coordinated snow & ice measurements are made in concert with remote sensing.
Eurasian Basin	2001		20-30	Geodynamics	Tikku, Anahita	5-10	Possibly Sweden, Norway, Greenland, Russia?	Marine geophysical survey
Western Arctic (W)	2002-2007	3	28-42	SBI Phase II program	Grebmeier, Jackie			

REGION	YEARS	# OF CRUISES	DAYS/ CRUISE	TYPE OF WORK	PI	# IN PARTY	EEZ's	COMMENTS
Lincoln Sea	2001-2002		45	Biochemical Cycling of Methyl Halides	Yvon-Lewis, Shari; Saltzman, Eric; Butler, James; Matrai, Patricia	8	Canada, Greenland	Continuous measurements of saturation state; depth profile measurements; incubations of water samples; isotopically spiked incubations from same selected depth for degradation rate measurements
Bering to Chukchi (W)	2001		14	A late Pleistocene coring transect	Keigwin, Lloyd	< 10	Russia	Acoustic surveying, water column sampling, gravity coring, piston coring, multicoring, and vibracoring.
Central	2002		45-55	Icebreaker & site survey support for drilling	Moran, Kathryn	7	International waters	High-resolution seismic reflection data collection; shallow piston core & box core operations; support to assist w/ maintaining primary drilling icebreaker
East Siberian (W)	2001 onwards		28-42	Late Quaternary paleoceanography of the western Arctic Ocean	Briggs, William M.	1	Russia	25-30 box cores along transects from basin to shelf
Arctic Basin, Nansen-Gakkel Ridge	2000-2010		~5/year	Local earthquake survey	Sohn, Robert	4	????	Deployment of long-term ocean bottom seismometers; revisit & deploy autonomous vehicle in following years; recover instruments at end of total program
Beaufort Sea (W)	2000-2001		14	Investigations of surface fluxes & radiometric properties	Maslanik, James A.	3	None	Sample vertical & horizontal profiles of atmospheric state variables, surface temperature, and surface reflectance upwind, above & downwind of leads at different flight levels.





# **APPENDIX IV**



## **McGillivray, Philip**

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**From:** Berkson, Jonathan  
**Sent:** Tuesday, November 17, 1998 2:39 PM  
**To:** McGillivray, Philip  
**Subject:** FW: AICC Nov98 Report1

**From:** McGillivray, Philip  
**Sent:** Sunday, November 15, 1998 3:53 PM  
**To:** 'jswift@ucsd.edu'  
**Subject:** AICC Nov98 Reports

Report for AICC Meeting, Nov. 18-20, 1998

Report #1. USCG PACAREA Icebreaker Operations.

### **PACAREA Command.**

During the past year, relations between Icebreaker Operations and PACAREA commands have been exemplary, and are expected to remain so. In the past year PACAREA has undergone changes in command, including the Commanding Officer (CO) and Chief of Staff. VADM Card, the previous PACAREA CO, departed this summer and is now Vice Commandant of the Coast Guard, so the educational process for PACAREA commands was useful. The new CO, VADM Collins, began this summer, and the new Chief of Staff, CAPT Worcester, began Nov. 2. VADM Collins is a technology enthusiast, and actively supports testing and development of technologies for PACAREA vessels on the icebreaking platforms. Along these lines planned technology evaluations include continued INMARSAT B testing and demonstrations of telemedicine systems, whose requirement for high bandwidth is similar to that needed by scientists. A briefing and review of issues on Icebreaker Operations is planned for the CO and Chief of Staff the second part of November, and we are discussing whether a visit from the AICC Chair may not be beneficial as well.

### **PACAREA Icebreaker Budget Issues.**

Changes in command staff have influenced Icebreaker Operations through budget allocations: recurring science funds, which come directly from CG HQ for passthrough by PACAREA, disappeared into the PACAREA budget this past year. And, with the changes of commands, they disappeared irretrievably despite efforts to correct this. New budget tracking and accountability measures are intended to correct this regardless of potential command changes. Permission to spend FY99 PACAREA icebreaker funding has already been granted, although the FY99 Icebreaker Operations funds have not yet officially arrived. Icebreaker Operations' coordination with the PACAREA command structure remains essential to ensure full funding of icebreaker needs, including science funding.

While USCG funding for FY99 increased overall, all of the increase was for drug interdiction, and a 5-10% decrease in funding in other operations is anticipated. New budget accountability measures and a reorganization of PACAREA staff that has just been completed have been undertaken to attempt to deal with this shortfall. The effects of the reorganization are not anticipated to affect icebreaker operations. One option may be that icebreakers perform more law enforcement activities. Icebreaker law enforcement activities are likely to focus on international high seas fisheries violations, particularly for law enforcement activities conducted jointly with the Russians, and other foreign nations. Should such activities be undertaken in the coming year, they will be only where convenient, and will neither impinge upon nor compromise science activities.

Interactions between PACAREA Icebreaker Operations and Joint Defense Forces have provided some additional monies for icebreaker technology development in 1999. Funding was secured for demonstration of the Freewing Autonomous Airborne Vehicle (AAV) (URL <http://www.freewing.com>) from a ship in San Francisco Bay, as well as for demonstration of the ACSA Company's ROV-tracking GPS buoy system (URL <http://www.underwater-gps.com>), and some additional ROV/AUV advanced technology demonstrations in March of 1999. The Navy will be providing their new SLICE vessel as a test platform for four days for these purposes. These funds are potentially available annually if this years' interaction is judged worthwhile.

### **INTERNATIONAL AFFAIRS.**

For the first time in a decade, a US icebreaker, the POLAR STAR, berthed in New Zealand en route home from Antarctic this past spring. The POLAR STAR was towing the NSF contract vessel GREENWAVE back from Antarctica, where it had lost power. Under these conditions, the POLAR STAR would be accorded access to the closest port of call, which was Christchurch, New Zealand. Response from the US Navy regarding this event, which countervailed US policy denying military vessels access to New Zealand waters due to longstanding disagreements over nuclear issues, was highly negative. NZ schoolchildren and press were allowed to visit the vessel, the crew did manage to get a small



amount of time ashore, and the ship's short visit was happily uneventful. Attempts to exempt the USCG icebreakers from the Navy restrictions met with support from NSF and within the USCG that were however insufficient to sway the Navy's opinion on this issue. Thus, regrettably, there are no plans to make such an attempt again. USCG activities thus continue to be cut off from direct interaction with the International Center for Antarctic Information and Research (ICAIR), and participation of NZ scientists in Antarctic cruises on USCG icebreakers is limited to their embarkation in Australia. For the current DeepFreeze mission (DF99), we are undertaking high seas fisheries law enforcement surveillance in the "NZ" sector of the Southern Ocean, i.e. that adjacent to the Ross Sea, during the transits of the POLAR SEA through these waters, particularly where illegal fishing is suspected.

During the past year the POLAR SEA was engaged in both oil spill response coordination demonstrations in the Sea of Okhotsk, Russia, and also fisheries law enforcement operations, both conducted jointly with the Russians. Both interactions were considered highly successful. Present opinion is that a continuation of such coordination is advisable, and increases the likelihood for access to Russian waters by US scientists. Discussion about revisiting joint international oil spill response training in the Sea of Okhotsk will continue during the coming year, along with discussions to consider inclusion of environmental impact studies in the region as well.

En route to the Sea of Okhotsk, the POLAR SEA also visited the port of Sapporo, on the island of Hokkaido, Japan. The ship hosted a number of Japanese scientists, both from Hokkaido, and from as far away as Tokyo, who came to visit the ship. Subsequent discussions have confirmed an interest in collaborative research in the arctic by several Japanese scientists visiting the ship.

Both the POLAR SEA and POLAR STAR performed crew rotations from the Canadian CG vessel DES GROSEILLERS during the summer as part of the SHEBA program. The crew rotation performed by the POLAR SEA was reimbursed, while the two rotations conducted by the POLAR STAR were performed under Canadian invocation of a mutual assistance agreement with the United States. The efforts of the US icebreakers were acknowledged at a formal ceremony in Canada attended by CAPT Garrett, CO of the HEALY, a few weeks ago. In another interaction with the Canadians, CDR Steve Wheeler, representing the USCG Icebreaker Program, continued to participate in International Maritime Organization meetings regarding icebreakers. At these meetings, the Canadian position on US icebreakers and other vessels having access to their waters continues to be of interest. Access for a US "SCICEX" sub to the Canadian arctic was not granted within the recent past, and will be requested and briefed again within the next few weeks to the Canadian Foreign Minister, with inputs mindful of the upcoming availability of the HEALY for operation in Canadian waters as part of joint missions. It is hoped that no problems with access by US icebreakers to Canadian waters will arise as a result of goodwill generated by the SHEBA-related activities of the past summer, and also as a result of planning for use of the HEALY in the Canadian arctic (and elsewhere in the arctic) as part of international multiship arctic programs that will also involve the Canadians.

#### OPERATION DEEPFREEZE 98.

The POLAR STAR completed the DeepFreeze mission in Antarctica this past year without incident, supporting seabird monitoring and geologic logistics support as usual. Changes in Automated Weather Station batteries were deferred for a year due to Univ. Wisconsin personnel issues. The Ice Pier, while damaged, was left in McMurdo; it will be necessary to dispose of and reconstitute it after this coming year.

#### OPERATION DEEPFREEZE 99.

The POLAR SEA departed Seattle Nov. 13 for DeepFreeze 99, with southern route port calls in Honolulu, Sydney, and Hobart. Steve Gerst, from Univ. Washington, will accompany the ship down, collecting air samples en route. NOAA Global Ocean Observing System (GOOS) buoys will be dropped en route as well. Science support prior to the McMurdo break-in will include changeout of Automatic Weather Station batteries along the Victorialand coast, along with logistics support and deployment of NZ scientists studying seabird colonies, and conducting other field research at Cape Hallett. Logistics support will also be provided to a scientific team headed by Gerd Wendler (Univ. Alaska), conducting SHEBA-like flux measurements on wind-ice-ocean interactions. The ship will return north via portcalls first at Hobart, Tasmania, then Adelaide, Australia, on to Jakarta, Indonesia, followed by Subic Bay, Philippines, and finally Petropavlosk, Russia. Science activities en route north will include planned sea-testing in Adelaide of an Australian Autonomous Underwater Vehicle, KAMBARA, which is equipped with "acoustic daylight" imaging systems, and collection of air-sea interaction data using MAERI (Marine Atmosphere Emitted Radiance Interferometer) equipment, provided by Peter Minnette (Univ. Miami). Following the Russian portcall, the POLAR SEA will transit to Dutch Harbor, Alaska, to embark an ROV and the scientific party of Jackie Grebmeier for an NSF-funded study of the St. Lawrence Island Polynya (the SLIP project) for two weeks, and after disembarking scientists in Dutch Harbor will return to Seattle on about May 7.

The withdrawal of Naval forces from Antarctica, and the replacement of air operations by Air Force and Air National Guard personnel, means some changes in Antarctic operations this year. However, effects of the change to Air Force involvement should generally be transparent to ship and science operations. The POLAR SEA is carrying to McMurdo Station a considerable supply of high explosives for use building site preparation, and also JATO (Jet-Assisted Take-Off)



bottles for use in aviation. The POLAR SEA will be towing the Ice Pier out this year at the end of Deep Freeze ship operations.

Report #2. 1998 SOO Review.

POLAR SEA AWS 98 SOO - presented by Lisa Clough, CAPT Garrett.

Relevant issues:

1) Use of ROV - procedures developed for use of ROVs. Training of divers for operation with ROVs was recommended.

2) Radiation license; use of radiation van - procedures now in place for such practices.

3) Outstanding issues:

(1) Communications

Email communications on the POLAR SEA were unreliable. The POLAR SEA had not yet been equipped with INMARSAT-B capabilities, which it now has. Positioning of the INMARSAT receiver/transmitter may still pose a problem requiring relocation. This issue will be revisited following tests during DeepFreeze 98.

(2) Divers

USCG regulations regarding divers were modified before the AWS 98 cruises. Interpretation of the newly modified rules led to confusion about the capability of non-USCG divers to dive from USCG vessels. During summer 1998 operations, non-USCG divers were not allowed to dive from USCG vessels, however the confusion brought this issue to the USCG Dive Officer, who is reviewing the situation, including the list of recommendations of gear and qualifications for non-USCG divers provided by the POLAR SEA. The possibility exists that non-USCG divers may be permitted to operate from USCG vessels in future, if perhaps only if USCG divers cannot perform tasks which are needed. Results of the policy review will be reported at the next AICC meeting.

(3) RADARSAT

The Terascan system, even with National Ice Center (NIC) personnel and Bob Whitner from Scripps Institution both present, and with POLAR SEA MSTs having travelled to NIC to be trained to receive this data, was unable to receive more than partial RADARSAT ice imagery. It is possible the location of the Inmarsat receiver was part of the problem, but the cause of difficulties is unclear as other satellite data was received successfully. We will continue to investigate receipt of RADARSAT imagery, as it is useful when available, and we wish to guarantee routine access to such imagery.

(4) BATHY 2000 Data

Bottom profile data from the Bathy 2000 unit were recorded and forwarded to Bernie Coakley at Lamont Doherty Earth Observatory for confirmation of format and data quality. Dr. Coakley has promised to review the format and data now that he has a bit of a breather from SCICEX dataflows.

4) Gear Loss/Damage:

(1) 15-ton crane - Crane experienced failure during normal operations. Cause for failure was determined as shearing of metal bar that prevents rotation beyond a certain point, which allowed for over-rotation, shearing hydraulics. NOTE: Hydraulic failure does NOT drop cargo from crane, rather locks everything in position. Correction steps: replacement of heftier anti-rotation bar. Preventive steps: POLAR STAR cranes also inspected to determine whether anti-rotation bar replacement/modification is advisable.

5) Additional Information regarding the POLAR SEA AWS 98:

Email was received the first week of November, 1998, from Paul Jensen, at Scripps Institution of Oceanography, indicating that a new class of macrolide with significant anti-tumor activity was isolated and identified from one of the ascidians collected by chain trawl dredge during the POLAR SEA AWS 98 cruise. He indicated their group was interested in obtaining additional specimens of the species of ascidian they have tentatively identified as the one in which the compound was found. Steps will be taken to assist them in obtaining additional specimens as opportunities arise.

POLAR STAR AWS 98 SOO

AWS 98 SOO operations on the POLAR STAR involved four main efforts: SHEBA personnel transfers; NASA educational outreach programs; NASA testing of ROV stereo-video cameras and 3D conversion software; and, marine chemical sampling. Science efforts involved collaborative efforts/sponsorship/participation of: NASA, NOAA/NURP, the National Park Service, Minerals Management Service, Naval Arctic Submarine Lab, State of Alaska, Santa Clara University, USGS, and Texas A&M University. The cruise was accompanied by the science reporter for "The Economist" magazine, a videographer from the television "Discovery Channel," and was visited by news teams from NBC and ABC news.

The schedule for AWS 98 SOO on the POLAR STAR was driven principally by requirements for the SHEBA program for personnel exchanges and transfers mandated under a mutual assistance treaty between the U.S. and Canada, which was invoked by the Canadians through the US Dept. of State.

NASA educational program personnel boarded the ship in Seattle, and immediately began conducting video



interviews on board ship which were typically broadcast daily live over the new Inmarsat-B high speed system to NASA groundstations which distributed the signal to schools in summer session across the U.S., and provided the capability for interactive questioning. As per discussion at the previous AICC meeting, digital still photos of the ships' crew were also compiled with a brief biography for crewmembers, and posted on a web page linked from the ships' home page. Information on the cruise, the journals of two high school students who worked on the NASA education program, the video archives of live interviews, and archives of digital still photos of ship operations and portcalls may be found at URL: <http://quest.arc.nasa.gov/arctic>

During the first days of transport, a new crewmember was injured in an accident with one of the ships' two boilers. He was medevac'd to Vancouver, and continues in recuperation. The ship made a portcall in Kodiak, and another in Nome to pick up SHEBA personnel. In Nome the ship also onloaded an emergency boiler, however water was rationed for the duration of the cruise. For the first personnel transfer on the POLAR STAR, SHEBA personnel were picked up in Nome, and then delivered to the SHEBA station; personnel from SHEBA were embarked, then offloaded in Barrow. All SHEBA operations went without incident. Ice cover had receded greatly from the POLAR SEA mission, but there was still heavy ice around the SHEBA vessel; consequently, there were no stops for science en route to SHEBA, and work near the SHEBA ship during personnel transfers was not possible.

Science operations began in earnest following disembarking of SHEBA personnel in Barrow. Operations began with marine chemical sampling using box cores, and large volume water sampling. After several days of sampling, a hydraulic O-ring/seal on the J-frame failed during a cast retrieval. While repairs were underway, the weather rapidly degenerated, and in 8-12' seas, the winch cable parted, and the rosette and CTD were lost, along with the 30-l Niskin bottles on it. This equipment will be replaced before the next cruise in summer 1999; the Niskin bottles probably before spring 1999.

Subsequent science activities included deployment and operation of the NASA ROV. The stereovideo camera system and 3D conversion software were tested from the ship, and worked satisfactorily. The conversion to 3D permits accurate measurement of objects on a computer screen, as well as their rotation in space. A video interview by Alex Derbes, archived on the web page cited above, explains this, and provides a sample image of one of the ships' screw in 3D produced from the stereovideo cameras. Additional deployments of the ROV were made from a small boat (the ships' LCVP). Wireless equipment from Wireless, Inc. (Belmont, Ca.) was used by NASA to transmit live video from the ROV below the LCVP a distance of 5 miles back to the POLAR STAR, where it was then transmitted live over the Internet from the ship via Inmarsat-B. Continuing weather problems from early fall storms made ROV and small boat operations problematic on a number of days, however NASA personnel working with onboard marine archaeologists from Santa Clara University and the Alaska Regional Minerals Management Service were able to locate the wrecks of at least two ships from the historic "lost whaling fleet of 1871." The finds were somewhat fortuitous, as the vessel locations were unknown, and side scan sonar devices provided by the Naval Arctic Submarine Lab experienced failures of both the main and backup units. The location of the "lost fleet" is being submitted as a National Historic Site by the National Park Service; the story of the fleet is described (with photos and archival material) on the web page cited above. Following the cruise, science participants made presentations to the Barrow Borough Science Council before departing Barrow.

#### Relevant issues:

- 1) Use of ROV - procedures developed for use of ROVs, including from small boats.
- 2) Communications - procedures for transmission of live (and interactive) video both from the ship and from a remote location on a small boat were demonstrated successfully to @78oN using Inmarsat-B and mini-M Inmarsat transmitters. Transmissions reached >40,000 web site hits/week for several weeks during the cruise. The addition of a router (provided by NASA) to the ships' email system made receipt of email by individuals possible.
- 3) Helo conveyance of hazmats.

The issue of helo on/off-loading of both radioisotopes and hazardous materials came up during operations at Barrow, Alaska. In effect there are strict rules governing conveyance of such materials in a sling below the helicopter, which generally prohibit conveyance of hazmats by sling-load unless flights are effectively exclusively over water (not the case in Barrow). This means such materials may be carried aboard the helicopter; such decisions are presently not codified beyond the pilots' discretion. Thus conveyance of acids, gasoline, etc., may be (and were) undertaken in this manner. This situation may warrant additional attention, but at present none is planned.

#### 3) Outstanding issues:

(1) Communications - USCG will acquire their own router to facilitate email to the individual, in keeping with new USCG policies which provide for direct email accounting to individuals. On return from the cruise, Hugh Electronics provided the ship with new computer boards to ameliorate the problems which arose from the new INMARSAT-B, which experienced frequent "dropouts" (premature disconnection). It is hoped these will solve much of this problem.

(2) A hand-lever winch control unit, similar to that installed on the POLAR SEA is still needed on the POLAR STAR.

#### 4) Gear Loss/Damage:

- (1) CTD/Rosette/30-l Niskin bottles - This gear will be replaced before summer 1999. Funds are now available



for this replacement. A smaller rosette will be purchased than the 24 bottle rosette which was lost; a 24 bottle rosette frame remains part of the inventory shared between the two polar icebreakers. The replacement CTD will include a fluorometer.

(2) Other oceanographic gear - The LCVP experienced motor difficulties during operations which required it be towed back to the ship. While this is always an option, a re-examination of backup motors on the LCVP is being investigated so that loss of the one engine will not be crippling. Changes are not likely with the present LCVPs, but new models may be obtained which incorporate such improvements.

### REPORT #3. ROV/AUV Interests in Arctic

An Arctic and Antarctic Access (AAA) Conference was jointly sponsored by NASA, NOAA's National Undersea Research Program, West Coast and Polar Regions Center (NOAA/NURP/WCPRC), and the US Coast Guard in mid-April, 1998, for three days in Palo Alto, California. The conference included government agency program personnel and invited scientists from a number of research institutions with an interest in ROV and AUV technology, as it may be applied to high latitude and also deep ocean environments. The AAA Conference Report will be available in printed form within the next week (mid-November 1998) from NOAA/NURP's West Coast and Polar Regions Center (call or email Dana at PH 907-474-5870, email: westnurc@ims.alaska.edu), and is available now in electronic form as a link on the NOAA/NURP/WCPRC website, <http://www.wcnurc.alaska.edu:8000/>. The Conference report highlights areas of mutual interest and potential for ROVs and AUVs in high latitude research.

Research and application of ROVs and AUVs in high latitude environments continues in other countries. The Italians, for example, will be in their fifth year of successful deployment of their fully autonomous underwater vehicle (AUV) at their Terra Nova Station in Antarctica this year. It can perform detailed trackline search patterns, return to a submarine battery charging station, and has been used to collect data under glacial ice shelves. Elsewhere, JAMSTEC recently announced it was dedicating \$21.4 million dollars for development of an AUV specifically for arctic research. And, the Russians are proceeding with development of their latest AUV with US military funding, which should also function in arctic environments. To take advantage of these and other US and international efforts to improve ROV/AUV technologies, an international ROV/AUV conference focusing on development and use of such vehicles in high latitude environments (including development of their use as part of benthic observatories), was suggested for the spring/summer of 1999 to the National Science Foundation. Preliminary discussions have suggested that such a conference might be held in Anchorage in spring coincident with (and at) the opening of the new building at the University of Alaska which is envisaged as an international center for arctic research, which includes considerable financial and personnel backing by the Japanese. Discussions between NSF OPP (Tom Pyle), NOAA/NURP/WCPRC (Ray Highsmith), NASA Ames Research Center, and the USCG (PAQAREA Icebreaker Operations) will be ongoing over the next month or so to work out details of whether such a conference is possible, and details of how it might be conducted. Tentative plans would include invitations to various foreigners active in ROV/AUV development, as well as US groups active in such research, e.g. those at FAU and FIT, as well as the Rutgers LEO15, WHOI, and other groups. Suggestions for possible invitees and input on topics for discussion are welcome. There is a general feeling the time is right to develop these technologies for general use, but particularly for use in high latitudes where they can accomplish tasks otherwise very difficult, if not impossible.

### REPORT #4. SCIENCE GEAR REPORT

1. Gear lost during the POLAR STAR cruise, including 12 30-liter Niskin bottles, CTD and CTD Rossette and frame, will be replaced prior to summer 1999 AWS cruises.
2. Plans to include a joystick on POLAR STAR winch controls are expected to proceed now that funds are available.
3. Plans to upgrade science gear, as was anticipated for use of FY98 funding which dematerialized, remain in place. Gear anticipated to be added to the USCG inventory includes that previously discussed with AICC, namely:
  - (1) Autosal salinometer, which we have been renting from U. Washington up to now
  - (2) Salinity bottles
  - (3) Turner Flow-Through Fluorometer
  - (4) Fluorometer for CTD
  - (5) New Rossette stand and cage
  - (6) Ultrasonic anemometer
  - (7) Spares of: Through Hull Pump; CTD pump; ice auger; CTD tripping pylon
4. During the coming year maintenance will be done on:
  - (1) The biology/radiation van
  - (2) Freezer van
  - (3) Wire/cable - routine load and torque testing
5. Items Still Requiring Action
  - (1) Meteorological Instrument Jackmast installation on POLAR SEA
  - (2) Upgrade of winch control computers on both ships

