Raytheon
Polar Services

ANTARCTIC VESSEL OVERSIGHT COMMITTEE (ARVOC)

18 November 2011

United States
Antarctic Program

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TABLE OF CONTENTS

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Executive Summary

There are a number of important changes taking place that will over the next several months influence marine science operations in Antarctica, so the November ARVOC meeting was an important one. A new support contractor will replace RPSC, but it is expected that many of the key personnel from RPSC will continue and that the transition will have minimal impact on the program. Negotiations for the RVIB are close to being finalized, which represents the culmination of nearly a decade of ARVOC work on this exciting project. It also means that new ARVOC members will play an important role in soliciting input from the science community concerning equipment and other issues. A new support vessel, the R/V Point Sur will begin operations in the Antarctic Peninsula area (The Gould will continue operations) and it appears as though a new pier at Palmer Station will at long last become a reality. Finally, the Blue Ribbon Panel, headed by Norm Augustine, will likely have recommendations that will impact vessel operations in the future. Most of the current ARVOC committee members will rotate off the committee right after the contractor transition. I think I speak for all of us who will be stepping down that it has been a rewarding experience.

Actions

ACTION: Bob will inquire if this type of testing can occur/be a part of the study during the dry dock. Dan and John will talk off-line about this suggested acoustic testing so information/advice can be provided to the new Antarctic support contractor. **(page 4)**

ACTION: Chris/IT RPSC will draft a form that lists what storage options are available for data collection and the polled grantees can provide RPSC with their preference. **(page 13)**

ACTION: Committee members are asked to review the list (Attachment 3 page 25), contact Dan with any questions, and to prioritize these items for further review/consideration by RPSC and the NSF. Priority list should be sent to Dan Herlihy and Tim McGovern. **(page 13)**

ACTION: Because of strong science support for the upgrade to EM122, John will write a letter on behalf of ARVOC to RPSC and NSF asking that this equipment be purchased. **(page 14)**

ACTION: Ross Hein/Andy Nunn will investigate leasing prices for seismic equipment and streamers. **(page 13)**

ACTION: Dan will summarize and send the price list to ARVOC members. **(page 14) DONE-** **refer page 29**

Sam Feola, RPSC Program Manager

Regarding the new contractor announcement, Sam reported that the tentative announcement date is November 18th but the announcement may slip a few days. ARVOC members will be informed as soon as the new contractor is identified. It is anticipated that most employees will be offered jobs with the new contractor, thus providing continuity and support to the researchers. Raytheon Polar Service's goals are to perform to the best of our ability and to make a seamless transition in these last four and one-half months.

These are exciting times for Palmer Station and the research vessels.

- Plans are being developed to bring in a support vessel to Palmer Station. (agenda topic later today)
- Tim continues to provide his vast UNOLS experiences and knowledge in support of the science community.
- Negotiations for the RVIB are close to being finalized. Sam thanked John Anderson, Maria Vernet and Bruce Huber for their assistance to RPSC during the process. The RVIB is now with Raytheon Corporate and the NSF Contract Office for final approval.
- A Blue Ribbon Panel, led by Norm Augustine, will review the current US Antarctic Program for optimal long-term strategy for conducting science and diplomacy in Antarctica. In a recent meeting in Arlington, travel plans were being developed for the panel to visit all of the USAP stations, per Sam.

http://usscar.tamu.edu/latest-news/92-latest-news/904-nsf-announcement-norm-augustine-to-lead-review-of- antarctic-science-blue-ribbon-panel

- We, as the USAP contractor, need to stay informed and be aware of the grantees' needs. If there is a perception of communication gaps, we need to work to improve communications, and to continue meeting science community requirements while staying aware of cost efficiency.

Tim McGovern, AIL Ocean Project Manager

Tim had the opportunity to travel to Palmer Station in April. The cruise to Palmer Station and transit though Punta Arenas allowed him time to speak with Palmer Station staff, R/V Laurence M. Gould and R/V Nathaniel B. Palmer vessel staff and to see the AGUNSA warehouse operations.

Staffing/personnel at NSF:
Kelly Falkner, Deputy Director, OPP
Brian Stone, continues as Division Director, AIL and is doing an excellent job
Paul Shepherd, Systems Manager, Operations and Logistics
Jim Swift will work (1 year) as Antarctic Research-Logistics Integration (ARLI) Program Director. Dr. Swift's start date is 19 December 2011.

Budget - The NSF will have a flat budget- 2 ½ percent across the program. Tim will communicate the budget results coming out of Congress as soon as known.

Dr. Erb will be traveling to Antarctica with the Blue Ribbon Panel. If schedules allow he will also travel to Palmer Station with the panel in late February.

The new USAP contractor will assume all duties effective April 1, 2012. The transition team will be in place and responsible for new hiring, continuity, etc. as soon as the new contractor is named. The NSF desires a clean transition even though two scheduled cruises currently span the time frame between contractors. Bruce Huber mentioned that he sailed a cruise during an earlier contract change. He and Tim will discuss that crossing in a separate phone call.

The NSF is working with RPSC to review Palmer Station pier options, designs, and cost effectiveness. (the pier is a later agenda topic. Also see Attachment 2.)

RVIB Rebid Contract Negotiations and Award Milestones

There is no signed contract or award as of today's meeting, per Dan.
Following is information Dan provided the committee prior to teleconference.

- Verbal contract negotiations completed on 20 October 2011
- RPS Subcontracts/Procurement to complete contract package and submit to RTSC and NSF Contracts no later than 2 December 2011 (Accomplished as scheduled on 12/2/11)
- RTSC and NSF Contracts review and approval of contract package expected no later than ???
- RPS contract award expected no later than 1 March 2012

Summary of Contract Negotiations

- Minor changes were negotiated to the general and special terms and conditions.
- Negotiated 1.5% reduction in the annual increase for the out years for both food and accommodation rates.
- One technical item was negotiated, the addition of a Forward Looking Sonar, along with associated spares and maintenance at a slight increase to the agreed to day rate for the duration of the contract including option years.
- Day rates for the charter proposed during the competitive bidding process were determined to be fair and reasonable based on pre-negotiation market research that demonstrated these rates were below those of similar vessels.

The contract package is a detailed and long document that requires meticulous review. We will make ourselves available to answer any questions from the NSF Contract Office and/or Raytheon Corporate and we are optimistic the 1 March 2012 will be met. RPSC/Dan Herlihy will inform the ARVOC members of the RVIB contract status as soon as possible following the award.

A complete acoustic study will be done as part of the RVIB project and made available to the new contractor. This will provide the new contractor information regarding potential costs if acoustic improvements are needed.

Vessel out-year schedules (2012-2013)

Because the new Antarctic support contractor has not been identified and because the RVIB is not awarded as of today's teleconference, any cruises past the end of March are technically not funded.

Some proposed work for several projects (2012-2013) are being discussed, some time frames have been blocked out and, while we may project out what might happen, priorities have not been set yet, per Lindsay. The draft schedules provided to the committee members today are for general discussion during the teleconference only and are not for general publication.

Dry dock - Bob Kluckhohn noted that plans are to make sonar improvements and an acoustic study during the dry dock period. Ship proximity noise and the affects to sonar reception are what will be included in the study. John inquired if the high resolution streamers and how they are affected will be a part of the acoustic study. **ACTION: Bob will inquire if this type of testing can occur/be a part of the study during the dry dock. Dan and John will talk off-line about this suggested acoustic testing so information/advice can be provided to the new Antarctic support contractor.**

UNOLS Vessel at Palmer Station- R/V Point Sur

Dan Herlihy provided information and committee discussed R/V Point Sur.

Why?

- To provide full-time vessel support to Palmer Station when the LMG is working elsewhere.
- To provide operating flexibility and scale that can be more efficiently met with a smaller, regional vessel.
- To provide enhanced science opportunities to Station-based groups usually restricted by small boat rules / limitations.
- First year test and evaluation for proof of concept

Potential Deployment Schedule

- UNOLS schedule ends 1 Nov 2012
- Demobilize/Mobilize 2-26 Nov 2012
- Depart MLML for transit south 27 Nov 2012
- Arrive PUQ ~31Dec 201
- (6,600 nm @ 9.0 kts = 30.5 + 3/4 days to refuel/re-provision & weather)
- PUQ 4-day port call to refuel / re-provision
- Favorable weather required for Drake Passage crossing
- Earliest expected PAL arrival ~8 Jan 2013
- Planned 60-day PAL deployment ends ~8 Mar 2013
- PUQ 4-day port call to refuel / re-provision
- Depart PUQ for transit north ~16 Mar 2013
- ETA Moss Landing ~18 Apr 2013 (weather favoring)

Palmer Science Enhancements

- LTER station work group:
    - Zooplankton net tows
    - Deep-water profiling CTD (SPEAR) casts
    - Extending penguin research beyond small boat limits
    - AUV / Glider recoveries
- LTER cruise work group:
    - Oceanographic mooring recoveries / turnarounds
    - CTD casts and water sampling
- Setting/retrieving ocean acidification project's crab pots
- Extending polar entomologist's collection areas
- Extended permafrost core sampling areas
- Extending dive support beyond small boat limits
- Shallow-water multibeam mapping from RHIB

Palmer Station Operational Enhancements

- Potential air/sea bridge link between Palmer Station, King George Island and Punta Arenas
    - LMG PUQ to PAL roundtrip 8-9 days + Station time + science time
    - Transit time PAL to Chilean Frei Base, KGI ~24-28 hours
    - Flight time KGI to PUQ ~90 mins

- Option 1 - NSF agreement with Chileans for space on their military flights between KGI and PUQ
- Option 2 – Possible space on commercial flights between KGI and PUQ serving the cruise ship industry
- Who could benefit most?
    - Short-term PAL visitors / VIPs unable to devote the extended time often required to fit into the LMG's schedule
    - PAL employees who currently use cruise ships for transport when the LMG is not available

Vessel Characteristics - Pt. Sur

Built	1980
Owner / Operator	NSF / MLML
LOA / Beam / Draft (ft)	135 / 32 / 9
Displace (LT)	298 (gross) / 539 (full)
Range (nm)	6,800 @ 9.5 kt cruising speed
Fuel Burn (gals/day)	~1000 @ 9.5 kts
Endurance (days)	21 / stores limited
Complement	8 crew / 2 techs / 10 scientists
Lab Space (ft**2**)	488 (Main) / 96 (Wet)

Comparison with USAP Vessels

	NBP	LMG	PT SUR
Built	1992	1997	1980
LOA (ft)	308	230	135
Beam (ft)	60	46	32
Draft (ft)	22.5	18	9
Displacement(GT)	6,170	1,600	298
Science/Tech Bunks	39/43	28	12
Science Space (ft2)	~7,600	~2,980	~584

Logistical Challenges at Palmer Station
Marine fuel replenishment

- Ship to ship transfer with LMG unlikely due to PAL pier issues
- PAL fuel mixture 60/40 MDO/Jet-A detrimental for Point Sur
- Exploring PAL return to MDO in only one tank following waxy fuel removal/cleanup for two-month vessel summer deployment
- Exploring availability of shore power while pier side

Re-provisioning

- Freshies delivered by LMG whenever visiting Station
- Overstocking Station in advance of ship's arrival
- Refer/freezer van on the pier to hold ship's overflow provisions?

PAL pier condition – affects due to extended dockings
Sewage discharge non-issue pier side (similar to LMG)
Water making issue pier side (similar to LMG)

Dan noted that this first deployment for Pt. Sur will be a test demonstration to determine how well this vessel may perform at Palmer Station. Logistics are still being worked through, i.e., food provision resupply, fueling. Dan asked ARVOC members to consider how a boat this size might work for their research, what other locations they might be able to access, what other geological, biological projects might be possible. The 2012-13 season will be an opportunity to see how well a vessel operates out of Palmer Station. During Dan's discussions with Stuart Lamberdin, Moss Landing, a suggestion for creating a small working group was mentioned. The group could perhaps talk monthly to plan logistics, tasks, equipment needs, manpower, and to ensure everyone is on the same page for the Pt Sur departure November 2012.

[DRH Note: Pt. Sur deployment planning working group formed and has met twice already in November and December via telecon on its planned monthly schedule through to planned vessel deployment in November 2012. Working group members include Tim McGovern (NSF), Stuart Lamberdin (MLML) and Bob Farrell, Rebecca Shoop, Lindsay Powers, Bob Kluckhohn and Dan Herlihy (RPS)].

New science support deck and electronic equipment additions/upgrades

Due to the RVTEC annual meeting this week, Andy Nunn, Ethan Norris and Ross Hein are unable to attend ARVOC. Attachment 1 (page 17) provides information/presentation for Line Items 1, 2, 3 and 7.

Regarding line item #4 RVSS Appendix A (Wire and Cable Safe Working Loads) Dan remarked that we are an estimated 90% compliant. The complexities of the wires, winches, sheaves, computations, safety, etc. have contributed to the time needed to become fully compliant. Any deficiencies found are being addressed. On future cruises there will be safety factors/deck operations to be determined on a cast by cast basis depending on sea/weather conditions. The technicians and the grantees will need to agree that when the parameters change, certain operations may not occur. It's important that RPSC and the grantees work within the new safety requirements during the cruise planning stages.

Maria inquired how the new wire safety requirements might impact her next cruise and the JPC operations scheduled for that cruise. The RPSC Planning Support manager and Ross Hein, Marine Tech Supervisor, will begin talking with the grantees to help phase in the new process, per Dan. Bruce added that these new changes need to be well communicated to all new grantees as well as the returning grantees so the new guidelines can be worked into the researchers' proposals.

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Explanation/details #4 RVSS Appendix A (Wire and Cable Safe Working Loads)
Ross Hein's power point presentation:

What is Appendix A of the Research Vessel Safety Standards (RVSS)?

The purpose of Appendix A to the Research Vessel Safety Standards (RVSS) is to establish safe and effective operating limits for vessels in the UNOLS fleet for cables and ropes loaded beyond traditional shore-side limits. This standard seeks to define the requirements which must be adhered to during over-the-side deployments in order to maintain a safe working environment for all personnel aboard. The secondary goal of this standard is to minimize damage to cables and handling equipment, and the loss of scientific equipment, while still permitting the science objective to be met.

The appendix address several key areas of over-the-side equipment in order to maintain high factors of safety in operations; minimize potential damage to cables and rope thus maximizing their useful working lives; assist in cruise planning and life-cycle replacement.

Appendix A sets forth specific requirements for equipment and operations dependent upon the Factor of Safety calculated for an operation. Specific criteria such as block sheave and groove sizes are defined. The ability to monitor and record cable tensions; set specific alarms, and training for winch operators are addressed in this Appendix.

The key areas to be addressed within the USAP and where they stand are outlined briefly below.

Block and Fairlead Survey
Work in progress. At this time the Marine Technicians on the vessels have worked through the block information for both vessels in order to verify all physical block data. Significant gaps in the database included sheave groove data and diameters for some blocks. This data is needed to calculate Factors of Safety (FS) for current in use tension members. As further information is received we will keep the block database current.

The Block survey is looking at the head sheaves we use and the Fairlead survey is to understand our compliance in terms of how the individual winches handle their wire or cable (referred to generically as the "tension member") for over-boarding through instrumented sheaves.

We have found that the head sheaves used for CTD casting on .322 are undersized using the D:d1 of 400 measurement requiring a 15" sheave. The sheaves on the current G.O. blocks are grooved correctly only 12" in diameter. For full compliance we must identify and fund a set of larger sheaves for each vessel meeting the minimum 15" diameter called out by Appendix A.

At this point it appears that the larger fixed winches are in better compliance than the smaller ones. Part of this stems from some unique characteristics of .322 EM cable. In terms of bending over sheaves 40:1 ratio of sheave to wire diameters has been the Industry Standard, referred to as the D:d ratio (and was originally the Appendix A standard). New Appendix A standards call for a D:d for 40 or a D:d1 of 400, whichever is greater, where d1 is the diameter of the largest wire in the armor for cable or the largest outer wire for wire rope.
The Appendix A D:d1 ratio requires a 15" sheave for .322 wire. The DUSH-5 series has 12" sheaves so they are undersized. The DUSH-4 winch was originally built for 1/4" wire rope and was modified while aboard the R/V Polar Duke to run .322 cable as well. Unfortunately, these sheaves are the original size of 9.5" and undersized as well.

The larger DUSH-11 and DUSH9-11 have oversized sheaves for both the .680 EM cable and 9/16" 3x19 TB wire rope that they handle.

Wire Tension Monitor:
Both vessels have been upgraded to the LCI-90i model which meets the UNOLS Appendix A criteria. Under those requirements the wire tension will be displayed at the operator's station with a resolution of 3 Hz. More problematic perhaps is that the system will be maintained with an accuracy of 3-4 % and calibrated every six months. As some of the loads that we may encounter could greatly exceed our standard 'pull tests', and with the degree of accuracy required by this standard, a system of portable accurate calibration standards such as "water weights" will need to be maintained on the vessel, and such calibrations will require time in the schedule to properly plan and execute. Each vessel will be required to have a pre-determined period in its schedule when this is planned for with additional time and appropriate personnel (MTs and ET staff).

For reference:
The calibration loads required by Appendix A to use the minimum safety factors for .680 cable is 20,000 lbs with 3% accuracy (FS 2.0) and 9/16" wire rope is 21,667 lbs with 3% accuracy (FS 1.5).

Update/Modify Wire Logs
A new format for a written log that will maintain all necessary information (wire ID, type, S/N, Mfg's P/N, FS, etc) as well as terminations and use. Logs will need to be maintained per cast as well. We have also started to examine how we will maintain the critical wire data now being collected by LCI -90i monitors to the RVDAS system. Next efforts there will focus on what other institutions are doing with this data, and how best to maintain and archive this data. When we have a sense of what the 'end product' needs to be with this, how long it is maintained (service life of wire) and where the repository is, a task statement will be developed with USAP IT for the next step of recording/reporting such information.

Winch Operator Certification
Under the RVSS Appendix A standard, any operation with a tension member (wire or cable) that is conducted with a Factor of Safety (FS) of less that 5.0 (>20% of wire breaking load), the winch operator must be "certified competent" by the "Owner" in writing.

RVSS definition of Owner: **The party or their representative who is normally responsible for the operation, inspection, maintenance, and testing of the winch. This could be the vessel operator or the scientific party.**

Exact wording from the RVSS:
The Winch Owner must certify that all Winch Operators are competent. By "Certified Competent" it is meant that the Owner must have written documentation in place showing that the operator has been through and successfully passed a formal owner/operator developed training program on the winch, handling apparatus, and monitoring system. The system vendor or the Owner, depending on the complexity of the system, may conduct a formal training program. The certification must be renewed annually. The master shall verify qualifications and designate the approved winch operators.

As we have a unique relationship with the winch operators, we will likely have to explore with ECO how we will document this in the future.

Training Program for Vessel Personnel
A simple training program for determining the Factor of Safety for a given task will incorporate the components outlined above. The calculations should be relatively straightforward for routine work, but an appropriate background will be required for all Marine Technicians to follow to properly assess a 'non-routine' deployment such as may be particular to a science cruise.

Additionally, it will be important for Planning Support Managers to have a working knowledge of the UNOLS Appendix A requirements such that non-routine deployments can be recognized and brought to the attention of the Marine Technician Supervisor for review early in the planning process to avoid the possibility of later conflict.

UNOLS Wire Pool Database
Skip Owen was added as an additional contact and given access to the WHOI-hosted UNOLS web-based wire pool database. The USAP held wires and associated winch data has been brought up to date. Remaining task there is to verify the USAP fair-lead assemblies and blocks in use to enter remaining data and derive associated current Factor of Safety (FS) Factors. Overview is that we are evidently compliant is some cases and have some issues in other areas. As we get this info we will be periodically updating this Database. (Note: Per WHOI, a new version of the Wire Pool Database is to be rolled out soon.)

The Next Move and Plan Ahead
The Marine Technician Supervisor is planning to engage Markey Machinery directly and is prepared to commission a small engineering study to look into engineering modifications for the fairlead heads of the non-compliant winches taking into account the latest knowledge of minimum bend radii but also stepping beyond the traditional 3-sheave fairlead head to a more innovative and versatile fairlead head that is also compliant with Appendix A. We hope to present several options and identify the costs associated with them.

We are currently engaging other operators and will continue to do so at the Research Vessel Technical Enhancement Committee (RVTEC) meeting this week (November 14-18, 2011) on their plans for compliance especially due to the ubiquitous nature of the DUSH/-5 winches throughout the oceanographic community. It is hoped that there will be more info to pass along at the time of the actual ARVOC meeting.

We will also be polling the oceanographic community to see what other .322 head sheaves are being used in the UNOLS fleet as well as looking into options for wide throat sheaves, especially for heavier wire and cable to allow passage of hardware and fittings.

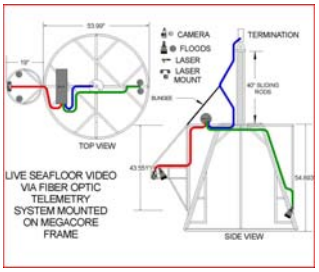
Regarding Line item #5 The **LCI-90i** installation (NBP) and upgrade (LMG) Bruce Felix and the ET staff worked to complete the install over the past year and it now ties into the new safety Appendix A. The **LCI-90i** was successfully used on NBP11-05. Four Electronic Techs now have experience with the **LCI-90i**. Plans are to install the same equipment on the LMG as time allows. Committee members may contact Dan, Skip, Ross or Bruce with any questions after they've reviewed the **LCI-90i** information and how it applies to Appendix A.

LCI-90i Winch Cable Tension Meter / Line Control Data System

New winch cable tension monitoring data display and archive system fully installed and integrated on NBP (replaced old, antiquated Metrox system), and will be installed on LMG by LTER (upgrading current older and less capable LCI-90 system). Meets UNOLS Research Vessel Safety Standards (RVSS) Appendix A (Wire and Cable Safe Working Loads) requirements for data acquisition and high frequency wire and cable tension monitoring, recording and archive.

Regarding Line Item #6 MK-E telemetry and camera system install/integration Andy Nunn, Electronics Tech Supervisor, is overseeing this fiber optic telemetry system and underwater camera upgrade prior to the NBP12-01 cruise. Andy will be in Punta Arenas in mid-December for installation prior to the December 24th cruise departure. It's anticipated that this equipment will be useful in many research applications where viewing the sea bottom before a sampling package is tripped. The diagram below shows how the MK-E is installed on the megacore.

A new system on the NBP utilizing its recently installed 10 kilometer hybrid single channel fiber-coax cable. 6000-meter rated MacArtney MK-E telemetry system with NTSC Video, 8 serial channels, gigabit Ethernet and 400 watts of power for instruments, cameras and lights. Will also work without Ethernet on regular .680 coax cable (LMG). Also have full set of fiber tools - OTDR, fusion splicer, termination tools, spares, etc. for support of fiber instrumentation. First test and evaluation deployment and potential operational use scheduled on NBP12-01 (McGillicuddy) and defined science mission operational necessity on NBP12-03 (LARISSA).



Pier advancements

Rebecca reported the following:

1. The NSF has contracted with Dowl HKM, one of the leading planning, surveying, and environmental services firms for a high level design for a Palmer Station boar ramp and pier. (Attachment 2)
2. Last year, Dick Armstrong visited Palmer Station and worked with staff to develop a long term master plan for up grades to Palmer Station. The plan includes: a new pier, fuel system replacement with modern tanks, new berthing building, water treatment facility, power plant needs.
   http://www.usap.gov/USAPgov/conferencesCommitteesAndWorkshops/userCommittees/documents/Palmer%20Major%20Systems%20Study122910.pdf
3. Expanding boating capabilities from Palmer Station with the use of a rigid hull boat that allows safe excursions farther than 2 miles is being studied. Crane requirements, time lines, options, etc. are being taken into consideration.
4. The Augustine Blue Ribbon Panel is scheduled to visit Palmer Station in late February 2011.

In response to Bruce's question about alternative power sources at Palmer Station, Tim noted that alternative power sources for all three stations are being promoted to the Blue Ribbon Panel.

ARVOC members will be kept informed as Palmer Station pier plans progress.

Internet access on vessels

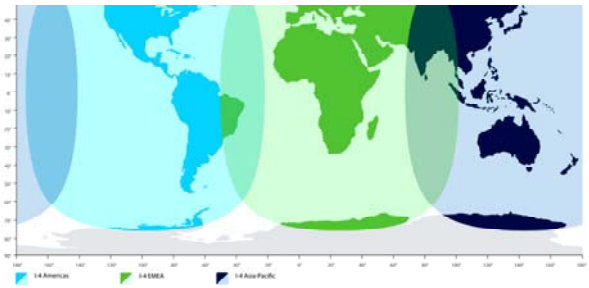
USAP Vessel Bandwidth Management presentation by Chris Linden, Joe Tarnow, & Scott Walker, RPS Vessel IT Group

Background

- USAP Research Vessels (Pre 2010)
  - Fleet 77 system:
    - ISDN connections back to Denver to transfer bulk e-mail and files.
    - Cost of service was ~ **$24/MB** ($3300/month/ship).
- Installation of FBB systems on the Laurence M. Gould (LMG) and Nathaniel B. Palmer (NBP) completed in early 2010.
  - Early deployment was focused in moving all services from the Fleet 77 system to the FBB system (E-mail & File Transfer).
- FBB monthly quota – 2 GB/ship.

Service Capabilities

- Fleet Broadband:
  - 432 Kb/sec Up/Down
  - Inmarsat 4 Constellation (F1, F2, F3)
  - The boundaries represent 24 hour coverage – some coverage exists outside of these areas for a few hours per day.



FBB Services

- Provide E-mail transfer service:
  - Remove the F77 Ffastest ISDN data service.
  - IPsec tunnel to DHQ.
  - Modify the current scripts to work through a TCP network.
- Provide IP phone service:
  - IPsec Tunnel to DHQ.
  - Set up DHCP parameters to point IP phones to Denver call managers.
- Provide Internet Access:
  - Requires additional software for bandwidth management, security and user identification.

Email and IP Phones

- Hardware
  - Cisco ASA 5510
    - Enterprise class firewall that meets the security requirements
    - Can produce a stable IPsec tunnel to DHQ over a low bandwidth, high latency connection
    - Has an additional "user friendly" interface (ASDM) for diagnosing issues by non-network savvy users.
- IPsecurity Tunnel = 20% overhead

Internet Access Testing Parameters

- Provide users Internet access
- Monitor the amount of data transferred through the system
- "Best Effort" Security:
  - Manage/Monitor Usage
    - Inappropriate sites
    - EntROB compliance
  - Isolate from ship network
    - Protecting from malware or other malicious exploits
- Will not affect normal ship operations:
  - E-mail
  - File Transfer

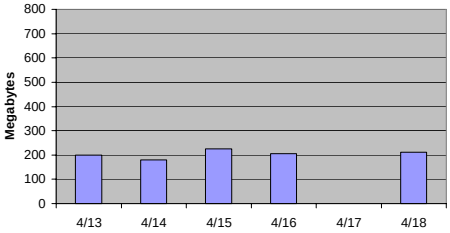
Initial "Café" deployment (LMG)

- Internet Café
  - Two hours per day - 15 minute sessions
    - First hour dedicated for science
    - Second hour open to science and RPSC
  - Ten hours per day – no set sessions
  - Only allow non-USAP assets to connect
    - No Enterprise security protections in place
  - Locate the Internet Café in a common area
    - **Create a self policing environment**
  - Provide antivirus updates locally
  - Provide a list of mobile sites
  - Provide Wireless Access

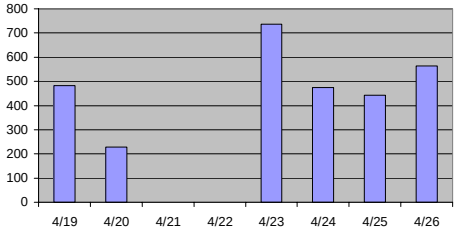
LMG Time Restricted Test Summary

- Two hours per day did not offer enough time for users to complete all tasks.

- Wireless access greatly increased the number of simultaneous users – Mobile devices.
- Very positive feedback



Café Two Hours/Day 204 MB/day



Café Ten Hours/Day 487 MB/day

Test Summary

Duration: 11 days	**Total: 7.5 GB**
Café: 4.0 GB	**Operations: 3.5 GB**
$11,400 Cruise	**$1100/day**

~20 GB/month

Quota Management Tools

- Internet Café Software
  - Used in Internet Café and Hotels:
    - Majority operate on a time based allocation
    - Limited functionality for quota management
  - Requirements:
    - User authentication
    - Ability to set daily/weekly quota per user
    - User scheduling
    - Reporting
  - Additional functions:
    - URL tracking
    - Port filtering
    - Bandwidth management

Internet Café Configuration

- Antamedia Hotspot Software
- Quota Management
  - Per User Basis
  - 100MB (Initial) to 10MB (Current)
- Bandwidth Management/Optimization
  - Per User Basis
  - 128 Kbps (Initial) to 32 Kbps (Current)
- Enhance security controls
  - Content Filtering
    - "Poor man's" content filtering using http://someonewhocares.org/hosts
  - Port blocking
    - Security generated list
    - Port blocking for Windows Updates and MAC updates

Way Forward *Striving to Meet NIST Security Guidelines*

- Manage/Monitor Usage
  - Inappropriate sites
  - EntROB compliance
- Isolate from vessel network
  - Protecting from malware or other exploits
- **Route all Internet bound traffic through DHQ**
  - Dynamically updated content filtering (Bluecoat)
  - Intrusion detection system (Sourcefire Defense System)
  - IPsec tunnel will create 20% overhead

- WAN Optimization
  - Riverbed Steelhead Devices:
    - Used at South Pole, McMurdo and Palmer stations
    - Improve bandwidth usage up to 50%
      - Caching
      - Application Optimization
- Due to the IPSec tunnel 20% overhead a Steelhead device would produce a 30% improvement for shipboard communications.

Additional Funding Required

Tim noted that Scott Walker's recent RVTEC presentation on vessel Café indicates a lot of flexibility. The multidisciplinary cruises may have some difficulty due to the extra people on board, but, overall, the "café" is being received very positively by the users.

The committee and RPSC IT staff discussed:
Wireless is a "case by case" occurrence. This is a SIP-specific item and the grantees' requests need to be submitted early in the planning process. Security can be easy to implement but it does take time, per Chris.
Real time data transfer is not an option at this time because of security issues. Some members noted they would like real time data transfer be a high priority.
Tim noted that he and Pat Smith are considering various ways to provide internet on the vessel.

Multibeam data - Chris asked members for input on whether RPSC needs to continue distribution on tapes or USB flash drives or hard drives? As tape drives are becoming harder to obtain, moving to an alternate media should be considered. **ACTION: Chris/IT RPSC will draft a form that lists what storage options are available for data collection and the polled grantees can provide RPSC with their preference.** RPSC can then provide the preferred option(s).

ARVOC shipboard science support items for consideration/consultation

(see Attachment 3 for entire list of 10 items. Items #2 and 6 had specific actions from teleconference.)

Dan reviewed the entire list of items under consideration. **ACTION: Committee members are asked to review the list (Attachment 3), contact Dan with any questions, and to prioritize these items for further review/consideration by RPSC and the NSF. Priority list should be sent to Dan Herlihy and Tim McGovern.**

#2 EM120 Multibeam Sonar System Upgrade to EM122

In discussions, Chris noted that the NBP was not upgraded to EM122. Rather, the budgeted $50k only allowed for a partial upgrade. Thus, the EM120 Multibeam Sonar System currently on the NBP and its data resolution does not equal that obtained on the Oden. Bruce noted that it's important for physical oceanographers to get the highest resolution as possible, John Anderson and Gene Domack, in prior discussions, also agreed that improved resolution is important to their science. **ACTION: Because of strong science support for the upgrade to EM122, John will write a letter on behalf of ARVOC to RPSC and NSF asking that this equipment be purchased.**

#6 Replacement of Seismic Data Acquisition System, Trigger System, Analog Streamers and Birds **Action: Ross Hein/Andy Nunn will investigate leasing prices for seismic equipment and streamers.** Leasing an integrated package and then providing in-house training may be a better option than purchasing.

[DRH Note: The Marine Manager received a formal e-mail response from the Dr. John Anderson, ARVOC Chair, on 12/8/11 indicating that upgrading the NBP's current EM 120 multibeam bathymetric mapping system to the more modern and widely used within the UNOLS fleet EM 122 system is the ARVOC's highest priority recommendation for scientific equipment/systems upgrade on the USAP vessels: "I can think of few other systems on the Palmer that are so essential to virtually every science group working on the vessel. Given current trends and discoveries on the Antarctic sea floor, such as gas seeps and small-scale geomorphic features associated with ice sheet retreat from the shelf, it is essential that the Palmer swath bathymetry system be upgraded at the soonest opportunity."]

Following general discussion of all items on the list, members were asked again to prioritize and to provide their input to RPSC. This information can then be provided to the new Antarctic support contractor and to help make for a seamless transition.

Other: John and the current ARVOC members agree to serve through to the end of Raytheon Polar Services Company contract end date (March 31, 2012). This will allow the new contractor, as it transitions, to be involved in the next committee selection, terms, etc. Committee Chair selection will be as usual, chosen by committee members. Tim thanked the members for their service and appreciates their willingness to remain active members.

Maria asked if a summary of prices/costs for the "shipboard science support items for consideration" be sent to members. **Action: Dan will summarize and send the price list to ARVOC members. (DONE- see page 29)**

Tim will suggest to the transition team that face-to-face ARVOC meetings be held rather than telephone conferencing. If not every ARVOC meeting is a face to face, perhaps the new Antarctic support contractor will consider this once a year or every other?

There being no further business, meeting adjourned 1:30PM MST.

Attendees and ARVOC members

Name	Affiliation	Email address
John Anderson	ARVOC Chair	johna@rice.edu
Matt Charette	ARVOC	mcharette@whoi.edu
Bruce Huber	ARVOC	bhuber@ldeo.columbia.edu
Maria Vernet	ARVOC	mvernet@ucsd.edu
Addie Coyac	RPSC	addie.coyac.contractor@usap.gov
Sean Drabant	RPSC	sean.drabant.contractor@usap.gov
John Evans	RPSC	john.evans.contractor@usap.gov
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Joe Tarnow	RPSC	joe.tarnow.contractor@usap.gov
Alex Isern	NSF	aisern@nsf.gov
Tim McGovern	NSF	tmcgover@nsf.gov
ARVOC members unable to attend		
*Sharon Stammerjohn	ARVOC	sharon.stammerjohn@colorado.edu
*Meng Zhou	ARVOC	meng.zhou@umb.edu

ARVOC
Friday November 18, 2011
Agenda

(1100 EST / 1000 CST / 0900 MST / 0800 PST / 0500 MCM / Nov 19th)

(Agenda schedule reflects CENTRAL STANDARD TIME, the ARVOC Chair's time zone; please adjust your agenda to reflect your specific time zone)

1000-1005 **Sam Feola, RPS Program Director**

Welcome and opening remark

1005-1020 **John Anderson, ARVOC Chair**

Introductions and brief overview of today's teleconference agenda

1020-1045 **Tim McGovern, NSF Ocean Projects Manager**

NSF Update:

1. Personnel changes
2. NSF budget
3. Augustine Blue Ribbon Panel

4. Identification of new USAP ASC (*only if announced prior to meeting*)
5. Other issues of concern

1045-1100 **Dan Herlihy, Manager, RPS Marine Science Operations**

RPSC update:

1. RVIB Rebid Project contract status
    a. Forward looking sonar
    b. Acoustic study

1100-1120 **Lindsay Powers, Manager, RPS Science Planning**

Vessel out-year schedules (2012 – 2013)

1120-1140 **Dan Herlihy / Lindsay Powers**

UNOLS regional work boat at Palmer Station in January/February 2013

1140-1210 **Ross Hein, Supervisor, RPS Marine Technician Services /**
Andy Nunn, Supervisor, RPS Marine Electronic Technician Services /
Dan Herlihy

New science support deck and electronic equipment additions and upgrades:

1. Markey COM-10 TMC winch
2. DUSH-4 winch refurbishment (LMG)
3. DUSH-11 mechanical to coaxial cable drum swap for LMG11-10
4. RVSS Appendix-A compliance update (wire and cable safe working loads)
5. LCI-90i installation (NBP) and upgrade (LMG)
6. MK-E telemetry and camera system install/integration
7. Engineering studies for vessel support enhancements

1210-1230 **Rebecca Shoop, RPS Palmer Area Manager**

New DOWL HKM "high level/low effort" PAL pier and boat ramp design

1230-1250 **Scott Walker, Manager, RPS Vessel IT /**
Chris Linden, Senior IT Analyst /
Dan Herlihy

USAP vessel bandwidth management
Multibeam data distribution via USB flash drive vice tape

1250-1400 **Andy Nunn / Dan Herlihy**

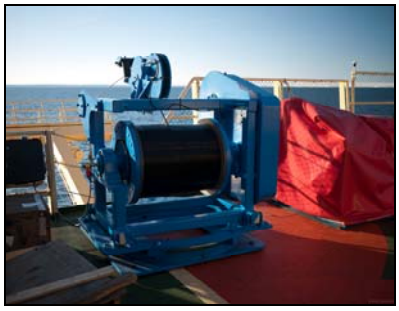
ARVOC shipboard science support items for consideration/consultation:

1. Forward Looking Sonar (RVIB Rebid)
2. EM120 multibeam sonar system upgrade to EM122
    a. Alternate EM302 Multibeam System
3. Portable zodiac-based shallow-water multibeam for shore approach bathy surveys
    a. Alternate single-beam sonar bathy survey system
4. Replacement of Simrad EK500 bio-acoustic sonar with EK60
5. Replacement of ODEC Bathy2000P 3.5 kHz sub-bottom profiler
6. Replacement of seismic data acquisition and trigger systems, analog streamers
7. USBL undersea locator beacons (for precise location of sea floor equipment)
8. Aperture sonar (for real time view of sea floor)
9. Field camp communication systems (COPA, Cape Shirreff, Avian Island, etc.)
10. Pole-mounted multibeam system for the LMG
11. Others?

1400-1500 ARVOC members' additional questions / deliberations

ATTACHMENT 1: **New Marine Science Support Equipment/Systems Additions and Upgrades**

1. Trace Metal Clean Winch and System Improvement for the NSF and USAP Marine Program Markey Machinery's Custom built COM-10 Winch With unique non-metallic sheave train for Trace Metal applications

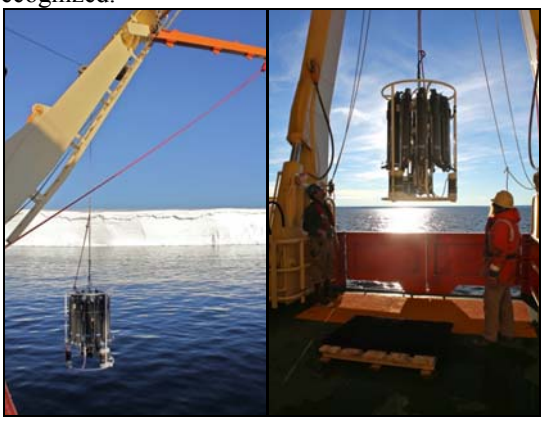


History

The USAP Marine Program has been reliant on an old, heavily worn Dynacon winch that was originally purchased as the BOPS winch (BioOptical Package) on the R/V Polar Duke. With the science package no longer supported, the Dynacon winch sat until some years ago when the drum and lebus shell of this winch were painted with epoxy paint and a 1,500-meter length of hydrel jacketed Kevlar cable with 4 copper conductors was drummed on to support Trace Metal science. The aging winch was grossly under powered and could not safely handle a rosette. The proximity level wind system required manual manipulation and was identified as a safety concern and the epoxy coating required regular attention due to the age and condition of the winch.

Background

The needs of the ASPIRE cruise (Nov-Jan 2011), along with some available stimulus funding from the American Recovery and Reinvestment Act of 2009 were the catalysts necessary for Dr. Roberta Marinelli and Dr. Alex Isern to address this area of inadequate capability for USAP marine science.
Initially, a replacement with the same depth capability was being spec'd by the RPS Marine group. But compelling scientific data was put forward by Dr. Tish Yager (UGA) et al and further illustrated by Dr. Sharon Stammerjohn (UCSC) showing that greater capability was needed and equivalent capability was just entering a new area of interest in the Antarctic. With this knowledge the NSF requested that RPS Marine explore cost effective increased incapability. Input was taken from across the Trace Metal sampling community and the GEOTRACES model was adopted for the USAP system. Input from Dr. Rob Sherrel (Rutgers), Dr. Greg Cutter (Old Dominion) and Dr. Chris Measures (UH) and others aided in the shaping of the sampling system as a whole. A new target of 2,500 m of cable was set for the winch with minimal increases in cost recognized.



Scope

The science drivers stepped this project from Markey Machinery's COM-7 system to a customized COM-10 platform. Specific innovations unique to the system built for USAP include a 100% non-metallic sheave train for cable handling. Although the construction of the winch is steel with a high quality marine grade epoxy finish, the path the cable follows is physically insulated from any metallic surface by Orcot or Nylatron. The drum features Orcot cheek inserts and a custom machined Orcot lebus shell. All sheaves are

Nylatron and over-sized in the 2-sheave fairlead head, which eliminates the less preferred reverse bending of tradition 3-sheave fairlead setups. Vertical rollers are also Nylatron with Teflon plates above and below isolating the epoxy coated steel spreader plates.

Final wire on the drum was just less than 3,400 meters with a proving cast to 3,000 meters demonstrated on its first cruise.

In order to make most efficient use of NSF funds this winch is powered by an existing HPU aboard the NBP. Piping and switching controls were installed aboard the NBP to transfer hydraulic power between the COM-10 winch and the existing DUSH5-5 waterfall winch. At this time the NBP is the only ship currently configured to support this winch but the LMG's DUSH-4 HPU can be used for power, once deck strength surveys are done and switching equipment has been installed.

Along with the winching system a 12-place rosette configured in the same manner as the GEOTRACES rosette was purchased to complete the package with the winch and Kevlar cable. It was decided at the time by Alex Isern and Jesse Crain that due to the variation in "clean" standards, USAP would not maintain sampling bottles for the Grantee community but would provide the winch and wire along with a dedicated 12-place rosette for Grantees to hang bottles on, that were cleaned to their required level for their science. Roberta funded a set of 12-liter Niskin-X sampling bottles complete with spares and back ups that are being maintained by Rob Sherrel at Rutgers University. So far other peer Trace Metal researchers that observe the GEOTRACES level of cleanliness have been allowed use of these bottles but their "clean-ness" is being maintained by the science community that is so reliant on it.

System Status

The new COM-10 Trace Metal Clean winch system was used on the NBP10-05 ASPIRE cruise supporting Dr.s Yager and Sherrel, and subsequently on NBP11-01 and 11-02 supporting Dr.s Measures and Lamb as well as the UNOLS-funded CLIVAR cruise lead by Dr. Jim Swift. It is currently scheduled to sail next on NBP12-01 to back up Dr. Sedwick's auto-firing rosette system, a critical component of the Dr. Dennis McGillicuddy-led cruise.

Lessons learned included experiencing a 1% stretch or set in the Kevlar conducting cable. Despite assurances from the cable manufacturer that the jacket was applied under tension and no stretch should be seen, a 1% permanent stretch or "set" was induced during the 3,000-meter proving cast. Initially, there was concern as the cross-section diameter of the cable system was reduced by 0.01" and the cable appeared slightly ovalized. The main concern was due to the precise air gap calculations that were made in the design of the lebus shell in order to maximize drum capacity. The ovalization also caused the cable system to behave more like a 3x19 system than perfectly round steel armored EM cable. After manipulating the level wind manually to ensure perfect lay, the decision was made to just watch the wire to make sure it wasn't damaged but to let the wire go on naturally under the tension of the science package. The winding on the drum was found to be very satisfactory even with the changes in tolerances, although it isn't nearly as perfect and round cable, it is smooth and regular and far better than any mechanical wire.

The Trace Metal Clean sampling package maintained by USAP is a SeaBird 12-position SBE 32G sampler with Ti electronics, release and lifting bail and welded aluminum, polyurethane powder coated rosette

frame. The CTD 911 plus has redundant T and C sensors in Ti housings and a WET labs transmissometer and SBE 43 DO sensors. The frame is set up to accommodate 12 ea, 12-liter Niskin-X sampling bottles.

2. DUSH-4 Research Winch, Markey S/N 15061, Hydraulic System Refurbishment aboard the ARSV Laurence M. Gould

History

Markey Machinery commissioned the DUSH-4 Research Winch and its associated power unit just over 20 years ago, originally aboard the R/V Polar Duke. With irregular dispatch of factory technicians and a re-installation aboard its current ship, this winch has served the mission of these ships well and remained in a state of original factory components. Due to the operating area of the LMG and the high cost of conducting science at sea, a proactive look was taken to examine both the DUSH-4 and it's sister winch the DUSH-5, also aboard the LMG and built at the same time as the DUSH-4. Similar systems of critical machinery are usually overhauled 25% earlier on board vessels frequently calling at ports with more comprehensive hydraulic services.

Background

Over the duration of the last season a degradation of the fine control of this winch system was noted, particularly on "in-haul". In-haul drum rotation began in a jerky manner and rolling speeds less than 20 m/min were difficult to maintain. Several attempts were made to trouble shoot and re-tune peripheral controls including joysticks, strokers and brake releases but no true resolution was achieved from these efforts, all of which provided minor improvements but did not solve the loss of fine control. During the commissioning of the COM-10 Trace Metal Clean winch a Markey Field Engineer attempted further trouble shooting but also without resolution. The asymmetrical nature of the loss of control (in-haul vs pay-out) is unusual in a hydraulic system as these systems should show balanced behavior. Test gauge readings showed that the pump may be having issues with balance in the controls feedback loop. The age and continued service life of the winch drive motor suggested worn behavior from this component would not be unusual either.

Plan

Rather than continuing to trouble shoot component by component it became obvious that in order to ensure that this critical system would be fully functional for the next LTER, this system re-furbishment was necessary.

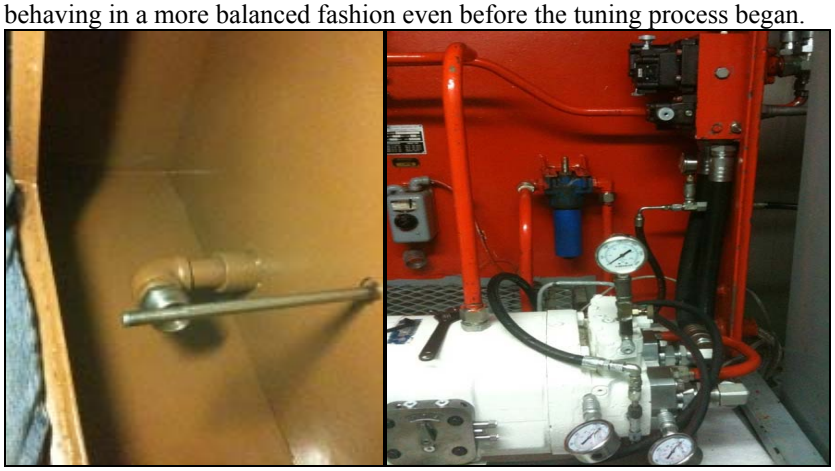
The spare P-11 pump (stored in the PA warehouse) was employed along with a new drive motor, new auto brake, updated hydraulic valves (cross port, relief, hot oil, etc), secondary controls, stroker and a full system servicing and cleaning was employed to bring the system back to original manufacturer specs during the LMG11-10 (25 Oct - 2 Nov 2011) port call. Originally this work had hoped to be completed during the previous extended open period, but long lead times on critical compoentry drove the project into a port call time frame (specifically the Volvo drive motor coming from Sweden).

The P-11 pump removed from the system is on its way back to Markey where it will be fully re-furbished and returned to the PA warehouse. Although the budget has not yet been built for next season, we recommend taking on this same re-furbishment proactively for the DUSH-5 winch using the lessons learned from this field re-furbishment process to better ensure smooth function of this critical system into the future.

Scope

The statement of work was written and managed on site by the Marine Technician Supervisor and included a Markey factory field engineer as well as the local subcontracting of an in-country hydraulic services

company, Marco Industrial (team of five workers). When the ship arrived following LMG11-09 we immediately began the dis-assembly and cleaning processes. The several hundred pound pump was drained and removed from the system and the hydraulic reservoir was drained for cleaning and inspection. The reservoir was fully cleaned and serviced and all system filtration was replaced (shown below). All hoses and flexible connections were replaced (pump to manifold, manifold to piping and weather deck to winch) and flushed to ISO code 13/12/08, far exceeding the Manufacturer's cleanliness requirements. All existing hard piping was flushed with a high volume/ high turbulence hot oil flushing system to an ISO code of 10/8/4, also far exceeding standard cleanliness requirements. The new drive motor and auto brake were installed on the winch and the Marine Techs gave the fairlead head some much needed attention. The auto-brake was bled several times and will be bled and checked several times during the current LMG11-10 cruise to verify a completely bled system. The brake release and stroker adjustments were made by the Markey field engineer together with the ships engineers. Testing occurred over a full day with improvements being made throughout the process, but it was immediately noted that the system was behaving in a more balanced fashion even before the tuning process began.



Roberto, the ship's bosun and primary winch operator, operated the winch with a test weight and noted the return of the fine control and the ability to maintain low spooling rates (10 m/min or less).

We will continue to monitor use and operation on the current LMG11-10 cruise and seek the feedback of the winch operators and MTs for the need for any further fine tuning. That said, we don't expect a need for any further adjustment based on the testing results seen in port. 90 degree bends were added to the hoses coming out of the weather deck to reduce strain and improve hose life on deck.

During this process a discrepancy was found in the documentation versus cross port relief valves found to be installed. It had to do with a drain being internal vs. external. Correct cross port valves will be sent down by the manufacturer and will be installed by the ship's engineers when they arrive. The procedure has been reviewed by the Markey engineer and no adjustment is required beyond installing the 4-bolt valve assembly onto the manifold block.

The value of proper shut off valves to isolate the system was demonstrated again through the testing process (and also for trouble shooting and adjustment). It is recommended that this be taken on for both the DUSH-4 and DUSH-5 next time a flushing effort is required aboard, hopefully as part of the DUSH-5 pro-active re-furb process. Also, the installation of test ports in the new pump will further enhance trouble shooting efforts by better understanding system pressures.

Reference

The ISO codes referred to describe the number of particles of a certain size found in 1 ml of sampled oil. All samples were taken in triplicate and the results averaged to give the listed ISO 4406 cleanliness number. Our Target ISO code was 17/14 (5micron/15micron) or better. ISO cleanliness numbers are based on particles present per ml of sampled oil. The level of analysis on site was also able to detect down to 2 microns so a three number code was giving 2 micron/5 micron/15 micron particle counts.
The DUSH-4 loop was flushed to an ISO 4406 code of 10/8/4 equal to a 5micron/15micron number of 8/4, far exceeding our target of 17/14 and well below the recommended values for the component types in this system.

3. DUSH-11 Deep Sea Trawling and Coring Winch Aboard the ARSV Laurence M. Gould Drum Swap Effort August 2011

Background

A science need was presented where the most suitable cable in the USAP inventory to support the activity was .680 EM cable. Use of this cable aboard the LMG required the swapping of the 10-ton 9/16" 3x19 TB wire rope spool for a loaded spool of .680 EM cable of similar overall weight. This had only been attempted once prior in the time the DUSH-11 winch has been installed on the LMG. The effort was made at the time to support the MOC-10 and swapped back the following cruise. Due to the high level of funding for trawling and coring cruises on the LMG, the 9/16" wire rope has been the wire of choice and the trawl wire drum has remained in place.

History

Poor records were kept from the last swapping event and old e-mails indicated that the effort was fraught with difficulties and the evolution did not go smoothly. There was no drum swapping procedure in Marine's records. In an effort to find a better solution we consulted with the winch manufacturer and

learned that a spreader bar had been designed to work with wire rope slings to facilitate drum swapping efforts.

Plan

A drum swapping procedure was drafted in consultation with Markey Machinery and they also provided us with engineering drawings for a custom spreader bar. We contracted with our Marine Riggers in Ventura at Coordinated Wire Rope who built and proof loaded the spreader bar as well as providing two sets of custom wire rope lifting slings and packaged the gear for immediate shipment south. Of particular note, the bar was designed to be man-handle-able with respect to size and weight while still maintaining a high factor of safety for strength.

Although we experienced some significant "rust stick-tion" from the drum having not been removed in some time, the perfect balance of the spreader bar allowed precise handling of the 10 ton load. The precision load handling with the custom bar greatly improves safety and maneuverability over stropping methods. The metal on metal surfaces were all stripped and treated and re-installed with generous amounts of anti-seize to ease future drum swapping efforts. A procedure was drafted, applied, evaluated and is now being formalized so that drum swapping in the future can be a more routine and well understood event with a basic procedure. In this case, having the right tools in your tool box makes all the difference. Lessons learned include how we store drums and their associated bearing assemblies for long periods of time. Also, treatment of the metal on metal surfaces with some type of durable marine grade corrosion protection is very important.

For future needs a properly skilled team of a Senior MT and several Marine Techs can easily swap drums in a 1-2 day effort from pre-prep, to lift, to post lift preparation for storage.

4. RVSS Appendix A (Wire and Cable Safe Working Loads) Compliance Update Aboard USAP Vessels **(see page XX)**

5. LCI-90i Winch Cable Tension Meter / Line Control Data System **(see page XX)**

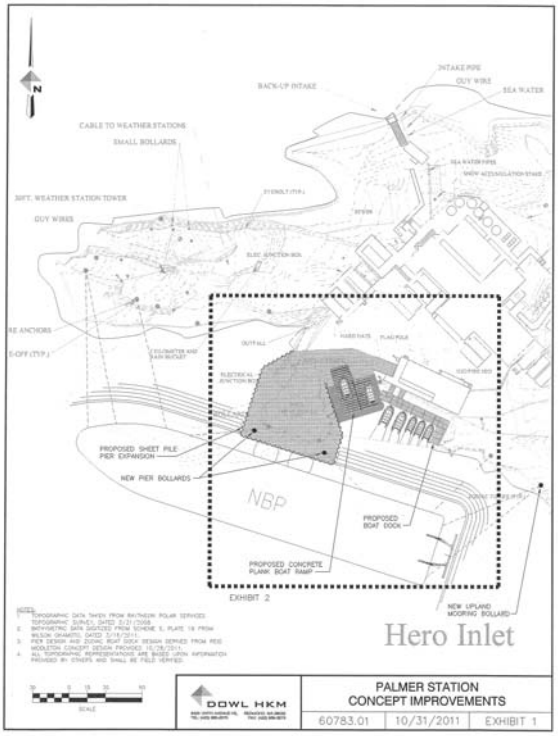
6. MK-E Fiber Optic Telemetry & Camera System **(see page XX)**

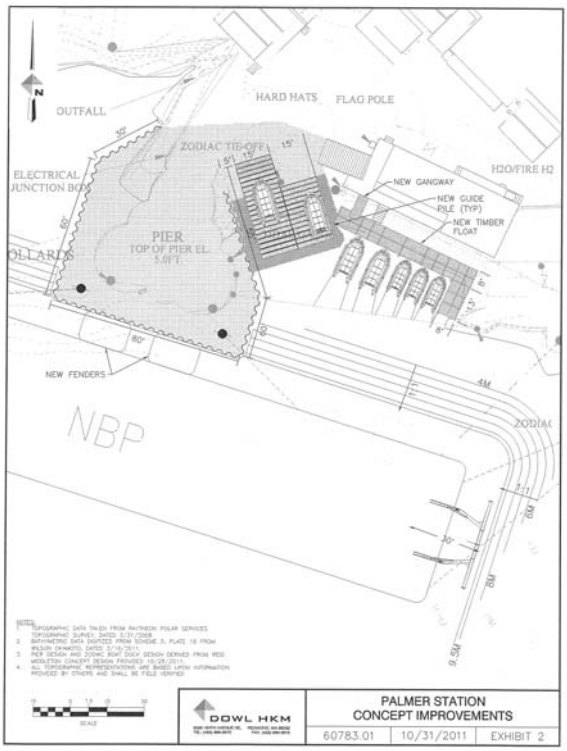
7. Engineering Studies for Vessel Science Support Enhancements

- RVIB Nathaniel B. Palmer
  - Helo deck strengthening to allow for full COM-10 TMC winch performance/tuning.
  - Installation of "super sockets" under starboard and stern A-frames for more efficient and safer weight testing of wire terminations.
  - Additional deck sockets to better fill out deck patter and allow for more efficient location and securing of deck equipment and cargo.
  - Installation of peck & hales directly behind the hatch for safer and more efficient container location and securing.
- ARSV Laurence M. Gould
  - Deck strengthening to allow for cross-decking and full COM-10 TMC winch performance/tuning.

- Installation of “super sockets” under starboard and stern A-frames for more efficient and safer weight testing of wire terminations.
- 02 deck strengthening and vessel stability update required for installation of new articulated crane for zodiac deployment and recovery that will allow for more efficient and safer operations.

ATTACHMENT 2: Palmer Station Pier Concept Improvements





ATTACHMENT 3: Potential equipment/system upgrades for ARVOC consideration

1. Forward Look Sonar (RVIB Rebid)

2. EM120 Multibeam Sonar System Upgrade to EM122

- Price for upgrade including assessment and replacement as needed of array and sea acceptance test - $311,725

Kongsberg EM122 12 kHz Multibeam Echo Sounder	
Depth range from 20 to 11000 m	Seabed image (side scan) data display and recording
Swath width up to 6 times water depth/30 km	Water column data display and recording
Focused beams for transmission and reception	Modular design, beam widths 0.5 to 4 degrees
High density and multiping modes for increased resolution	Dual and triple frequency versions possible
Up to 864 soundings per ping	Integrated sub-bottom profiler
Yaw, pitch and roll stabilization	Mammal protection
High accuracy	

2a. Alternate EM302 System
(rough order of magnitude estimate with full array install)

- 0.5 degree Transmit by 1.0 degree Receive - $2.76M
- 1.0 degree Transmit by 1.0 degree Receive - $1.77M
- 1.0 degree Transmit by 2.0 degree Receive - $1.53M

3. Portable Zodiac-based Shallow-water Multibeam/Side Scan System
(for shore approach bathymetric survey)

- Kongsberg GeoSwath Compact, 500 khz (including over the side pole mount for zodiac ops, MRU, SVP) - $153,808

  http://www.km.kongsberg.com/ks/web/nokbg0397.nsf/AllWeb/299C321F8F909842C1257894002B399C/$file/Application-Note-GeoSwath-Plus-Compact.pdf?OpenElement

  http://www.km.kongsberg.com/ks/web/nokbg0397.nsf/AllWeb/F4B7FD3461368388C1257599002D34BC/$file/GeoSwath-Plus-brochure.pdf?OpenElement

3a. Alternate Portable Single Beam Sonar/GPS Bathymetric Survey System

- HydroliteTM - $11,375 + $9500 for Hypack survey & processing software

4. Replacement of Simrad EK500 BioAcoustic Sonar with EK60

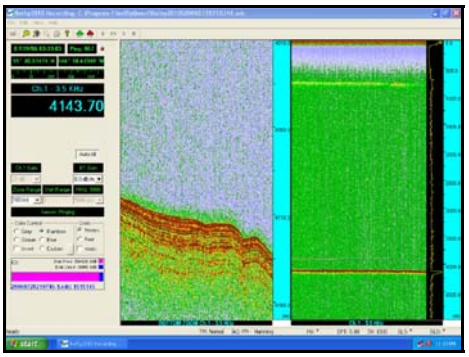
The current EK500 200 kHz transducer on the NBP is a single beam unit; therefore it would not work with the EK60 system. The other two (38 and 120 kHz) are split beam transducers and would work. An upgrade would require one EK60 GPT (general purpose transceiver) per transducer as they are dedicated to a specific frequency. Pricing for the two GPT EK60 system units would be approximately:

- 38 kHz: $51,600
- 120 kHz: $38,700

Simrad EK60 Scientific Echo Sounder for Fisheries Research Applications

5. Replacement of ODEC BATHY-2000P 3.5 kHz Sub-bottom Profiler

BATHY-2000P Chirp Sub-Bottom Profiler



- SyQwest (ODEC buyout) BATHY-2010 Upgrade - $35,522

6. Replacement of Seismic Data Acquisition System, Trigger System, Analog Streamers and Birds

(no price estimate available at this time)

7. USBL Undersea Locator Beacon
(for precise locations on sea floor equipment)

http://www.sonardyne.com/products/positioning/scout-usbl.html

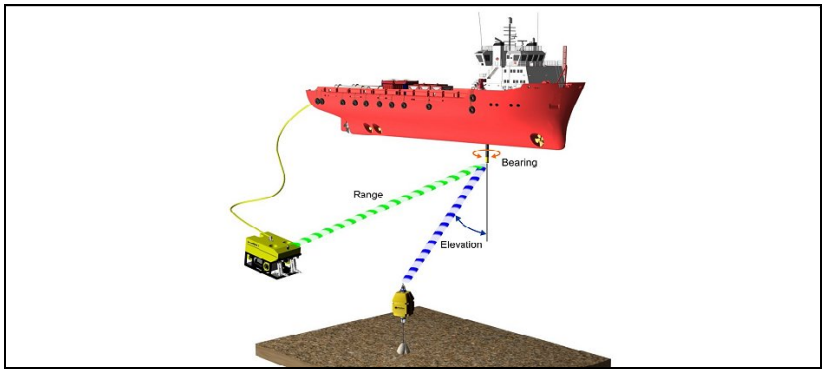
- Sonardyne USBL Scout 500 meter range - $32,536
- Sonardyne USBL Scout Pro 1000 meter range - $76,378

http://www.sonardyne.com/products/marking-a-relocation/rov-homer.html

- Sonardyne ROV-homer range & direction system – 4000 meter receiver = $7733
- 500 meter transponder $1720
- 4000m transponder $4152

http://www.sonardyne.com/products/positioning/ranger1.html

- Sonardyne USBL Ranger1 – 6000 meter range - $102,084
- WSM transponder 4000 meter directional - $7971



8. Aperture Sonar

(for real time view of the seafloor) BlueView DP900-90 (including deck unit, sonar, and software development kit) - $42,520 http://www.blueview.com/DP900-90.html

HOME › PRODUCTS › 2D IMAGING SONAR

P900 Series

Applications

- ROV Navigation
- UUV OAS and Tracking
- Diver Detection and Tracking
- Hull & Structure Inspection
- Material & Equipment Placement
- Mine & IED Detection/Identification
- Search & Detection (Small Area)
- Seawall & Pier Inspection
- Damage Survey

Benefits

- High-Definition Imagery
- Not Affected by Motion (0-7 knots)
- Compact/Low Power
- Designed for Integration

Features

- Standard Ethernet Interface
- Plug and Play Sonar Heads
- Easy to Use Windows Software
- Software Development Kit

Interface

- Coms: Ethernet
- Voltage: 12-48VDC

About the P900 Series Sonar

The P900 Series sonar family now offers 3 field-of-view options for high-performance forward looking imaging sonar: 45°, 90°, and 130°. At 900 kHz the P900 Series is the ideal sonar for underwater detection and identification operations. Specifically designed to increase the search rates and effectiveness in low and/or zero visibility conditions with both mid-range detection and close-range identification capabilities from moving or stationary platforms.

	P900-45	P900-90	P900-130
Description	Multi-purpose entry level system; medium to long range imaging capabilities	Ideal system for underwater detection and identification; expanded field of view	Ultimate system for maximum efficiency; ultra-wide field of view
Sonar			
Field of View	45°	90°	130°
Max Range	100 m (328 ft.)	100 m (328 ft.)	100 m (328ft)
Optimal Range	2 - 60 m (6.5 - 197 ft.)	2 - 60 m (6.5 - 196.8 ft.)	4 - 60 m (13.1 - 196.8 ft.)
Beam Width	1° × 20°	1° × 20°	1° × 20°
Number of Beams	256	512	768
Beam Spacing	0.18°	0.18°	0.18°
Range Resolution	1 in.	1 in.	1 in.
Update Rate	Up to 15 Hz	Up to 15Hz	Up to 15Hz
Frequency	900 kHz	900 kHz	900 kHz
Interface			
Supply Voltage	12 - 48 VDC	12 - 48 VDC	12 - 48 VDC
Power Consumption	9.0 W/9.5 W max.	18 W/22 W max.	19 W/23 W max.
Connectivity	Ethernet/VDSL*	Ethernet/VDSL*	Ethernet/VDSL*
Mechanical			
Weight in Air	5.3 lbs.	5.7 lbs.	5.7 lbs.
Weight in Water	1.3 lb.	1.36 lbs	1.36 lbs.
Depth Rating	1,000 m (3,280 ft.)	1,000 m (3,280 ft.)	1,000 m (3,280 ft.)
Size	11.3 in. × 5 in. (OD)	11.3 in × 5 in. (OD)	11.3 in × 5 in (OD)

9. Field Camp Communication Systems (COPA, Cape Sherriff, Avian, etc.)

Multi-Channel Iridium "internet in a box" system developed in house and in use at McMurdo terrestrial deep field camps - $50K + $1000/mo for 2G/mo, expandable

BGAN Terrestrial INMARSAT - $1500 to $5000 for base station + $5849/mo for 2GB/mo

10. Pole-mounted Multibeam System for the LMG

Note that GeoSwath system (see #3 above) can be pole mounted on the side of the LMG as well as zodiac- or installed in hull.

Price for in-hull (retractable) install (just for reference) - 350mm gate valve, hydraulics, controls, etc -$106,691

Summary of items for considerations with prices

Item	**Description**		Price
#1	Forward look sonar	RVIB rebid	
#2	Upgrade to EM122	Kongsberg EM122	$311,725
#2a	Alternate EM302 System	0.5 degree Transmit by 1.0 degree Receive - 1.0 degree Transmit by 1.0 degree Receive - 1.0 degree Transmit by 2.0 degree Receive -	$2.76M $1.77M $1.53M
#3	Portable Zodiac-based Shallow-water Multibeam/Side Scan System	Kongsberg GeoSwath compact	$153,808
#3a	Alternate Portable Single Beam Sonar/GPS Bathymetric Survey System	Hydrolite Hypack survey & processing software	$11,375 plus $9500
#4	EK60	38 kHz: 120 kHz:	$51,600 $38,700
#5	3.5 kHz Sub-bottom Profiler	SyQuest Bathy 2010 upgrade	$35,522
#6	Trigger System, Analog Streamers and Birds		No price yet
#7	USBL Undersea Locator Beacon	Sonardyne USBL Scout 500 meter range Sonardyne USBL Scout Pro 1000 meter range Sonardyne ROV-homer range & direction system 4000 meter receiver 500 meter transponder 4000 meter transponder Sonardyne USBL Ranger1 – 6000 meter range WSM transponder 4000 meter directional	$32,536 $76,378 $7,733 $1,720 $4,152 $102,084 $7,791
#8	Aperture Sonar	Blue-view DP900-90	$42,520
#9	Field camp comms systems	Multi channel Iridium BGAN Terrestrial	$50,000 plus $1,000/month $1,500 to $5,000 for base plus $5,849/month
#10	Pole mounted multibeam system (LMG)	In-hull, retractable install	$106,691