STARC Report to AICC

Seattle Washington
USCG Base Seattle
January 10-11, 2018

Presented by:
- Brett Hembrough – Arctic Cruise Coordinator
- Lee Ellett – Manager Shipboard Tech Support – SIO
- Andrew Woogen – MarTech Manager - OSU

Photo by: Britton Anderson
Ship-based Technical Support in the ARCtic

- Collaboration between Scripps Institution of Oceanography – UCSD and Oregon State University
- In cooperation with USCG
- Entering 5th year of 5 year grant (2018) 2014 - 2018
Established staffing consistency throughout field season

• **Only** staffed cruises with experienced techs with recent dockside and underway experience (3 tech model)
• Trained new techs during pre-season and transits Multibeam (Sweden), Fiber Optic (UDEL / Seattle)
• Building technical resources for the future

Utilization of UNOLS Tech Pool and Tech Exchange

• Able to bring in specialized skill sets
• Matrixed support to complement OSU / SIO techs
  More scheduling flexibility
• Diversity and experience from other ships / institutions
Documentation and Diagramming

Completed all science spaces and computer racks

• Shortens troubleshooting time
  • Know where to look and what to look for
  • Less wire tracing 😊

• Cable organization and Clean-up

• Labeled all connections at both ends
  1. Local port - ex: Advantech port 12
  2. “What it is” - ex: Seapath GPS
  3. * Intermediate info ex: Rack 6 to Rack 5 (if necessary)
  4. Final Destination – ex: Multibeam computer
Standardized Weekly Reporting

Same format across all cruises and techs!
Critical due to multi-institution support structure

- Techs received formal training on reporting style and critical info to include (Power Point presentation)

- Track instruments by serial number
  Long term performance evaluation
  Record of sensor swaps

- Checklist format
  Easily compare to previous reports
  Nothing left out

- Reminders to include weekly system checks/tests
  Multibeam BIST
  Gravimeter Voltages
  PCO2 Gas Log
Weekly Report Template

1. **STARC Techs:**
   - Chief Scientist: [Name]
   - Ship: USCGC Healy
   - MapServer:
   - Open CPN:
   - KADCP:
   - Multibeam:
   - Sync:
   - Systems:
   - Fledermaus:
   - Qimera:
   - TRU:
   - AshTech ADU5:
   - Trimble:
   - kHz: WAGB20
   - Resets?
   - AG: 132
   - W AG: 122
   - MET Computer
   - HCO Sensors:
   - Bridge Sensors:
   - Wind Bird Stbd (RM):
   - Wind Bird Port (RM):
   - Ultrasonic Wind (RM): Young, Young 85004
   - Young 80185
   - Young 80186

2. **INFRASTRUCTURE**
   - Linux Hypack PC:
   - KTD/XBT PC:
   - Console PC:
   - LOG:
   - Met Computer
   - APC:
   - Bridge:
   - Aft Con:
   - Bridge:
   - Bio Lab:
   - ADCP:
   - Bridge:
   - Bio Lab:
   - Main Lab:
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3. **NETWORK**
   - Healy NAS:
   - Fiber Optic:
   - Advantech Displays:
   - Altimeter:
   - Transmissometer:
   - Fluorometer:
   - O2:
   - IC:
   - Computer Lab (Eaton):
   - Bridge:
   - Aft Con:
   - Aft Con:
   - Bridge:
   - Bio Lab:
   - Science Sea Water:

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Troubleshooting Tablet – plug into terminal
• Grab and Go carry case with multiple connectors/adapters
• Pre-loaded with system specific software installed

Tech Reporting Tool – portable w/ online access
• Syncs to Healy NAS – long term record and back-up
• Used for Daily Rounds
• Notes for Evening Planning Meetings, etc

Shows great potential will continue to fine tune use during 2018 season
Defined Technician Responsibilities and Recording

Daily:
- Rounds to all STARC system locations
- Visual inspection of sensors (inside and outside)

Weekly:
- Multibeam BIST (Built in Self Test)
  - Record of performance over long term and varying conditions
- Gravimeter Voltage Readings
  - Provide to PFPE via Google Drive
- PCO2 Gas Log

Monthly:
- UPS Battery Checks
- Multibeam filter cleaning
- Acquisition Computer disk checks
Atlassian: Confluence

Wiki Style - Knowledge Base software

• Source of Truth
• Easy Sharing and Collaboration, Exportable
• Revision Control and History
  Permissions and user roles
• Single Source – editable by all
  Eliminates need to update info in multiple locations
• Compatibility with other cloud based tools
  Google Drive, LucidChart, Slack Chat, etc
• More creative uses coming in future...
  Public facing pages... link to icefloe?
  Weekly Report posting
  Daily Tech Blog
Atlassian : Jira

• Ticket Tracking software w/ email notification
  Used in many industries, customizable to STARC needs
  Tells a story and tracks project progress
  Set deadlines, reminders, assign tasks, importance

• Shareable across institutions
  Email access even at high latitudes
  Subject line title will link with ticket number (HLY-149)
  Notifications for ticket creation, changes, closing
  Supervisors able to follow along and provide real time guidance and feedback.

• Searchable database
  Links to similar and/or related tickets
  Generate Reports (completed vs in-progress)
  Performance Metrics
Ticket Tracking

SOMTS Support

USCG Healy
HLY-212 Prepare for Healy pre-season projects 2019 / HLY-198
Determine installation requirements for Trimble ABX-Two GPS/Attitude

Details
Type: Sub-task
Priority: Critical
Labels: abx_two, gps, HY217E
Mission ID: HY217E

Description
The ABX-Two from Trimble has been identified as a possible replacement for the AshTech ADU (no longer supported). It is possible that a loaner unit may be available from Trimble that we could evaluate on Shoemaker/Italcrane. In order to move forward, we need to review the installation requirements and check out the proposed install location (on top of HCO). It may be possible to use some of the pre-existing AshTech antenna mounts. If this seems feasible a prototype TCTO procedure will be initiated to coordinate install and get approval from the USCG.

Innovation
An innovations for the head unit and a couple of antennas (currently in use with PostFerry) in order

Checkboxes:
- HLY-213 Determine replacement for AG 132 GPS system... OPEN
- HLY-103 Spec and Procure a replacement unit for AshTech... IN PROGRESS
- HLY-182 Evaluate the direct successor to AshTech’s ADU... CLOSED

UC San Diego
Pre-Season Projects

- Annual Calibrations and standard maintenance
- Uninterrupted Power Supply Updates
  RMA, New Batteries for all, 2x new units (AftCon, Comp Lab)
  Inventory and maintenance spreadsheet developed
- Completed Diagramming
  Wire tracing and Fiber Optic testing
- Fiber Optic Cleaning and Repair
  Inspection Scope and cleaning supplies
  Field Termination kit
- New Servers in Computer Lab x10
  Updated OS and software
  Lifespan replacements
  Better processing power
  New capabilities – QPS (Qinsy, Qimera, Fledermaus)
- K-Sync re-established
**Pre-Season Projects**

- **CTD Rosette and Bottles prepped**
  Complete Niskin bottle sets (24 primary, 24 back-up, ~6 spares)
  Cap, vent, spigot, and spring replacements as necessary
  New O-rings throughout

- **MET**
  Improved weatherproofing of Wind Sensors (only 1 failure all season)
  Installed new Relative Humidity sensor for evaluation (less susceptible to freezing)
  New wire run on forward Jack Staff, more robust install on gooseneck

- **Dedicated 1PPS feed added - Ceesync**

- **Gravimeter Platform and spares sent for evaluation**

- **PCO2 site visit and new gas cylinders installed**

- **Winch Re-Spooling (9/16\(^{th}\), .680, .322 wires)**
  STARC involved as liaison
  New wire logs started, coordination between STARC and HEALY Deck dept.
Pre-Season Projects

• Preparation for MAC visit
  Documentation gathering and survey verification, coordination w/ Kongsberg
  PosMV antenna mount re-measured and verified
  New IMU (v5) offsets updated (phase center based on height of sensor)
  Seapath MRU sent for calibration

• Preparation for JMS Inspection
  Winch/wire terminations, slip ring service and re-install
  Coordination with Coast Guard MSTs
  • Welcome Aboard binder and Lab Layout drawings
  • Fume Hood certifications
  • Equipment Preparations
  • Improved installation for XBT launcher
NSF Project Updates

Forward Science Vans
- Electrical completed w/ enclosure boxes
- Potable and Seawater connections completed
- Next phase = communications, alarms, network, etc

12kHz Transducer replacement
- Lifespan replacement for Knudsen echosounder
- Equipment purchased, delivered, awaiting install opportunity
- Transducer void access gained in Dec 2017 to assist in work planning
- Healy has plans to replace ice windows and gaskets in dry dock 2019
  STARC planning to install new transducer at this time.
Icefloe.net content updates

- Small boat / dry suit requirements
- Ice –Ops policy
- Contact info, etc

Cruise Planning Telecon Agenda refined per AICC comments

- In addition to Cruise Planning form (mirrors topics)
- Allows for more detailed discussion and note taking
- Modeled after successful Cruise Planning template used at SIO
- Coordination with Coast Guard MSTs
Shakedown May 16-23

Underway with:
Multibeam Advisory Committee ~3 days
  Paul Johnson and Vicki Ferrini
  Kongsberg Technician – Tony Dalheim

UHDAS
  Jules Hummon – new computer install, updated OS
  • Ongoing noise troubleshooting – deck unit relocation

JMS Inspection ~ 2.5 days
  Ted Colburn
  Science spaces, equipment, and over-boarding gear

SIO 5x techs, OSU 2x techs
  Training for 2017 field season and beyond
  24hr watch standing during MAC operations
EM122 Calibration and Verification Tests

- Verify sensor installation and system geometry
- Patch Test (SeaPath and PosMV)
- Pitch and Latency Lines
- Roll Lines

Noise Testing

- Self Noise vs. RPM
- Machinery Diagnostics

Swath Width

- Extinction Plot – (shallow > deep and deep > shallow)
- On approach to Hawaii – pending analysis
Multibeam Advisory Committee

Full report now available

- No major issues with sensors or latency
  
  BISTs indicate system is within spec, however, some elements are at the edge of acceptable tolerances (one notable outlier observed)- requires ongoing monitoring

- Swath width is roughly 5x water depth @ ~750m, reduces to 4x @ ~2600m

Healy suffers from elevated noise levels

- Impacting swath width and standard deviation of soundings.
  
  Continue Power Plant configuration analysis
  
  More advanced testing needed- Gates Acoustics?
Noise Levels

- Last assessed in 2014 – Gates Acoustics
- Known sources/configurations were tested again
  - Boiler feed pumps, potable water pumps, main sea water pumps, aux generator pumps, fire pumps
  - Bridge echosounder (fathometer)
  - Speed logger
- Swath width > 60 degrees shows a reduction of 5-10 degrees compared to typical EM122 coverage at same depth
- Possibly noise related
Preliminary and Full Report Available
Overall Healy scored “Very Good” or “Good” in all inspected areas.

Over-boarding Equipment
Winches
- RVSS Appendix A – Factor of Safety 5.0
  - Develop Extenuation Circumstance Plan vs. GAR
  - Level-wind Rollers (.322)
  - Tension monitoring tolerances

Cranes
- Tested under load
  - Operated safely (alarms and indicators functioned properly)
“All systems tested appeared to operate properly including the EM 122 Multibeam system, the Knudsen 3260 Chirp echosounder at 3.5 and 12 kHz, the flow through seawater system with associated sensors, the XBT system, both DI clean waters systems, the gravimeter, and the meteorological sensor system.“

“There appears to be an excellent program established to identify and document science related cabling in the labs and an initiative to remove unused cabling.”

Areas to Improve
- Laboratory Lighting
- Labeling of HazMat locations and sink drainage (addressed by MSTs)
- Dedicated Li Battery storage location
Seattle: Majority of science equipment loaded

Honolulu: Some items for RDC picked up (drifters, etc)

Seward: HLY1701 – RDC gear loaded and set-up

Dutch Harbor: HLY1703 and 1704 deck equipment swaps
Chief Scientist – Scot Tripp
July 21 – Aug 11

- Diving Ops
  Re-establish diving capability on Healy
- F/V Destination
  Multibeam Mapping of wreck site
  New QPS Software used to design survey and drag for crab pot
- UAV/AUV and ROV Ops
- Oil Skimmer testing
- Moorings
F/V Destination Survey

QPS - Qinsy real time track map

UC San Diego
Chief Scientist – Bob Pickart
Aug 26 – Sept 14

- CTD Ops
  100 planned stations, completed 141!

- Coring and Grabs
  HAPS, Multi-HAPS, Van Veen

- Bongo Net Tows – NOAA

- Water Chemistry

- Underway Deployments
  Up-Temp, Pop-up buoys
HLY1703 – CANAPE - Deep

Chief Scientist - Peter Worcester
Sept 19 – Oct 13 (early arrival on 11th)

• Mooring & Source Recoveries
  Including Moorings for HLY1704

• CTDs
  Usually two per mooring site

• Gliders

• Sub-bottom Echosounder Surveys
  Head start on HLY1704 objectives
  STARC assisted throughout entire survey

• Multibeam Surveys
HLY1704 – CANAPE - Shallow

Chief Scientist – Mohsen Badiey
Oct 17 – Nov 10

• Mooring Recoveries
  Some difficulties with releases
  Dragging Ops

• CTD Survey
  Additional science sensors installed
  Cold temps – heater on deck

• Multibeam and Echosounder transects
  STARC highly involved (11 transects)

• Small boat ops in ice – Acoustics

• 11x Gravity Cores – with Acoustic sensors
End of Season

• Sensors sent for calibration and repair
• SSW system flushed and secured
  
  Discussions with Healy engineering for full system flush in progress

• Dockside maintenance period prep and planning
• Improvements to HCO antenna mounts (in progress)
Action Plan:

- Evaluate Mapserver features and identify highest priority functions for science users
  
  AICC provided input regarding desired capabilities, Coordination with Coast Guard for bridge navigational needs (ice imagery display)

- Investigate and identify commercially supported software which may be able to replace core functions of Mapserver (Hypack, QPS-Qinsy, OpenCPN)

- Install, configure and test software aboard USCG Healy

- Evaluate software while underway to determine stability and capability

- Train technicians on use of software and develop SOPs for science missions

- Gather feedback from technicians and science users

- Communicate successes and challenges to the UNOLS research fleet at large and work to establish a collaboration that may be used on multiple platforms.

  - Discussions with Sikuliaq to collaborate on development of “Mapserver 2”

  - RCRV (OSU) is developing similar product....combine efforts?
QPS- Qinsy

- Experimental use in 2017
  Implemented after departure from Seattle – short learning window
- On site training by QPS in Seward prior to HLY1702 (4 days)
- Includes Qimera and Fledermaus (available to Science)
- Available as situational awareness tool and real time data for Bridge
  - Valuable planning tool for HLY1701 F/V Destination survey and salvage.
  - All stations and work site for each cruise displayed

Open CPN

- Secondary situational awareness.
  Track line, stations, ETA, watch circle, charts, etc

HyPack

- Light use in 2017
- Alternative to Qinsy
- Also able to be used as real time display for Bridge
  Ice Imagery capability still being evaluated
Next Steps:

- Continue collaborative effort with UAF – Sikuliaq during joint cruise – SODA HLY1802
- Install hardware needed to run Mapserver on Healy (replace archaic original equip)

For 2018 season will continue to run with combined package of Qinsy, Hypack, and Open CPN

- Build database shore side
- Experiment with bringing in additional data streams
  May need GIS style tools to combine ice images
- Higher level training for technicians
Icefloe.net

ActionPlan:

- Website audit and report by 3rd party web developer
  - Include recommended steps and options to maintain/upgrade or migrate
- Back-up current version of Icefloe.net website
- Create offline version of website locally and use as test sandbox
- Immediately bring website up to minimum acceptable security standards (SSL)
- Offline website updated to version 7.56 of Drupal
- Upgrade offline version of website to latest Drupal Modules, test for stability
- Correct content errors and address user complaints (case by case basis)
- Fix broken links, ship track-lines, and aloft-con imagery
  - Partially complete
- Improve user experience with new/modern theme.
- Improve Mobile / Tablet functionality
- Address Cruise Planning Form problems. (UNOLS Cruise Planning Portal?)
- Update content links – USCG Mission Blog, USCG Healy site, Confluence Wiki, etc
Dead Link Checker

- Most *external* links are no longer active
- Some *internal* links are no longer pointing to correct locations
- Clean-up is underway – done manually, very tedious work need to check each link individually

Ties into identifying **scope and scale** of icefloe.net, determining what is relevant vs. archival. Overall goal of the site?
Backed up original site and data

- Update from Drupal core 6.28 to 7.56 is a major update

Most broken features are due to out of date modules or version incompatibility

- Current theme is not compatible with new version – trying to overhaul theme to function with core upgrade is running into problems

Or.... choose new theme altogether?
https://www.drupal.org/project/usage/drupal
Summary and Next Steps:
Firm understanding of the barriers to update, continue to build and test offline site, getting closer to stable version.

- Identify scope and scale of icefloe.net going forward
  - Requesting input from USCG, NSF and AICC
- Evaluate UNOLS Cruise Planning Portal
- Theme preferences – colors, feel, layout?
  - Info centric vs. imagery?
  - Wiki style?
- Demo updated site to USCG/community, and receive feedback
- Implement any requested changes
- Pick a time to publish updated site? Not to interrupt cruise planning season

Define site maintenance vs. higher level development efforts
- At a minimum needs to be considered annually (security, updates, etc)
Multibeam

Action Plan:

✓ Impedance testing for all TX/RX transducers and Kongsberg review of results
✓ On site Kongsberg technician support- dockside ship visit and underway time
✓ UPS (Uninterrupted Power Supply) sent to manufacturer for repair and new batteries
✓ Routine maintenance conducted prior to getting underway for Shakedown
✓ Fiber Optic and Serial connections traced, serviced, verified, and documented.
✓ UNOLS Multibeam Advisory Committee aboard to assess performance of system
✓ Update Sound Velocity Profile Software and verify transfer of data to multibeam
✓ BIST (Built in Self Test) conducted weekly to accumulate season long history
Multibeam

Summary and Next Steps

- Overall the health of system is ‘within spec’ although may be showing symptoms of degradation.
- Noise is still high concern.
  - Work with Healy engineering to diagnose.

- Use impedance analyzer for high latitude testing (SIO owned)
- Continue BIST regimen
- Visual Inspection during Dry Dock 2019
  - Coordinate with Kongsberg
- Continue discussions with MAC – deep swath
- Noise Assessment – Gates Acoustic (after DryDock)
2018 Plans

Identified Projects so far....

- Ash Tech replacement (Trimble ABX-Two)
- AG132 replacement
- Antenna Verification Survey (dockside)
- Computer lab UPS – networking
- Computing Cluster – Mapserver, network monitoring
- Chirp 3260 Deck Unit
- New Milli-Q
- Resolve intermittent scoreboard problems
- Reference Hydrophone Equipment
Currently in late planning stages

STARC is participating in meetings with USCG

Projects under discussion:

• 12kHz Transducer Replacement
• EM122 Inspection
• Bow Kickpipes
• Formal instrument and antenna survey
• Fiber Optic Upgrades
Data Access Policy

- Policy for making data available to 3rd party users (Gravimeter, PCO2, science party onboard)

Icefloe scope and scale

- Prioritized discussion relating to site features, intent, design, and content
- Develop support model to keep pace with security standards and software releases
Questions for STARC?

Thank You