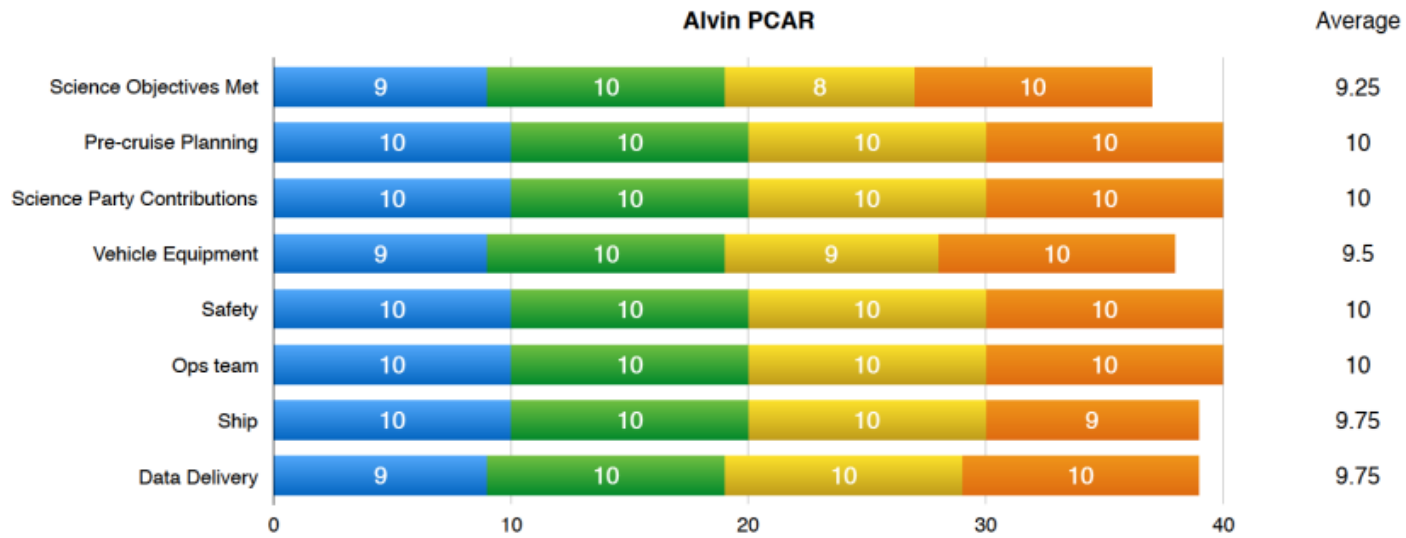
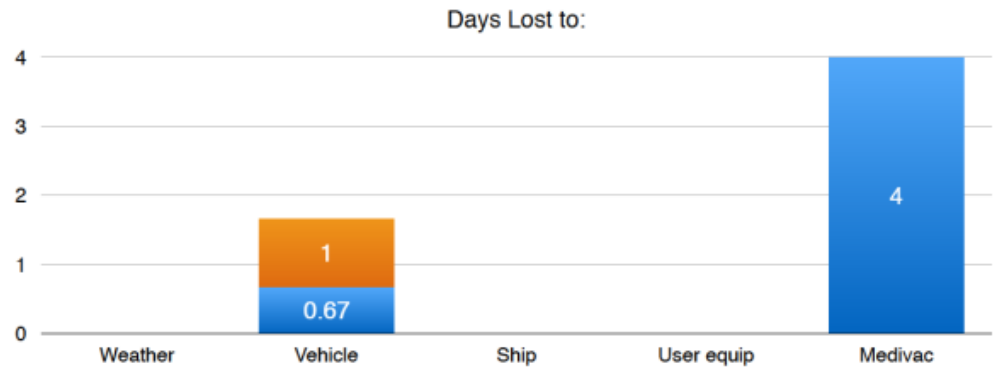


Summary of 2017 Alvin Debriefs

4 cruises, 4 debriefs, 4 PCARs



Two PCARs from one cruise



Color of 'Days Lost' bars correspond to PCAR results

Alvin Debrief Highlights

- Overall, PIs were pleased with the performance and capabilities of the Alvin, with most of the objectives accomplished.
- Communication between the expedition leads and the scientists went very well
- Given the integration of some new and different electronics, the PIs were impressed by the Alvin group and their ability to integrate these new systems relatively seamlessly
- PI noted some benefits to using Alvin over Jason for certain environments

Pre-cruise - Recommendations

- Pre-cruise planning was complete and overall was very well done. No suggested changes.

Mobilization

- In port mobilization for the 4 cruises was long enough. This enabled testing of equipment and resolution of technical issues before dives commenced.

Operations –vehicle performance

- Leak detected-resolved within 30 min
- Dive aborted due to suspect CO2 absorbent.
- One cruise commented that bottom time was “less than expected”, likely due to long transits on the seafloor, high battery usage.
- Two other cruises noted better than expected bottom time.
- Only one major ground fault.

Operations- NDSF-provided equipment

- Some issues with frame grabber
- HiT probes did not function 100% of the time
- Navigation was excellent
- Sample collections went smoothly
- Some camera issues in general, including joysticks not able to switch between camera sources or controlling the pan and tilt .

Operations- User-provided equipment

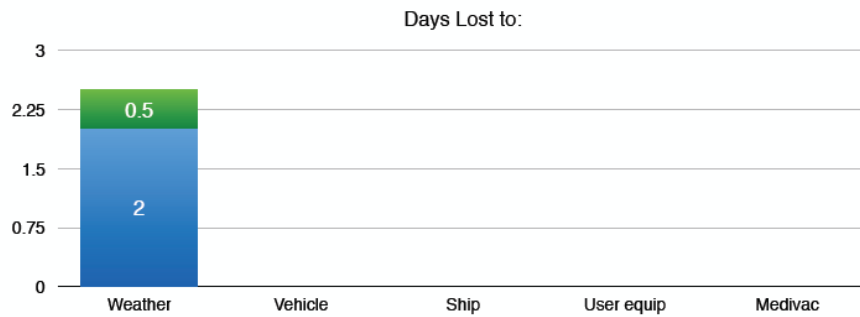
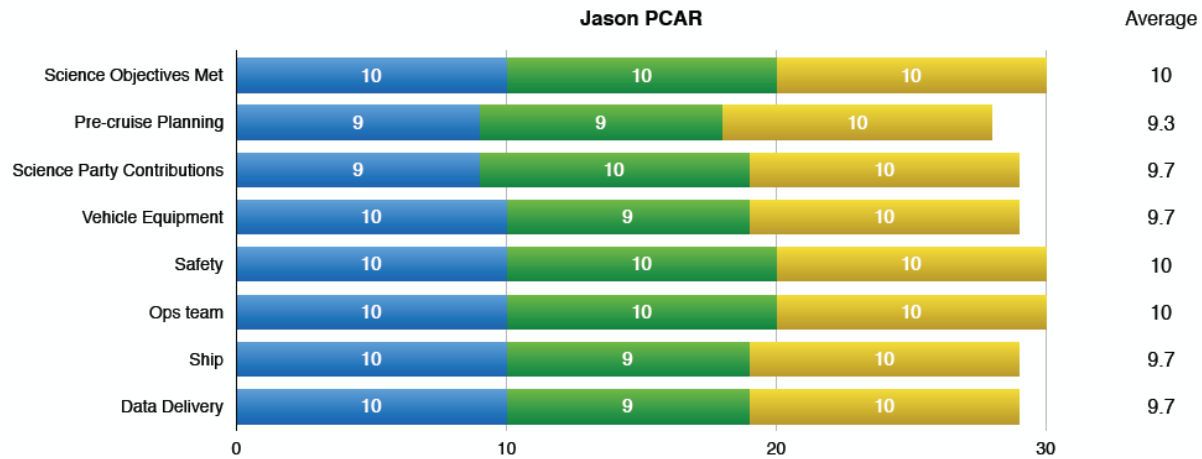
- High success rate with integrating user-supplied equipment
- Alvin group helped trouble shoot syringe sampler issues
- Additional cameras added to Alvin (forward, down-looking, and 4K cameras) worked well.

General Recommendations

- Improve the user controls for the Alvin video systems (use and reliability)
- Improve moisture control within the sphere

Summary of 2017 *Jason* Debriefs

3 Cruises, 2 Debriefs, 3 PCARs



Color of 'Days Lost' bars correspond to PCAR results

Jason Debrief Highlights

- Jason's first year of operating in either single or two body (w/Medea) mode. Single body mode operations, and heavy lift ops working as expected.
- Shake-down cruise on the new Ocean class vessel Sally Ride.
- Overall, vehicle worked well with minimum of issues related to ground faults, manipulator problems, tether, or related issues.

Jason debrief – Issues.

- After multiple operations in single body mode, use of Medea led to some wire issues and time-loss.
- **Suggestion:** Is there an easy technical fix? Awareness of this issue for science party and pre-dive planning to work out 'kinks' .

Jason debrief – Issues.

- Rock orientation tool.
- **Suggestion:** For collection of some geological specimens knowing the precise orientation of the vehicle to the rock face is important, tools are available, either purchase or recommendations for the loan such a tool might be useful.

Jason debrief – Issues.

- Purchase and routine use of a 4K camera for Jason.
- **Suggestion:** Useful for very high resolution imaging of both geological and biological specimens on the seafloor.

Jason debrief – Issues.

- Single body mode ops with Rapp winch and LARs seems redundant on an ocean class vessel where deck space is at a premium.
- **Suggestion:** Use of installed .681 FO wire and ship's DP and handling systems integrated with Jason ops to free-up deck space and expand weather window for ops.

Jason debrief – Kudos.

- “The JASON plan to downsize to a single-wide control van is a great idea, and there's a good deck plan for Ocean Class when a single-wide control van is used in conjunction with their tool van and spares van, which will free up a lot more space on the work deck.”
- “Jason functioned perfectly, 100% up time. The USBL navigation was particularly impressive at the ~1 meter level. The interfacing of our acoustic modem with Jason was seamless. Everything was great.”

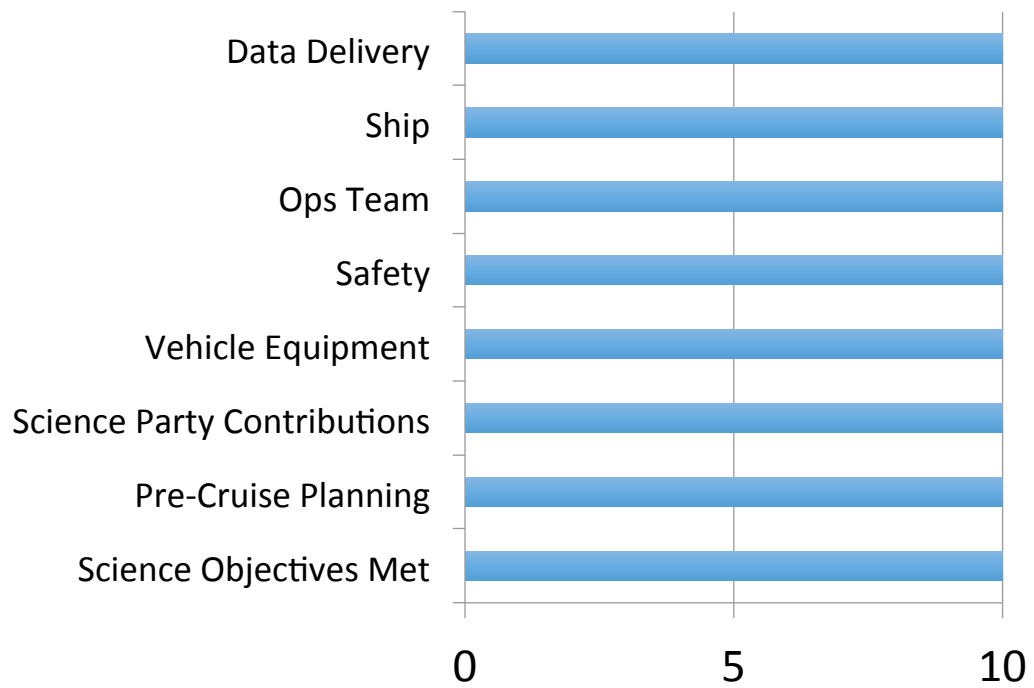
General Debrief Comment

- Inclusion of more senior scientists in NDSF cruise training exercises, who either have not, or have not recently (> 5 yrs), used NDSF resources.

Mid-2017 *AUV Sentry* Debriefs

3 Cruises, 3 Debriefs and 1 PCAR

Sentry PCAR Summary



Sentry Debrief Highlights

- Overall, all Principle Investigators were pleased with *Sentry*'s performance and generally able to meet their science goals.
- Reson multibeam failed (did not turn on) on one dive of 1 of 3 cruises.
- Preliminary bathy within ~30-60 minutes of the AUV on-deck: All PI's were pleased
- Quotes
 - "Sentry was near perfect, and never aborted despite the challenging terrain"
 - "Sentry went down and up like clockwork"

Sentry Pre-cruise Recommendations

- Sentry and dredging operations, but expectations not met for dredging operations due to a shortage of ship personnel.

Sentry Ops Recommendations

- Consider improving the standard processing capabilities for sidescan and subbottom data
- Routine (annual) calibration of magnetometers is a good idea. Jeff Gee did that for this cruise and potentially could do it in the future.
- The Sentry team should provide their data on a RAID drive as the Jason team do.
- Zac and Carl excellent communication with science teams and ship's crews. Recommend awarding a medal 😊



Alvin Operations – Vehicle Performance

- Leak detected - resolved within 30 min
- Dive aborted due to suspect CO₂ absorbent
- Although not a common criticism, bottom time was “less than expected”, likely due to long transits on the seafloor, high battery usage
- Only one major ground fault
- The suspected CaOH source was identified as a single bad bucket of material, the last remaining bucket of the lot. No other material of this lot was in our stock and no further issues experienced with absorbent material.
- Bottom time averages remain close to 6 hours and are a function of the scope of work (heavy manipulation and transits). Suggest that near term future plans include incorporation of higher energy density battery technologies.

Alvin Operations - NDSF-provided equipment

- Some issues with frame grabber
- Temperature probes did not function 100% of the time
- Navigation was excellent
- Sample collections went smoothly
- Some camera issues in general, including joysticks not able to switch between camera sources or controlling the pan and tilt
- Frame grabber fault isolated to a single failed video component, replaced with new.
- RTD temp probe failures primarily attributed to cable grounds. Group has ordered components to increase temp probe spares and evaluating inclusion of a 2nd redundant temp probe for dive missions that rely on temp probes.
- Camera control issues are under current evaluation – near term plan to work through control issues to improve usability (2017). Long term plan to evaluate video system and improve overall quality, usability.

Alvin - General Recommendations

- Improve the user controls for the Alvin video systems (use and reliability)
- Improve moisture control within the sphere

Response:

- Video system improvements in progress (new cameras, usability and control improvements), incorporation of new cameras with longer term evaluation for improvements in progress.
- Moisture control improvements specifically to prevent 'wicking' of condensation through pads. Plan to install plastic isolating barrier material between pads after next T/F test (for approval of material). Additional wipe down of accumulating sphere moisture (with towel) will reduce total moisture wicking to observers.

Jason debrief – Issues.

- After multiple operations in single body mode, use of Medea led to some wire issues and time-loss.
- **Suggestion:** Is there an easy technical fix? Awareness of this issue for science party and pre-dive planning to work out 'kinks'.
- Suggest extra engineering day after change over

Jason debrief – Issues.

- Rock orientation tool.
- **Suggestion:** For collection of some geological specimens knowing the precise orientation of the vehicle to the rock face is important, tools are available, either purchase or recommendations for the loan such a tool might be useful.
- Survey community to see if there is enough demand to justify adding it to NDSF

Jason debrief – Issues.

- Purchase and routine use of a 4K camera for Jason.
- **Suggestion:** Useful for very high resolution imaging of both geological and biological specimens on the seafloor.
- Agreed, we're working on 4k for Jason
 - Ideally to replace still cam and imaging cam

Jason debrief – Issues.

- Single body mode ops with Rapp winch and LARs seems redundant on an ocean class vessel where deck space is at a premium.
- **Suggestion:** Use of installed .681 FO wire and ship's DP and handling systems integrated with Jason ops to free-up deck space and expand weather window for ops.
- We can and will
 - Wanted to establish capacity to op with single body on SR/NA
- But this won't increase weather window

Sentry Debrief Highlights

- Overall, all Principle Investigators were pleased with *Sentry's* performance and generally able to meet their science goals.
- Reson multibeam failed (did not turn on) on one dive of 1 of 3 cruises.
 - The Reson is currently the number one major failure mode on the vehicle. This is partly because it is almost always critical when used, partly due to hardware and partly because it is tricky to configure. We are making large investments in further automation of configuration and on-vehicle and acoustic data QA.
 - The Reson is essentially 2009 technology and the company has gotten difficult to deal with as well. We should begin considering replacement when fiscally viable. Several excellent candidates are on the market with substantial performance improvements.
- Preliminary bathy within ~30-60 minutes of the AUV on-deck: All PI's were pleased
- Quotes
 - "Sentry was near perfect, and never aborted despite the challenging terrain"
 - "Sentry went down and up like clockwork"

Sentry Pre-cruise Recommendations

- Sentry and dredging operations, but expectations not met for dredging operations due to a shortage of ship personnel.
 - This is unfortunately beyond NDSF's control.

Sentry Ops Recommendations

- Consider improving the standard processing capabilities for sidescan and subbottom data
 - Our attempts to utilize MB System are not bearing the fruit we hoped for sidescan. We are evaluating alternate options. It is challenging to maintain both a quick turn around and a high quality product and extremely difficult to do with limited on-board data processing staff. We had not heard any complaints about the Seismic Linux based sub-bottom pipeline (c. 2015) but would be interested in any specific suggestions.
- Routine (annual) calibration of magnetometers is a good idea. Jeff Gee did that for this cruise and potentially could do it in the future.
 - We have not had any other requests for this except Jeff and this is not a factory recommended calibration. If there is consensus on this, please let us know and we will make sure to take care of it. Otherwise, we will do this on request from a PI.
- The Sentry team should provide their data on a RAID drive as the Jason team do.
 - In our experience Prosumer raids are prone to corruption and may not be large enough for some cruises anyway. Enterprise RAID systems are cost prohibitive as give away systems. We feel that the individual drives represent the best option for most PIs at present but we will be happy to work with individual PIs who may have differing needs.
- Zac and Carl excellent communication with science teams and ship's crews. Recommend awarding a medal 😊