

# *Sentry* debrief summaries - 2010

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<b>PI</b>	<b>Project</b>	<b>Ship</b>	<b>Area</b>
Camilli	Tracking oil plume	Endeavor	Gulf of MX (RAPID)
German/Camilli /Yoerger	Gas hydrate stability	Merian	Norwegian Margin
Delaney/Kelley	OOI survey	Thompson	NE Pacific (pre-OOI)

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## **1) Precruise Planning**

- Most issues adequately addressed
- Worked well even with 2 week lead time

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## 2) Mobilization

- Local issues; mostly resolved efficiently

## 3) Vehicle Operations

- *Sentry* & *Jason* used in parallel effectively
- Effective & adaptable- even with very complex logistics (many other ships in vicinity; navigational uncertainties)
- Both mid-water & near-bottom work excellent
- Dives 12-67 km (5-33 hrs)

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## 4) NDSF Equipment

- Reson system worked well mid-water & bottom (10s of cm vertical resolution possible)
- UBSL worked very well
- Sub-bottom profiler worked well from 5-80 m height off bottom
- Questions re: CTD (shipboard comparison)
- Magnetometer needs to be relocated (interference with rear control system)
- Bottlenecks for large-volume data recovery (i.e., images, SBP, Reson data)

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## **4) NDSF Equipment- continued**

- EdgeTech side-scan system not yet tested

## **5) User-Provided Equipment**

- Tethys MS worked well in different environments
- Eh sensor worked well

## **6) Personnel-general**

- *Sentry* & *Jason* teams work effectively together

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## **7) Data Delivery**

- Near- real time images. Efficient delivery led to rapid publication (5 wks after cruise)
- Even large data sets delivered on cruise or within one week of end of cruise

## **8) Demobilization**

- Local issues, mostly resolved quickly
- Delays/Communication problems in offloading *Sentry* van (Hatfield)

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## **9) Recommendations**

- WHOI mgmt needs to consider “best effort” for both expeditionary science but also contract work (e.g., OOI)
- Pre-cruise preparation needs to be uniform
- Improve uniformity of navigation for all teams and communicate calibration needs to PI’s
- Recommendations for operational limitations (e.g. sea state) for specific classes of vessels
- Issues with CTD & EdgeTech side-scan need resolution
- Data transmission rate for large-volume data sets needs improvement



# *Jason* debrief summaries - 2010

<b>PI</b>	<b>Date</b>	<b>Ship</b>	<b>Area</b>
Chadwick	March	Kilo Moana	Mariana arc
Cowen/Fisher (orig. Alvin)	June-July	Atlantis	NE Pacific (pre-IODP)
Delaney/Kelley	July- August	Thompson	NE Pacific (pre-OOI)
Chadwick/ Huber/Butterfield	Aug-Sept	Thompson	Axial Seamount
Fisher / Cordes	Oct-Nov	Ron Brown	Gulf of Mexico

# *Jason* debrief summaries - 2010

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## 1) **Scheduling, maintenance, preparation, and consequences**

- Adding Cowen cruise saved one PI's science but at the expense of another's
- Extra NDSF effort & support made the Cowen cruise successful, but that level of attention was lacking for the subsequent cruise with new Reson multibeam sonar, new HD video camera, and photo-mosaicing
- NDSF needs to carefully consider impacts of shortening maintenance periods and ensuring adequate time for prep. & testing, especially with new equipment

# *Jason* debrief summaries - 2010

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## **2) Also examples of heroic efforts to repair equipment at sea for science**

- Chadwick: transformer repair on *Jason*
- Cowen: major pressure case repair

## **3) Chronic issues**

- Communication between NDSF on-shore and at-sea teams (preparation, documentation)
- Better training for renav, multibeam, mosaicing
- Communication in the control van between pilots and the science team
- Data flow to science team during a cruise is sometimes problematic

# *Jason* debrief summaries - 2010

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## **4) Pilot training**

- Science supportive of need for training, but some discretion is also needed about when training opportunities are not appropriate
- Should be more than “sink or swim”

## **5) HD video camera issues**

- HD camera long-delayed & poorly delivered & even back-up prototype camera had problems
- Poor communication between AIVL & NDSF
- Camera controls in van need improvement
- Need color/white balance calibration & better monitor for ensuring good focus

# *Jason* debrief summaries - 2010

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## **6) Navigation / Data quality control**

- USBL system is excellent. Huge improvement.
- But improvements needed in re-nav software to better merge USBL and DVL navigation. Real time and/or re-navigation should eliminate DVL wander in the final nav files.
- Need clarification as to what users can expect as data deliverables from navigation, multibeam bathymetry, and photo-mosaics
- Need better documentation of data processing and data quality delivered with the data (for nav, imagery, multibeam bathymetry)

# *Jason* debrief summaries - 2010

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## 7) Appreciated improvements

- HD frame-grabber is very good and can replace *Jason* DSC camera (but more real time feedback would be valuable)
- Capability to record HD video to hard disk
- Good vehicle reliability, in general
- Virtual Van now available as stand-alone DVD
- Increased vehicle payload
- Increased flexibility with dive schedules & turn-around times



# *Alvin* debrief summaries - 2010

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## Five cruises

Juan de Fuca  
Cascadia  
Costa Rica  
EPR  
Galapagos

# *Alvin* debrief summaries - 2010

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## Overview:

**All the PIs were very satisfied with their *Alvin* experience and felt that their scientific goals were all met or exceeded.**

**The *Alvin* team was universally praised for its professionalism.**

**The following is an overview of some of the issues that came up during the cruises. Some of these are problems that have or will require some sort of corrective action while others are issues beyond the NDSF's control but presented here for their educational value to future users.**

# *Alvin* debrief summaries - 2010

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## Pre-Cruise Planning:

All PIs satisfied with planning in general with only a few issues.

Juan de Fuca, Cascadia, and Hydrate Ridge work continues to require complex planning due to multiple programs occurring in the area during the short weather window. This will likely continue for many years due to multiple initiatives there and will need continued close attention. In spite of this planning, conflicts continue to occur.

**Advice to PIs:** ALL participants need to bring passports, passport renewals need to be reported, and PIs need to have up-to-date passport information for all participants.

If there is a need to get scientists and their gear offloaded rapidly at the end of a cruise (such as a scheduled Coast Guard inspection, etc.) the PI should be made aware of this at the planning stage or as soon thereafter as possible.

# *Alvin* debrief summaries - 2010

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## Mobilization/Demobilization:

**Most gear was transferred at US ports making this easy. The ability to leave gear on board until a US port is reached was greatly appreciated.**

**The ability to get on-board ship 2 days in advance of the cruise was noted and much appreciated by all PIs.**

**Getting gear on and off the ship at anchorage in Costa Rica is often problematic. Efforts should be made to minimize all but personnel transfers.**

# *Alvin* debrief summaries - 2010

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## Operations - Vehicle:

**No significant problems were reported.**

**Batteries were reported to be in good condition with power only limiting dives with exceptionally long transits.**

**One dive was lost to problems with the variable ballast system.**

**There were problems with thrusters on one dive series early in the year but it did not limit dives.**

# *Alvin* debrief summaries - 2010

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## Operations - NDSF Equipment:

**Navigation worked well throughout. USBL reported to be as good or better than LBL and all navigation was best ever.**

**Framegrabber software needs updating to incorporate USBL**

**Camera and lighting worked well. One PI strongly suggests 3 handheld cameras in the ball, one for each person.**

**Sonar and Reson worked well - Reson data pipeline needs to be automated so it can be used in the same manner as on Sentry.**

**There were a few minor equipment failures (cameras, recorders, framegrabber system, pan&tilt, ...) but all were corrected by the following dive.**

# *Alvin* debrief summaries - 2010

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## Operations - User Provided Equipment:

**No problems reported. Numerous instruments (mass spec, optical modem, in situ GC, pressure sensors, etc.) were successfully interfaced directly to Alvin and other seafloor instruments were interfaced using ICL loops or other connectors.**

# *Alvin* debrief summaries - 2010

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## Data hand-over:

**One PI noted that this has been improving over previous years, particularly when there were only a few hours between the last dive and disembarkation.**

**Hard drives now being used for data transfer which is proving much more efficient. If multiple copies are required, scientists should bring their own.**

# *Alvin* debrief summaries - 2010

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## User Recommendations:

**The PIs who used both Alvin and Sentry could not emphasize enough the merits of using them together.**

**The functionality of Alvin could be greatly enhanced – perhaps doubled – if an ability to transmit images from the seafloor acoustically were implemented as has been done routinely, for more than a decade with Shinkai. The ability to confer with scientists on deck would greatly enhance the capabilities of the current Alvin and the new A-4500.**

**Maintain multibeam data onboard Atlantis for at least the commonly visited sites so it is available for dive planning.**

# *Alvin* debrief summaries - 2010

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## User Recommendations (continued):

**The use of elevators is an excellent way to overcome limitations in the payload of Alvin and more scientific users – as well as the ship’s crew – should become proficient in taking advantage of this.**

**As part of sustaining a credible night program, the ship should become more aware of issues associated with running CTD-rosette operations without contamination. Specific issues:**

- When to pump (and not pump) sewage outboard [PIs were told that sewage release is continual – which is problematic]**
- Deck painting**
- Hosing decks and causing organics/nutrients to be washed overboard**

# *Alvin* debrief summaries - 2010

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## User Recommendations (continued):

**One PI who had not used Alvin in the past 10 years was pleased to note a complete transformation in the ethos at sea in terms of both the ship's crew and even the cleanliness aboard ship. Everybody aboard ship, including both the ship's crew and the entire Alvin team seemed genuinely interested in the science being carried out.**





# NDSF Vehicle Debrief Interviews

## NDSF Response - *Sentry*



- It would be useful to have a clear set of policies as to the type of ships that are recommended for *Sentry* operations (DP, twin screw, single screw +bow thruster), and at what sea states the vehicle can be launched or should be recovered. There were issues on the last day where the Captain decided that he was not comfortable with a deployment operation despite the *Sentry* team's and my willingness to go ahead with operations.

This is a good recommendation. Although we usually discuss our operational limits with prospective users, it is worth drawing up general guidelines. Obviously, the competency of the ship handling and the deck crew influence the operational limitations.

- Rates of data down-load from the vehicle need to be enhanced (optical vs Ethernet cable?) so that this doesn't become the rate-determining step for turn-around.

A couple of fiber optic penetrators are planned for the new 6,500 meter main pressure housing (due to be fabricated & installed mid-2011). This will increase the data transfer rate immensely. The hard wired Ethernet connections between instruments and the vehicle electronics are also being investigated to increase the data transfer at this bottle neck.



# NDSF Vehicle Debrief Interviews

## NDSF Response - *Sentry*



- **The *Sentry* team needs to work on better ways to access and interrogate the large volumes of data that are now becoming standard from the Reson and SBP.**

Methods for providing access to the data are proceeding. The Reson water column data collected on a single dive can create almost 500 gigabytes of data. We are increasing our storage capacity and insuring timely transfer. Programs to better process and visualize the large amounts of Reson water column and sub-bottom data are being developed. These efforts include linking of the data to the re-navigated position and integrating these data with other data from both *Sentry* and other platforms.

An image viewing system is presently being tested on the current cruise. This image viewing station allows viewing of processed images and corresponding re-navigated position information for easy reference.

- **The Edgetech sidescan sonar capabilities for the vehicle still need to be implemented.**

The transducers are both large and heavy. The maintenance period planned for late spring 2011 includes the mounting of the side-scan transducers and the addition of buoyancy blocks to float them. The electronics is already included in the housing containing the sub-bottom electronics.



# NDSF Vehicle Debrief Interviews

## NDSF Response - *Sentry*



- It is time to train up a new *Sentry* Expedition Leader, freeing Dana Yoerger to focus on mission planning and post-dive data manipulation and visualization.

Personnel have been hired and training is in progress.

- Issues with the *Sentry* magnetometer and CTD data both need to be followed up and resolved.

A Sea Bird CTD has been ordered to supplement our current instrument. Magnetic measurements were made of the vehicle. Our dual magnetometers have been moved to mid ship and are being tested on the current cruise. Three units configured with one vertical and two lateral instruments thus giving both vertical and lateral comparison will replace the present configuration in '11.

- The only (and extremely subtle) down-side to the camera operations was that the stand-in strobe for *Sentry* (since loss of ABE) takes 7 sec. to recharge, so progress of the vehicle over the seafloor had to be moderated to obtain overlapping photographs.

During the spring maintenance period we expect to install and test the LED strobe system that is in fabrication at WHOI. The flash rate will increase thus allowing *Sentry* to drive at closer to 1 m/s (~ 1.5 to 2 knots).



# NDSF Vehicle Debrief Interviews

## NDSF Response - Jason



### Scheduling, Maintenance, Preparation, and Consequences

- Adding Cowen cruise saved one PI's science but at the expense of another's
- Extra NDSF effort & support made the Cowen cruise successful, but that level of attention was lacking for the subsequent cruise with new Reson multibeam sonar, new HD video camera, and photo-mosaicing

*We lost time for these integrations by doing Cowen, and underestimated the impact this could have on the follow on cruise*

- NDSF needs to carefully consider impacts of shortening maintenance periods and ensuring adequate time for preparation & testing, especially with new equipment
  - *Added a person to the shoreside support team*
  - *We are incorporating a more rigorously documented maintenance regimen that includes a web-based documentation and communication portal*



# NDSF Vehicle Debrief Interviews

## NDSF Response - Jason



### Examples of heroic efforts to repair science equipment at sea:

- Chadwick: transformer repair on Jason
- Cowen: major pressure case repair

### Chronic Issues

- Communication between NDSF shoreside and at-sea teams (preparation, documentation)

*To address this issue we're incorporating a web-based portal available to **both Users and Operator** that allows access to pre cruise meeting minutes, cruise plans, and vehicle documentation/post-dive reports*

- Better training for renav, multibeam, mosaicing

*Working toward standardization of these data products across all platforms*

- Control van communication between pilots and the science team

*We will strive to include the science party in the decision making and trouble shooting process more than we have in the past*

- Data flow to science team during a cruise is sometimes problematic

*Review of data practices for all platforms seeking to become more Sentry-like*



# NDSF Vehicle Debrief Interviews

## NDSF Response - Jason



### Pilot Training

- Science supportive of need for training, but some discretion is also needed about when training opportunities are not appropriate
- Should be more than “sink or swim”

*Introduction of a formal training program for Jason pilots will begin*

### HD Video Camera Issues

- HD camera long-delayed, poorly delivered and even backup prototype camera had problems
- Poor communication between AIVL and NDSF
- Camera controls in van need improvement
- Need color/white balance calibration and better monitor for ensuring good focus

*Addressed separately by Jon Howland during HD status briefing*



# NDSF Vehicle Debrief Interviews

## NDSF Response - Jason



### Navigation / Data Quality Control

- USBL system is excellent. Huge improvement.
- But improvements needed in re-nav software to better merge USBL and DVL navigation. Real time and/or re-navigation should eliminate DVL wander in the final nav files.

*Further research is required to determine the cause of the wander; this is being actively addressed by NDSF*

- Need clarification as to what users can expect as data deliverables from navigation, multibeam bathymetry, and photomosaics
- Need better documentation of data processing and data quality delivered with the data (for nav, imagery, multibeam bathymetry)

*We are working toward standardization of these data products*



# NDSF Vehicle Debrief Interviews

## NDSF Response - Jason



### Appreciated Improvements

- HD framegrabber is very good and can replace *Jason* DSC camera (but more real time feedback would be valuable)  
*Down-looking DSC imaging is still desired, and the HD camera won't fit in down looking mode*
- Capability to record HD video to hard disk
- Good vehicle reliability, in general
- Virtual Van now available as stand-alone DVD
- Increased vehicle payload
- Increased flexibility with dive schedules & turn-around times  
*There should be more flexibility in turnaround time with new LARS*



# *NDSF Vehicle Debrief Interviews*

## **NDSF Response - Alvin**



### **Operations - Vehicle**

- **One dive was lost to problems with the variable ballast system**

*This will be addressed during the 2011 overhaul*

- **There were problems with thrusters on one dive series early in the year but it did not limit dives**

*This will be addressed during the 2011 overhaul*



# NDSF Vehicle Debrief Interviews

## NDSF Response - Alvin



### Operations - NDSF Equipment

- **Framegrabber software needs updating to incorporate USBL**

*This will be addressed during the 2011 overhaul and update of the submarine's data logging and processing tools*

- **Camera and lighting worked well. One PI strongly suggests 3 handheld cameras in the ball, one for each person.**

*A third camera will be purchased*

- **Sonar and Reson worked well - Reson data pipeline needs to be automated so it can be used in the same manner as on *Sentry***

*This will be addressed during the 2011 overhaul and is linked to NDSF efforts in this area*



# NDSF Vehicle Debrief Interviews

## NDSF Response - *Alvin*



### Operations - User Provided Equipment

- **No problems reported. Numerous instruments (mass spec, optical modem, in situ GC, pressure sensors, etc.) were successfully interfaced directly to *Alvin* and other seafloor instruments were interfaced using ICL loops or other connectors.**

*Recent Navy audit findings will now require more stringent record keeping and adherence to ALOPS pressure testing, electrical ground checking and gas testing policies. If a PI or science party member arrives with inadequate documentation ALOPS may have no choice but to refuse to install equipment on the sub.*



# NDSF Vehicle Debrief Interviews

## NDSF Response - *Alvin*



### User Recommendations

- **The functionality of *Alvin* could be greatly enhanced – perhaps doubled – if an ability to transmit images from the seafloor acoustically were implemented as has been done routinely for more than a decade with *Shinkai*. The ability to confer with scientists on deck would greatly enhance the capabilities of the current *Alvin* and the new A-4500.**

*ALOPS is investigating this function but there is a risk that navigation will be effected because of data transmission times of images though the water.*