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URI/IFE – NOAA/OE

Data Acquisition and Processing
Seamount Leg – RHB August 2005

Data from Argus/Hercules Remotely Operated Vehicle System: Current state of IFE data acquisition capabilities

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This document was handed out by Dwight Coleman during the second Deep Sea Stepping Stones cruise planning meeting, held at URI on Friday, April 8, 2005. Notes were taken by Catalina Martinez, and reflect discussions that occurred on that day.

NOTE: ACTION items are in *italics*.

1. Navigation – D-GPS; USBL; DVL

Ship GPS and ROV USBL fixes are logged in Hypack; DVL-Nav logs all three (mostly ASCIII text files, some screen grabs)

- There are three different navigational spaces in vans, and DVL-Nav is the most robust, as it is tied to real world coordinates through a USBL fix. All data is logged as ASCII text files.
- For the Lost City leg, IFE will lease a lower frequency system, but had not thought about keeping the system for the second leg. Not a huge expense, but could be a couple of grand. USBL is surprisingly good, so this may not be necessary. Peter did not think any system would work extremely well on the seamounts and thought USBL would be fine.
- Gaining access to the one-minute ASCII text files is easy as they are broken periodically – maybe every hour.
    - ACTION: *Webb will make sure these files are accessible to science during the cruise.*
- Lauren told us that it was very beneficial for her when Louis Whitcomb converted Nav files to dot CSV files with cheat sheets on how to interpret them. In addition, Louis provided some sort of initialization file with information on where sensors are located in reference to one another on the vehicle, for correction purposes. All three products would be very useful for science: conversion of Nav files to CSV format (comma separated values); the users manual; and the initialization file. Lauren explained that you end up with about 45 columns of data from the ROV's and scientists use only about 5 columns frequently. Dwight suggested that science identify which parameters are most useful out of the 45 columns, and they can separate them out. Lauren said that science should walk away with all columns, but also with an understanding of what each means and how they are useful. Someone mentioned that if you do a Web search of *Whitcomb* and *DVL Nav* at Johns Hopkins you get the users manual that Lauren is talking about – potentially at this URL? http://robotics.me.jhu.edu/~llw/dvlnav/. Would be helpful to have a more intuitive means to deal with the data files.
- Grad student (Vicky) at Woods Hole is working with Jon Howland to take CSV files and process them to make maps. She is also working with Dan Scheirer on this data, with software developed by Howland. That same software will be used by IFE this year.
- Science thought that a real-time graphically displayed dive track would be great, to see where the vehicles are in XY space. Dwight said that you can click screen grabs in the van to get Nav screens, and that it could be simple to have it log automatically if you want it. Science would prefer to teach watch standers how to take frame grabs of different screens.
    - *ACTION: Dwight will put together cheat sheets in the control van about using the system.*
- *ACTION: Ivar said that they will determine what data sets they really hope to acquire, and will include this information in the cruise plan.*
- Max depth of dives on seamounts – about 2500 meters.
- Multibeam:
    - Multibeam data was converted to DXF files last year and put into Nav system. They are raster files, and colors were distracting so Dwight contoured them as thin black lines and labeled them every five meters. Jim and Ivar thought they were useful to Navigation last year. If collecting new multibeam data, it will need to be processed on the fly and added. Having the ability to turn this on and off is important.
    - Already have multibeam data of most dive sites, but we'll need to collect new multibeam where we have gaps to provide a broader context.
    - Capability will be important – turn around multibeam and utilize it on site. Dan is coming to deal with multibeam, and Alan Gontz may also join with Auster's group.
    - GEOTIFF is supported.

2. Vehicle Data – Argus and Hercules ROV control data; CTD; DO

- Vehicle data is logged on the topside computer (ASCIII text files, usually compressed with gzip).
- Dwight said that there is a lot of data that science probably doesn't want to deal with, such as data files about vehicle electrical systems, thrust, oil, etc.
- Science was able to log CTD data last year, and Dwight might try to send it to Hypac this year.
- Sensors:
    - ParASCIIentific is the main depth sensor, and there are three additional ports for sensors on the vehicle.
    - Sensors would have to support 24 volts RS232.
    - Herc has a DO sensor, but it doesn't work well.
        - ACTION: *Tim will look into calibration and testing of the DO sensor for Lost City. Dwight said that there was a group at GSO working on floats, and that he would ask about calibration.*
    - *ACTION: Peter said he would look into borrowing a backscatter sensor, and will make sure it can be supported on the vehicle.*

3. Scanning Sonar – Fan Beam – Mesotech

- Dwight said that this data is rarely logged, only at scientist's discretion (MS-1000 software specific sonar replay files). He said it is typically only used for finding targets as it is an obstacle avoidance sonar, and that you do not acquire profiles. He said that you could potentially get frame grabs and that you can record some kind of binary playback file, but that you need to run a special software to use it. Peter thought the frame grabs would be useful, as he would look at gray scale values as a measure of topographical complexity.
    - ACTION: *Dwight said that he would look into the logistics of using this system, as it's not great software, and they don't always know where it logs. He also said that he would add this information to the cheat sheet, if he thinks the data can be acquired.*

4. Video – High-definition (HD-Cam X 2); Standard definition (DV-Cam)
DV-Cam tapes are always recorded with a switched camera feed
HD-Cam tapes are recorded at scientist's discretion, HD-Cam dupes can be made

- Last year we ran video to two DV Cam decks and two DVD decks, and used high def decks for highlights.
- IFE will have one DV Cam deck and two high def decks.
- Peter said they lost the 16x9 format going from high def to DV Cam, but Dwight said that as long as you set the recorder properly during recording, that you won't lose the formatting.
- Peter would like high def recorded all the time on Argus, but at select times on Herc.
- Time code retention was an issue last year, so deck owners need to make sure they bring the documentation for decks. New generation burners can potentially retain time code and IFE can set them up in the control van prior to Lost City and figure them out during the cruise, using them on Lost City.
    - *ACTION: Peter said that he would purchase 2 DVD recording decks and get them to Jim to set up in the control van by June 17. Tim will provide one DSR 20 deck before he leaves on his cruise.*
    - *ACTION: Jim will try to fit all decks in the ROV control van for Lost City and then will have them in place for the Deep Sea Corals leg.*
    - *UPDATE: Jim's team has looked into the purchase of DVD writers that can record time code, and it appears that such units are very expensive, and as most DVD players can't read the time code anyway, this is not being pursued.*
- Duplication:
    - Tim wants a full set of Herc DV Cam tapes, a full set of high def tapes, and a set of video DVD's, along with all digital ship and ROV data on DVD. Tim will not want a full set of Argus tapes.
    - Peter wants a full set of Herc DV Cam and Argus tapes, a full set of high def tapes, and a set of video DVD's, along with all digital ship and ROV data on DVD.
    - OE will work with science to develop a highlights tape and CD of high res still images and will provide a copy to each science party and IFE in format of choice. IFE would like a copy of the highlights tape in high def.

5. Data Log – Event data; Low-res frame grabs
INI initialization file can be customized to add logging quick-buttons to the datalogger
(ASCIII text files, one file per log entry, corresponding jpeg frame grabs)

- Data logger:
    - The system will be set up the same as last year for a watch position, and it can be customized with some pre-planning. Can set hotkeys to be consistent among shifts.

- ACTION: *Science will provide the following information to Webb very soon, so that he can work with Howland to set the system up.*

- A list for dropdown menus – corals, fish, geology, habitat, etc.
- A list of one-click event logging items for each dropdown menu.

- Tim mentioned that there may be a standard hotkeys list from WHOI from the Jason event logger software.
- Data logger can also be used manually as a first order annotation, and watch standers can use the frame grab button to take low res stills. Howland is working to make this image higher res.

6. Still Cameras – Pixelfly, stereo pairs, one color, one b/w
Usually only recorded during photomosaic surveys, simultaneous pictures collected every 8 seconds (uncompressed raw 12-bit TIFF files)

- Positioning of cameras: Cameras are used for various applications (mosaicing, ecological transects, species ID's), and so we may need to find a way to position them providing the most flexibility.
- Image processing: Jon Howland processed the images from last year well, but when Lauren processed them they were not high quality. Howland can provide a logarithm and script that will work only if data is collected with vehicles at a constant heading and constant height above the bottom. Have to do a lot of corrections otherwise – only about 2/3 of the images were worthwhile when Lauren processed them from last year. Cameras not fix mounted so altitude changes cause problems. Have to dedicate the vehicle time to the dataset.
- Lauren also found multiple copies of the lasers in some images, so she could not always figure out true scale. Howland doesn't know what this is from, and Jim thought that it may not be from the lasers because of positioning and distance issues.
- Tim has a program in Matlab that Hanu developed for automated mosaicing – can convert b&w to color and can correct. It may be possible to automate the color conversion and color correct scripts to run during the cruise.
  - ACTION: *Tim will work to provide capacity in his group for post-processing the pixelflys.*
- Lighting associated with pixelflys: Strobes can be moved around.

7. HD Capture – Still image frames from the HD video
Grabbed randomly by someone on watch or after the dive during HD playback (BMP or TIFF format files)

- Can potentially automate the HD capture card and have it take stills automatically. Howland looking at this to integrate into data logging software?
- Audio:
  - Can customize select intercom channels to be recorded as tracks on the video.
  - Hydrophone was not very useful last year, but we may move it to Argus.

Data Processing Software

- ASCIII data – i.e. Navigation, CTD, DO, etc.
  Data files best viewed with word processing software or Excel
  Unix command-line programs and shell scripts (sed, awk, grep, cut, paste) are best to decimate and parse out the data of interest
  Matlab and GMT are useful for analysis, plotting, contouring, etc.

- Image processing – i.e. for photomosaics (HD-capture and Pixelfly digital stills)
  Matlab (image processing toolbox) is useful, IrfanView, Thumbs Plus, Photoshop
  Special software is available from WHOI (Hanu Singh) and UNH (Yuri Rzhanov)