

U.S. DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NATIONAL OCEAN SERVICE

# Data Acquisition & Processing Report

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*Type of Survey* \_\_\_\_\_ Navigable Areas & Field Examination \_\_\_\_\_

*Project No:* \_\_\_\_\_ S-F901-NRT2-10 \_\_\_\_\_

*Time Frame* \_\_\_\_\_ June --- October 2010 \_\_\_\_\_

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## LOCALITY

*State* \_\_\_\_\_ North Carolina \_\_\_\_\_

*General Locality* \_\_\_\_\_ Morehead City \_\_\_\_\_

\_\_\_\_\_  
**2010**  
\_\_\_\_\_

## CHIEF OF PARTY

\_\_\_\_\_  
Robert W. Ramsey Jr. – Team Leader  
\_\_\_\_\_

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**Library & Archives**

**DATE** \_\_\_\_\_

# Data Acquisition & Processing Report Title Sheet

*Project No.* S-F901-NRT2-10

*Date of Project Instructions:* 15 June 2010

*Vessel* NOAA Launch 1210

*Field Unit* Navigation Response Team 2

*Chief of Branch* CDR. Lawrence T. Krepp

*Chief of Party* Robert W. Ramsey Jr. – Team Leader

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# **Data Acquisition and Processing Report For Calendar year 2010**

## **NOAA Launch 1210, Navigation Response Team 2**

### **A. Equipment**

The following sections describe major operational systems used to acquire survey data or control survey operations:

#### **A.1 Platform**

NOAA launch 1210, a 30-foot SeaArk with an 8.5-foot beam and draft of 0.5 meters, was used to collect all survey data. Launch 1210 is equipped with a J-arm to deploy the side scan sonar. An electric winch controls the tow-fish height during side scan acquisition. The operator maintains the proper depth for the best coverage at the sonar scale. The vessel DGPS (POS MV) was checked weekly to a known GPS reference point. There were no unusual vessel configurations or problems encountered with the vessel.

Launch 1210 is equipped with a 3PS Inc SD-41 counter that measures the side scan towfish tow cable by counting revolutions of the towing block (IS-.3K-002 Rev C-) on the J-Arm. The length of cable deployed is computed automatically and output to Hypack, and Klein SonarPro.

Launch 1210 is equipped with a POS MV Applanix system for heave, pitch and roll corrections, as well as vessel position and speed.

Coastal Oceanographic Hypack Max is used for survey navigation, Detached Positioning (DP), and VBES data logging bathymetry, as well as outputting the cable out values to the Klein Sonar system. Sonar Pro was used for on line acquisition of side scan sonar. Caris & Pydro were used for data processing, and MapInfo Professional, were used to support processing and plotting.

The PCs running Hypack and Sonar Pro are automatically synchronized to UTC time from the NMEA-0183 (zda) GPS messages. The time update occurs during the start and stop logging messages on the Hypack computer.

## **A.2 Sounding Instruments**

### Vertical Beam Echo Sounder

An ODOM Echotrac CV Fathometer, Ser # 23031 was used to collect all echo soundings on this survey. A standard lead line calibrated in meters, was used during this survey for depth comparison checks with the echo sounder. No problems were encountered with any of the sounding equipment.

### Side Scan Sonar

A Klein 3000 side scan sonar system was used throughout this survey. The Model # 3110 TPU (Topside Processing Unit) Ser# 389 and Model # 3210 Towfish Ser# 498 are part of this system. The side scan sonar equipment was used to conduct dual Freq surveying and investigate AWOIS items. The system used frequency of 100 & 500 kHz. The recorder was set on one of either 25/50/75-meter range scales. The confidence checks were performed daily by identifications made to known features, such as active buoy blocks.

Side scan sonar lines are planned to run along current axis, spaced in accordance with the Side Scan Sonar Manual. Lines are planned with at least 10m of overlap with adjacent swaths on either side. Range scales during acquisition are determined primarily by water depth. Vessel speed is adjusted to ensure that an object one meter in characteristic size would be detected and clearly imaged across the sonar swath.

## **A.3 Positioning and Attitude Instruments**

An Applanix POS MV 320 Ver4 (S/N 2546) was used as the primary navigation station and motion sensor on launch 1210 for all hydrographic data acquisition.

A Trimble DGPS Beacon Receiver (S/N 0220261525) was used to supply the RTCM corrector to the POS MV.

A GPS Trimble GeoXH (Handheld) (SN: 4928419767) was used for all ENC high accuracy positioning and establishment of calibration points. Trimble TerraSync software v4.10 was used for data acquisition. Trimble Pathfinder Office v4.20 software was used for processing the ENC high accuracy position data. This data was then post-processed for local COR site correctors, to finalize the data submitted.

## **A.4 Ancillary Instruments**

The Instruments used for determining corrections for the speed of sound through the water column were an ODOM Digibar Ser # 98295-020606 and a Seabird-Seacat Velocity Profiler, model 19-03, Ser# 198671-1477. Velocity casts are downloaded and processed in the Velociwin program supplied by the Hydrographic Systems and Technology Program (HSTP).

## Lead Line

Leadline comparisons are conducted weekly, these calibrations show that under the prevailing conditions at that time and location, Launch 1210's fathometer meets the International Hydrographic Organization "Special Order" specification for vertical soundings.

## Diver Least Depth Gauge

Not Applicable

## Bottom Samples

Where required by project instructions, NRT2 personnel acquire sediment samples from the sea floor in the survey area adjacent to charted bottom characteristics. The primary tool for this operation is a "clamshell" style gravity-closed sediment sampler, which penetrates approximately 0.05m into the bottom. Subset method of samples showed agreement with charted sedimentary descriptions in all cases except any specifically noted in respective surveys.

## **A.5 Data Acquisition and Processing Software**

7/13/2010 12:21:27

NRT-2 / S-1210

### Active Software Versions

| <u>Name</u>          | <u>Version</u>                 | <u>SP/HF</u>        | <u>Remarks</u>              |
|----------------------|--------------------------------|---------------------|-----------------------------|
| Applanix POS PAC     | 5.3                            |                     | Processing                  |
| Caris Hips/Sips      | 7.0                            | SP-1 HF-5           | Processing                  |
| Pydro                | 10.6                           | {r2953}             | Processing                  |
| Velocipy             | 10.4                           | (r2927)             | Processing                  |
| MapInfo Professional | 10.0.0.28                      |                     | Processing                  |
| Hydro_MI             | 8.3{r250}                      |                     | Processing                  |
| Vertical Mapper      | 3.1.1.002                      |                     | Processing                  |
| SBE Data Processing  | SBEDataProcessing_Win32_V7_20c |                     | Processing                  |
| Sea-Term             | Seaterm_Win32_V1_57            |                     | Processing                  |
| Pathfinder Office    | 4.20                           | hf-7                | Processing                  |
| Digibar Pro          | 3.0                            |                     | Processing                  |
| Adobe 8.0 Pro        | 8.1.7                          |                     | Documentation               |
| MV- POSVIEW          | 3.4.0.0                        | sw: 05.01 HW: 2.9-7 | Controller PGM              |
| Hypack               | 2010                           | 10.0.0.34           | Acquiring / Processing      |
| SonarPro             | 12.0                           |                     | Acquiring / Processing      |
| Odom eChart          | 1.4                            | 4.09/4.02           | 1.22/1.22<br>Controller PGM |
| TSIP Talker          | 2.00                           |                     | Communication DGPS          |
| Trimble DM12/212L    | 1.71                           |                     | Acquiring (Firmware)        |
| Fugawi               | 3.1.4.881                      |                     | Secondary Navigation        |
| TerraSync            | 4.10                           |                     | Acquiring                   |

Offshore Navigator 5.08  
Windows Mobile 6.1

Secondary Chart viewer  
Data Transfer

Calibrations:

Digibar Pro s/n: 98295 JAN 2010  
Sea-Bird SBE 19 s/n: 198671-1477 DEC 2009

## **B. Quality Control**

### **B.1 Bathymetry Data**

#### Vertical Beam Sonar Data

Survey data for single beam and side scan sonar Hydrography is transferred to a removable hard drive on the launch and entered into the post processing system in the Office trailer. Vertical Beam sonar data is converted from Hypack format to CARIS format using the CARIS “Hypack” data converter. After conversion, the data is opened in CARIS Navigation Editor, Attitude Editor, and Single Beam Editor. Vessel navigation data is manually checked for errors, which are rejected with interpolation. Attitude data are checked for errors or gaps. Sounding data are checked for irregular pings.

#### Final Processing of Sounding Data

Survey personnel scan raw VBES soundings in CARIS Single Beam Editor, any sounding questions are then compared directly to the sounders graphic record file (.bin) for edits required to validate or correct the values in question. Once VBES soundings are scanned, the raw data is corrected by applying sound velocity, tides, and true heave; then TPE values are applied, and then the data is merged. The tide data is applied either by Pydro via TCARI, or Caris by a ZDF file.

### **B.2 Side Scan Sonar Imagery**

All side scan sonar imagery is converted from SDF formats to CARIS format using CARIS SDF converters. After conversion, the data is opened in CARIS Navigation Editor, Attitude Editor, and Side Scan Editor. Survey personnel check vessel attitude (if present), cable out, Gyro, and sonar height. Due to the higher rate of current data logging of position 25-50Hz some minor noise is present in the speed data, these are left unedited due to their insignificance. Data showing speed jumps may be rejected with interpolation. After confirming the validity of the vessel navigation, cable out, and towfish depth values, survey personnel then use the “recomputed towfish navigation” function to calculate towfish position. Side scan sonar data is scanned in CARIS Side

Scan Editor. Survey personnel correct errors in bottom tracking, slant range correct the imagery at 0.02m resolution and scan the data for significant contacts. Contacts deemed “significant” include, but are not limited to, contacts with a shadow indicating a contact height of 1.0 m or greater in water depths of 20m or less, that fall in channels, or critical navigation areas. Contact heights that are 10% of the water depth in water deeper than 20m are addressed if it is believed that they warrant development. Other contacts that may be considered significant by NRT2 personnel include smaller contacts in particularly shoal areas or channels, cables and pipelines, and contacts of possible historical significance.

Point feature contacts are picked using CARIS “single point contacts”. Larger contacts and line features are picked using CARIS “multipoint contacts”. All contacts are descriptively labeled and feature codes selected if conclusive identification is possible, and the software has the ability to do so. TIF format images of all contacts are saved. After the initial SSS imagery scan, a check scan of all data is conducted.

HSTP’s Pydro software package is the primary tool for sounding and feature integration and assessment. Side scan contacts and detached positions are inserted into the Pydro Preliminary Smooth Sheet (PSS).

Coverage of 200% was obtained in the required survey areas and where AWOIS items and water depth or hazards permitted. The coverage was verified by generation of 1m resolution mosaics, to evaluate any gaps in coverage. Side scan sonar coverage was conducted to the limits that were assigned in the project letter when vessel and personnel safety allowed. Single beam reduced line spacing was performed in other areas where warranted. The towfish was deployed off the starboard quarter of the vessel, which proved very stable. Distorted images caused by strong tidal currents were seen periodically. Some localized areas were found to have bottom characteristics that provided poor reflectivity and weak signal return on both the Hi and Lo Freq channels.

Pydro provides five flags for categorizing features: “Significant”, “Chart”, “Report”, “Investigate”, and “DTON”. In addition, Pydro provides “Primary” and “Secondary” flags for grouping correlated features. After insertion, SSS features are first categorized by significance. Contacts that meet the standard of significance described in section B.2. , are marked as such; those contacts which are deemed insignificant are marked “Resolved” and Rejected and not investigated further. Also, multiple contacts representing the same physical feature are grouped. The contact that the Hydrographer believes well represents the feature (typically, the most clear SSS image) is selected as the “Investigate” contact.

“Investigate” flagged contacts are then reassessed to determine if additional investigation (typically VBES development) is required. Hypack target files are generated for significant contacts, and investigated. After contacts are sufficiently investigated, they are further assessed to determine whether they require charting. Features that the Hydrographer believes should be added, retained, or modified on the chart are marked as



such. Features that will be reported in the survey Descriptive Report are flagged “Report.” Features that pose a special threat to vessel traffic have their shoal soundings marked as “DTONS”, and a Danger to Navigation Report is generated. Features that are dangers, however are not felt to be imminent hazards due to normal traffic in the area, may not have DTON’s issued by the field, and are left to the processing branch for final disposition.

The High accuracy DGPS positions for ENC (Electronic Navigational Chart) are transferred to Trimble Pathfinder Office software on the post processing system in the Office trailer. The data points are then loaded into the Pydro PSS where they are addressed. Appropriate exports of this data are made in the end users requested format, and are transferred to those users.

The NOS program Velocity, and MS Word was also used during survey post processing.

## **C. Corrections to Echo Soundings**

### **C.1 Vessel Offsets and Static Draft**

It is OCS and NRT2 policy that all data be acquired and logged in raw format without application of any corrections for vessel offsets, sensor alignment, sound velocity profile, or tides. These factors are logged separately or contained in the CARIS “Vessel Configuration File” (VCF), and applied in post-acquisition data processing (a copy of the VBES VCF Report is embedded at the end of this report).

The lead line for launch 1210 was calibrated using a steel tape on Jan. 20, 2010 (DN: 020). No corrections were necessary.

The Caris waterline value was determined by the difference in the vertical "Z" of the reference point to the transducer face.

### **C.2 Dynamic Draft**

Settlement and squat measurements for launch 1210 were taken on Jan. 20, 2009 (DN: 020). These measurements were conducted in Charleston, SC using the level method. Settlement and squat correctors were entered into the Caris vessel configuration file for Launch 1210.

### **C.3 Attitude and Heave**

An Applanix POS MV 320 Ver4 (S/N 2546) was used as the primary navigation station and motion sensor on launch 1210 for all hydrographic data acquisition. The POS MV

was calibrated on 20 January, 2010. Detailed supporting documentation can be found in the HSRR for 2010.

#### **C.4 Sound Velocity Profile**

Conductivity, temperature, and depth profiles are acquired using two velocity (CTD) profilers. The primary instrument used for determining corrections for the speed of sound through the water column was a Digibar-Pro, S/N 98295-011007. (01/2010 last calibrated). Data quality assurance tests were performed by the “Compare two Profiles” method of two casts acquired at the same time with two different instruments.

The check instrument used for determining corrections for the speed of sound through the water column was a Seabird-Seacat Velocity Profiler, model 19-03, S/N 198671-1477. (12/2009 last calibrated). The calibration records are included with the HSSR for 2010.

#### **C.5 Water Levels**

Field soundings are corrected by verified tides data from NOAA/CO-OPS, as per

#### **WATER LEVEL INSTRUCTIONS S-F901-NRT2-2010 Beaufort Inlet and Approaches, NC (03/11/2010 LH)**

**This is a ZDF controlled project.**

Pertinent water level data were provided via email data transmissions through TIDEBOT, to the Field unit. Water level data requested and used were both 6 min Preliminary; and Verified for final data submission

The operating National Water Level Observation Network (NWLON) stations at Beaufort, NC (8656483) and Wrightsville Beach, NC (8658163) serve as datum control for the survey area including determination at each subordinate station, during all periods of hydrography. ZDF graphic below.

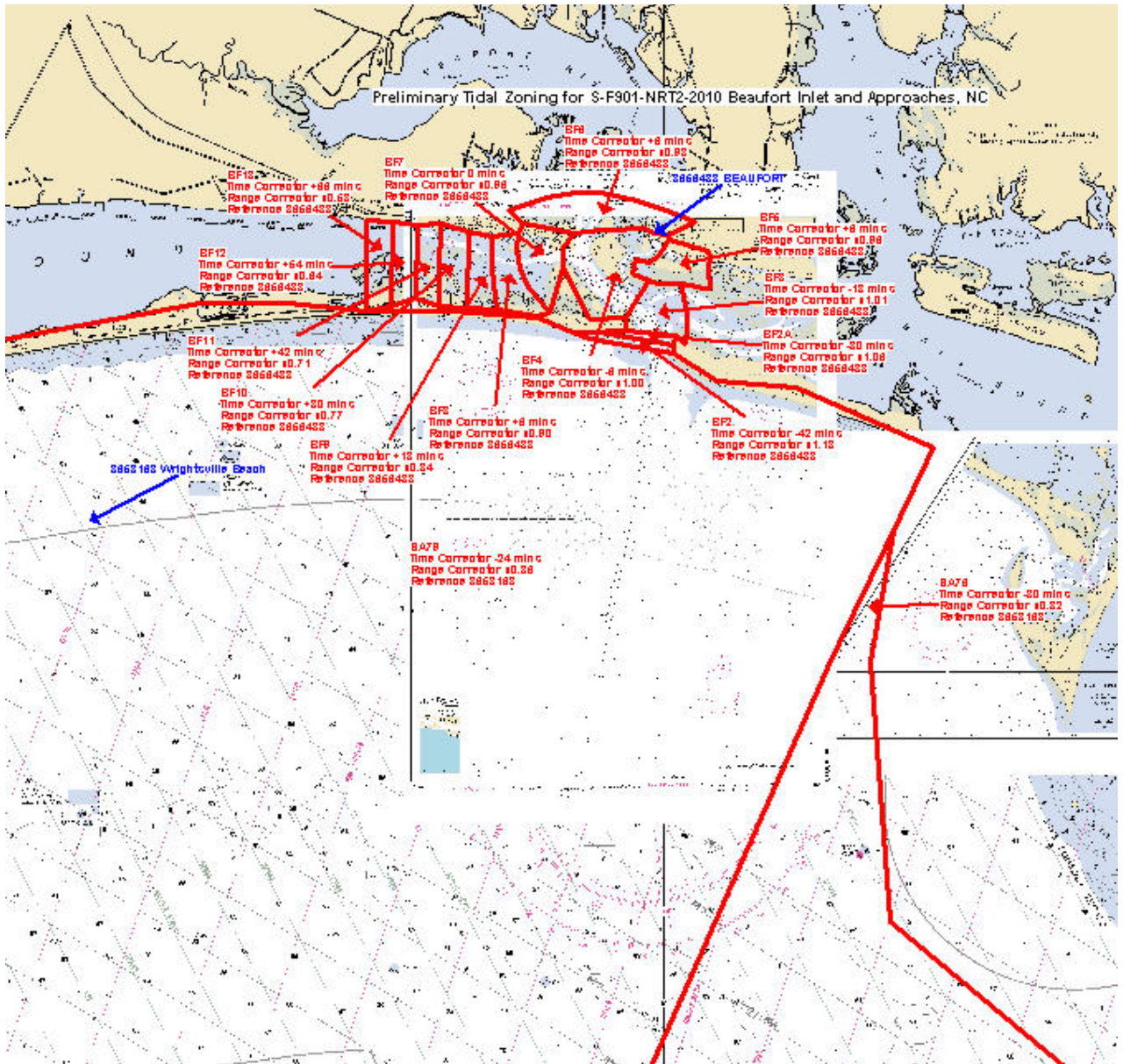


Figure 1: S-F901-NRT2-10 ZDF

Vessel Name: NRT2\_1210\_SB.hvf  
 Vessel created: February 01, 2010

Depth Sensor:

Sensor Class: Swath  
Time Stamp: 2006-001 00:00

Comments: R=0.01m / A=0.01m  
Time Correction(s) 0.000

Transducer #1:  
-----

Pitch Offset: 0.000  
Roll Offset: 0.000  
Azimuth Offset: 0.000

DeltaX: 0.000  
DeltaY: 0.000  
DeltaZ: 0.000

Manufacturer: Odom  
Model: oecv  
Serial Number: 23031

Depth Sensor:

Sensor Class: Swath  
Time Stamp: 2008-057 00:00

Comments: R=0.01m / A=0.01m // RP to XDCR  
Time Correction(s) 0.000

Transducer #1:  
-----

Pitch Offset: 0.000  
Roll Offset: 0.000  
Azimuth Offset: 0.000

DeltaX: -0.176  
DeltaY: 2.060  
DeltaZ: 0.169

Manufacturer: Odom  
Model: oecv  
Serial Number: 23031

Depth Sensor:

Sensor Class: Swath  
Time Stamp: 2009-258 00:00

Comments: R=0.01m / A=0.01m // RP to XDCR(new XDCR)  
Time Correction(s) 0.000

Transducer #1:  
-----  
Pitch Offset: 0.000  
Roll Offset: 0.000  
Azimuth Offset: 0.000  
  
DeltaX: -0.176  
DeltaY: 2.060  
DeltaZ: 0.135  
  
Manufacturer: Odom  
Model: oecv  
Serial Number: 23031

---

Navigation Sensor:

Time Stamp: 2005-061 00:00  
  
Comments: <1m HP, Speed @ 0.1kts  
Time Correction(s) 0.000  
DeltaX: 0.200  
DeltaY: -0.770  
DeltaZ: -3.600  
  
Manufacturer: Trimble  
Model: DSM12/212\_L  
Serial Number: 0220261525  
  
Time Stamp: 2008-057 00:00  
  
Comments: HW v1.9 // SEP 2006 {RP}  
Time Correction(s) 0.000  
DeltaX: 0.000  
DeltaY: 0.000  
DeltaZ: 0.000  
  
Manufacturer: Applanix  
Model: MV V4  
Serial Number: 2546

---

Gyro Sensor:

Time Stamp: 2005-061 00:00  
  
Comments: From DGPS VTG msg  
Time Correction(s) 0.000

---

Heave Sensor:

Time Stamp: 2008-057 00:00

Comments: RP to IMU  
Apply Yes  
Time Correction(s) 0.000  
DeltaX: 0.000  
DeltaY: -0.127  
DeltaZ: -0.167  
Offset: 0.000

Manufacturer: Applanix  
Model: POS M/V V4  
Serial Number: 2546

---

Pitch Sensor:

Time Stamp: 2008-057 00:00

Comments: IMU  
Apply Yes  
Time Correction(s) 0.000  
Pitch offset: 0.000

Manufacturer: Applanix  
Model: POS M/V V4  
Serial Number: 2546

---

Roll Sensor:

Time Stamp: 2008-057 00:00

Comments: IMU  
Apply Yes  
Time Correction(s) 0.000  
Roll offset: 0.000

Manufacturer: Applanix  
Model: POS M/V V4  
Serial Number: 2546

---

Draft Sensor:

Time Stamp: 2005-061 00:00

Apply Yes  
Comments: SS 2005  
Time Correction(s) 0.000

Entry 1) Draft: 0.000 Speed: 0.000  
Entry 2) Draft: 0.010 Speed: 4.500  
Entry 3) Draft: 0.020 Speed: 5.500  
Entry 4) Draft: 0.030 Speed: 7.000

Entry 5) Draft: 0.040 Speed: 8.300  
Entry 6) Draft: 0.020 Speed: 10.600  
Entry 7) Draft: -0.050 Speed: 14.700

Time Stamp: 2006-032 00:00

Apply Yes  
Comments: SS 2006  
Time Correction(s) 0.000

Entry 1) Draft: 0.000 Speed: 0.000  
Entry 2) Draft: 0.012 Speed: 4.525  
Entry 3) Draft: 0.025 Speed: 5.517  
Entry 4) Draft: 0.031 Speed: 7.019  
Entry 5) Draft: 0.042 Speed: 8.287  
Entry 6) Draft: 0.024 Speed: 10.598  
Entry 7) Draft: -0.051 Speed: 14.717

Time Stamp: 2007-004 00:00

Apply Yes  
Comments: SS 2007  
Time Correction(s) 0.000

Entry 1) Draft: 0.000 Speed: 0.000  
Entry 2) Draft: 0.014 Speed: 4.530  
Entry 3) Draft: 0.027 Speed: 5.520  
Entry 4) Draft: 0.030 Speed: 7.018  
Entry 5) Draft: 0.043 Speed: 8.290  
Entry 6) Draft: 0.023 Speed: 10.625  
Entry 7) Draft: -0.052 Speed: 14.719

Time Stamp: 2008-015 00:00

Apply Yes  
Comments: SS 2008  
Time Correction(s) 0.000

Entry 1) Draft: 0.000 Speed: 0.000  
Entry 2) Draft: 0.010 Speed: 2.994  
Entry 3) Draft: 0.050 Speed: 4.490  
Entry 4) Draft: 0.040 Speed: 6.395  
Entry 5) Draft: 0.060 Speed: 7.989  
Entry 6) Draft: -0.010 Speed: 10.594

Time Stamp: 2009-007 00:00

Apply Yes  
Comments: SS 2009  
Time Correction(s) 0.000

Entry 1) Draft: 0.000 Speed: 0.000  
Entry 2) Draft: 0.010 Speed: 2.994  
Entry 3) Draft: 0.050 Speed: 4.471

Entry 4) Draft: 0.050 Speed: 6.395  
Entry 5) Draft: 0.060 Speed: 7.989  
Entry 6) Draft: 0.000 Speed: 10.497  
Entry 7) Draft: -0.080 Speed: 14.987

Time Stamp: 2010-020 00:00

Apply Yes  
Comments: SS 2010  
Time Correction(s) 0.000

Entry 1) Draft: 0.000 Speed: 0.000  
Entry 2) Draft: 0.010 Speed: 2.994  
Entry 3) Draft: 0.050 Speed: 4.490  
Entry 4) Draft: 0.050 Speed: 6.415  
Entry 5) Draft: 0.060 Speed: 7.989  
Entry 6) Draft: -0.010 Speed: 10.594  
Entry 7) Draft: -0.070 Speed: 15.492

---

TPU

Time Stamp: 2008-057 00:00

Comments: POS M/V install date  
Offsets

Motion sensing unit to the transducer 1  
X Head 1 -0.176  
Y Head 1 2.187  
Z Head 1 0.336

Motion sensing unit to the transducer 2  
X Head 2 0.000  
Y Head 2 0.000  
Z Head 2 0.000

Navigation antenna to the transducer 1  
X Head 1 -0.916  
Y Head 1 -1.150  
Z Head 1 3.147

Navigation antenna to the transducer 2  
X Head 2 0.000  
Y Head 2 0.000  
Z Head 2 0.000

Roll offset of transducer number 1 0.000  
Roll offset of transducer number 2 0.000

Heave Error: 0.050 or 5.000'' of heave amplitude.  
Measurement errors: 0.010  
Motion sensing unit alignment errors  
Gyro:0.000 Pitch:0.000 Roll:0.000  
Gyro measurement error: 0.025  
Roll measurement error: 0.020  
Pitch measurement error: 0.020  
Navigation measurement error: 1.000



Transducer timing error: 0.000  
Navigation timing error: 0.010  
Gyro timing error: 0.010  
Heave timing error: 0.005  
PitchTimingStdDev: 0.005  
Roll timing error: 0.005  
Sound Velocity speed measurement error: 0.000  
Surface sound speed measurement error: 0.000  
Tide measurement error: 0.000  
Tide zoning error: 0.000  
Speed over ground measurement error: 0.030  
Dynamic loading measurement error: 0.010  
Static draft measurement error: 0.010  
Delta draft measurement error: 0.010  
StDev Comment: Applanix POS M/V V4

Time Stamp: 2010-020 00:00

Comments: POS MV Updates

Offsets

Motion sensing unit to the transducer 1

X Head 1 -0.176

Y Head 1 2.187

Z Head 1 0.309

Motion sensing unit to the transducer 2

X Head 2 0.000

Y Head 2 0.000

Z Head 2 0.000

Navigation antenna to the transducer 1

X Head 1 -0.916

Y Head 1 -1.150

Z Head 1 3.113

Navigation antenna to the transducer 2

X Head 2 0.000

Y Head 2 0.000

Z Head 2 0.000

Roll offset of transducer number 1 0.000

Roll offset of transducer number 2 0.000

Heave Error: 0.050 or 5.000'' of heave amplitude.

Measurement errors: 0.010

Motion sensing unit alignment errors

Gyro:0.000 Pitch:0.000 Roll:0.000

Gyro measurement error: 0.025

Roll measurement error: 0.020

Pitch measurement error: 0.020

Navigation measurement error: 1.000

Transducer timing error: 0.000

Navigation timing error: 0.010

Gyro timing error: 0.010

Heave timing error: 0.005

PitchTimingStdDev: 0.005

Roll timing error: 0.005  
Sound Velocity speed measurement error: 0.000  
Surface sound speed measurement error: 0.000  
Tide measurement error: 0.000  
Tide zoning error: 0.000  
Speed over ground measurement error: 0.030  
Dynamic loading measurement error: 0.010  
Static draft measurement error: 0.010  
Delta draft measurement error: 0.010  
StDev Comment: Applanix POS M/V V4

---

Svp Sensor:

Time Stamp: 2005-061 00:00

Comments: SBE 19 cast  
Time Correction(s) 0.000

Svp #1:

-----  
Pitch Offset: 0.000  
Roll Offset: 0.000  
Azimuth Offset: 0.000

DeltaX: 0.000  
DeltaY: 0.000  
DeltaZ: 0.000

SVP #2:

-----  
Pitch Offset: 0.000  
Roll Offset: 0.000  
Azimuth Offset: 0.000

DeltaX: 0.000  
DeltaY: 0.000  
DeltaZ: 0.000

Time Stamp: 2008-057 00:00

Comments: Digibar Pro  
Time Correction(s) 0.000

Svp #1:

-----  
Pitch Offset: 0.000  
Roll Offset: 0.000  
Azimuth Offset: 0.000

DeltaX: -0.176  
DeltaY: 2.060  
DeltaZ: 0.169

SVP #2:  
-----  
Pitch Offset: 0.000  
Roll Offset: 0.000  
Azimuth Offset: 0.000

DeltaX: 0.000  
DeltaY: 0.000  
DeltaZ: 0.000

Time Stamp: 2009-258 00:00

Comments:  
Time Correction(s) 0.000

Svp #1:  
-----  
Pitch Offset: 0.000  
Roll Offset: 0.000  
Azimuth Offset: 0.000

DeltaX: -0.176  
DeltaY: 2.060  
DeltaZ: 0.135

SVP #2:  
-----  
Pitch Offset: 0.000  
Roll Offset: 0.000  
Azimuth Offset: 0.000

DeltaX: 0.000  
DeltaY: 0.000  
DeltaZ: 0.000

---

WaterLine:

Time Stamp: 2005-061 00:00

Comments: 208khz 8dgr beam  
Apply Yes  
WaterLine -0.500

Time Stamp: 2008-057 00:00

Comments: RP to Static WL  
Apply Yes  
WaterLine -0.196

---

**D. APPROVAL SHEET**

**Data Acquisition and Processing Report**  
For Calendar year 2010

For Accompanying Surveys

The Data Acquisition and Processing Report information and all accompanying records and data are approved.

**Submitted by:**

**Robert W. Ramsey Jr. – Team Leader**  
**Navigation Response Team 2**