EAHC Capacity Building Programme 2009
TRAINING REPORT

I. COURSE TITLE

Quality Assurance on Multibeam Surveying and Data Processing

II. COURSE DESCRIPTION

The course was designed to enhance quality assurance methods and techniques in multibeam surveying as well as data processing, to provide more efficient and accurate hydrographic data.

III. DURATION AND DATE

Four days (August 18, 19, 20, 21, 2009)

IV. AUTHORITY

The training course was conducted with the agreement regarding the Capacity Building Training Programme for 2009 during the 3rd EAHC Coordinating Meeting held in February 2009 in Sanya, China. The programme invitation was distributed thru EAHC Circular Letter No. 06/2008 dated 26 May 2009.

V. PURPOSE

The objective of the activity is to train the participants on multibeam data acquisition and processing, for efficient quality assurance.

VI. SPONSOR AND SOURCE OF FUND

International Hydrogaphic Organization – Capacity Building Committee (IHO CBC)

VII. HOST COUNTRY

Philippines

VIII. IMPLEMENTING AGENCY

National Mapping and Resource Information Authority (NAMRIA)

IX. TRAINING VENUE

A. Geomatics Training Center, NAMRIA Building, Fort Bonifacio, Taguig City
B. BRP HYDROGRAPHER PRESBITERO, Subic Bay, Olongapo City, Zambales

X. PARTICIPATING COUNTRIES

EAHC Member State	Lecturer	Trainee
China, People's Republic	0	0
Hong Kong	0	0
Indonesia, Republic of	0	1
Japan	0	1
Korea, Republic of	0	1
Korea, Democratic People's Republic of	0	0
Malaysia	0	1
Thailand, Kingdom of	0	1
Philippines, Republic of	0	8
Singapore	1	0

A. Lecturer (1)
   Singapore - Tuck Meng Wong
B. Trainees (13)
   1. Indonesia - Ahmad Afandi
   2. Japan - Takeshi Tomohisa
   3. Korea - Changsu Hwang
   4. Malaysia - Mohamad Yasir bin Hj. Ali
   5. Thailand - Chaiyarit Klayboonsong
   6. Philippines - Jonathan Pason
      Glenn Jandayan
      Rommel Correa
      Rodel Guarte
      Danilo Arguelles, Jr.
      Bai Dyanna Sinsuat
      Lorena Jasmin Lerio
      Marvin Espino

XI. COURSE OUTLINE

Day 1: Survey Accuracy Verification

Standards for Hydrographic Surveys (IHO S-44)
Total Horizontal Error (THE)

- Accuracy of horizontal positioning system(s)
- Horizontal positioning accuracy check (e.g. range check) record and result verification
- Patch test record and result verification
- Verification of statistical method for determination of THE

Total Vertical Error (TVE)

- Accuracy of vertical positioning system(s) (e.g. echosounder, sound velocity profiler)
- Bar check record and result verification
- Patch test record and result verification
- Verification of statistical method for determination of TVE

Standardization and documentation

Day 2: Multibeam Data Verification

Coverage
Standard deviation of binned/gridded data
Detection and verification of systematic errors and outliers

- Agreement of overlapping survey lines/cross lines profiles
- Depth colored surface inspection
- Sun-illuminated surface inspection

Comparison with backscatter imagery
Comparison with chart/ENC overlay
Comparison with historical bathymetry
Standardization and documentation

Day 3: Field Work

Hands-on practical of preparing and carrying out quality check and assurance for multibeam survey

Day 4: Post Processing and Review

Hands-on practical of carrying out post-processing of multibeam survey data
Review and conclusion of training course

XII. SOFTWARE USED / DEMONSTRATED

FLEDERMAUS – It is a three-dimensional (3D) data visualization software used in creating bathymetric surface models. The software is used to edit data from a wide variety of multibeam, single beam, Lidar and other data formats considering appropriate data flags for point rejection and related parameters.

XIII. PLATFORM AND INSTRUMENTATION

1. BRP HYDROGRAPHER PRESBITERO - NAMRIA's Hydrographic Survey Vessel. It has an overall length of 53.5 meters, breadth of 12.0 meters and a draft of 3.8 meters. Its maximum speed is up to 13 knots.

2. Sea Beam Sonar 2000 (12/36 KHz) - multibeam sonar for bathymetric data acquisition.

3. Attitude Sensor, TSS HDMS Model 220 – provides correction to errors caused by the vessel's motion.

4. Acoustic Doppler Current Profiler (ADCP)

5. Sea Surface Sound Velocimeter (SSSV), FSI – hull direct reading 2.0" Micro-CTD (hull mounted) for defining the Sound Velocity Profile of the survey area.

6. Sippican T5 Type Expendable Bathy Thermograph (XBT) – gathers temperature readings of the water column. It is used to define the Sound Velocity Profile at the survey area.

XIV. DISCUSSIONS AND OBSERVATIONS

Day 1 (August 18, 2009)

The participants were welcomed at the Administrator's office of the National Mapping and Resource Information Authority. The lecture began with an introduction on the different classifications of survey based on the IHO Standards for Hydrographic Surveys (S-44), namely Special Order, Order 1a, Order 1b and Order 2. Factors affecting uncertainty in positioning were then discussed, such as GPS error and offset error from angle bars and equipment offsets. The total horizontal and vertical uncertainties were also introduced, as well as the effects of salinity, temperature, pressure and attenuation on sound velocity.

The next discussions were mainly on the concept of echo sounding and the factors that affect the echo sounding data. A summary of the derivation of the sonar equation from the echo sounding process was also discussed. Afterwards, the effects of vessel speed, depth, angular sector, inter-ping time interval, beam width, incidence angle, transmission strategy, inter-ping changes and the type of active stabilization used between roll, pitch and yaw on seabed feature detection and coverage were tackled.

The differences between single beam and multi-beam coverage were also taken up, including their respective advantages and limitations. Afterwards, detection, definition and reduction of systematic errors were also tackled, followed by the four elements of patch test calibration namely, latency, roll, pitch, heading/yaw.

Day 2 (August 19, 2009)

During the second day of the training, data verification was tackled. A comparison between the features of the Teramodel and Fledermaus software was presented. Lastly, the procedures for standardization and documentation were discussed.

A short tour of the Hydrography Department was conducted in the afternoon before the participants traveled to Subic, Zambales for the succeeding survey activities. Upon arrival at the Bravo Wharf, Subic Bay, Zambales, the participants boarded the BRP HYDROGRAPHER PRESBITERO. A welcome orientation and tour of the ship's facilities were rendered by the officers and crew of the vessel. The participants stayed overnight at the hotel in Subic.

Day 3 (August 20, 2009)

An actual multibeam survey was conducted on the third day. The vessel cruised for approximately seven (7) hours to the survey area. The survey team dropped an Expendable Bathy Thermograph (XBT) upon arrival within the vicinity of the survey area. Water column temperature acquired by the XBT was processed and used to define the sound velocity profile. It took about two (2) hours to cover all the survey lines.

The equipment used as well as the procedures and methodologies implemented during the survey operation were demonstrated and discussed. The participants were able to ask questions regarding the system of the survey vessel and shared something about their country's hydrographic survey system to compare their methods and procedures.

The data acquired during the survey was utilized the next day during the lecture about data analysis and processing using Fledermaus version 6.7.

Day 4 (August 21, 2009)

During the last training day, the participants were instructed with the actual application of the Fledermaus software for data processing. The participants were taught how to import data files into the software using DMagic, for the preparation of grid data. Area-based editing was then demonstrated. Data processing was discussed step-by-step, after which the different problems encountered and queries from the participants were taken up.

The training was concluded with a short closing ceremony. Training certificates and tokens were given out to the participants, and cocktails were served to finish off the successful event.

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