

**REPORT OF THE XXVIIth MEETING OF THE FIG/IHO
INTERNATIONAL ADVISORY BOARD OF STANDARDS OF
COMPETENCE
FOR HYDROGRAPHIC SURVEYORS AND NAUTICAL
CARTOGRAPHERS**

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1. Location and attendance

The XXVIIth meeting of the FIG/IHO Advisory Board was held at the Palm Resort Hotel, Johor Bahru, Malaysia, from 4 to 9 May 2004. The following were present :

Mr. Svante Astermo (Chairman) (FIG)
Capt. Andy Armstrong (Vice-Chairman) (IHO)
Capt. Federico Bermejo (Secretary) (IHB)

FIG Members

Mr. Gordon Johnston
Dr. Razali Mahmud
Ms. Tiina Tuurnala
Dr. David Wells

IHO Members

Cdre. Jayaraman
Dr. Luciano Surace
Dr. Delf Egge

ICA Members

Mr. Ron Furness
Dr. Lysandros Tsoulos

The meeting was hosted by the Faculty of Geoinformation Science and Engineering University Teknologi Malaysia (UTM)

The Chairman welcomed the three new members of the Board, Ms. Tiina Tuurnala (Finland), Dr. Delf Egge (Germany) and Dr. Luciano Surace (Italy), appointed by FIG and IHO respectively. He noted that Ms. Tuurnala would be replacing him as a FIG member due to his retirement from the Board at the end of this meeting.

2. Opening of the meeting and adoption of the Agenda

Professor Dr. Mohd Ibrahim Seeni Mohd, Dean of the Faculty of Geoinformation Sciences & Engineering (UTM), inaugurated the meeting, stressing the importance of the Board's mission. The Chairman then opened the meeting and the Agenda was adopted.

3. Administrative Arrangements

A conference room and other facilities were provided by the UTM. Dr. Razali Mahmud explained the administrative arrangements and social events scheduled, which included a visit to the facilities of the University, in the afternoon of 4 May and a courtesy call to the Vice Chancellor of UTM. On Thursday 6 May, the Board was invited on board the Royal Malaysian Navy hydrographic vessel - KD Perantau.

4. Chairman's Report

Mr. Astermo highlighted the action items completed following the XXVIth meeting, including the finalization of the course reviews and the forwarding of Recognition Certificates to the UK Royal Navy, EPSHOM (France), Dalian University (China) and the Portuguese Hydrographic Service.

He also recalled the promulgation of the new Standards of Competence for Nautical Cartographers, new Standards (M-8) which, after two years' work, had been successfully finalized.

5. Inter-sessional activities

The Board Members and the Secretary reported on the activities related to training and education carried out between meetings. A summary of these activities is given here below:

IHB/IHO – Capacity Building and training-related activities were discussed during technical visits to the Dominican Republic, Vietnam, Thailand and Brunei. A project concerning training in multibeam is now under consideration. Numerous activities in the academic field concerning provision of courses and refinement of the Master's Degree at the Universities of New Hampshire and Southern Mississippi, and the National Hydrographic School of India.

FIG – the successful involvement of two FIG members (Dr. Wells and Mr. Johnston) in the first meeting of the IHO Capacity Building Committee representing Academia and Industry. Dr. Wells had been very active in running multi-beam courses in Seattle, Hong Kong and Stavanger. Other courses were currently under negotiation. Dr. Wells had been approached by the teaching authorities of Saudi Arabia to organize a Course in Hydrography at Category A.

The chairman will report from the work of the board at the FIG Working Week in Athens 24 – 28 May.

ICA – Involvement in the Australasian Conference in Australia. Proposal from Greece to the National Research Committee in Greece to solve problems related to the automatic compilation of nautical charts and to produce a prototype worldwide.

6. Review of M-5 “Standards of Competence for Hydrographic Surveyors”

The Board examined a set of amendments proposed by Dr. Wells. Some of the amendments proposed were immediately incorporated into the text of the 9th edition of the Standards, which will be M-5, 9th edition - 2004.

Consideration of other amendments resulted in the formation of various Working Teams, who will carry out the tasks assigned during the inter-sessional period and will forward the proposals to the next meeting. Therefore, no new edition is planned until next year, but the changes made will be addressed by adding the year in which they were made to the Edition number.

7. Review of courses

Pending courses.

1. UKHO Hydrographic Data Processing and Marine Cartography Programme

Although the authorities responsible for this course had stated their intention to submit the course to the XXVIIth meeting, the documentation did not reach the Board before the meeting. It was decided to send a letter to the UKHO indicating that the Board was ready to consider reviewing the course by correspondence, as indicated at the XXVIth meeting in London.

2. Course In Hydrography for Naval Officers of the Indonesian Navy (SEHIDRAL)

This course should have been reviewed for re-recognition in 2003 but, at the request of the Indonesian Hydrographic Office, a delay of one year had been agreed to allow them to properly prepare the course documentation. However, no submission was made in 2004, and the Board will write a letter to the Indonesian Authorities informing them that recognition will only be maintained if the submission is received by the Board no later than 30 January 2005, for consideration at the XXVIIIth Meeting in 2005.

Courses submitted

A. AGAINST M-5 (HYDROGRAPHIC COURSES)

1. Course of Hydrography for Naval Officers of the Peruvian Hydrographic Service

The Advisory Board was assisted in the course review by Cdr. Jaime Valdez from the Peruvian Hydrographic Service, who answered numerous questions from the Board and who also provided a clear presentation of the Peruvian H.O. general and training activities. The Board decided to confirm the recognition of this course at Category B with Options 1 and 2 after receipt of the complete documentation, including some missing items that were developed during the meeting by the representative from Peru. The Board also encouraged the inclusion of additional items that could allow recognition also of Options 5 and 7. This subject will be finalized by correspondence.

2. Basic Hydrographic Course of the Bangladesh Navy

The Board felt that some areas of this course required either some expansion or further explanation of the process, in order that the submission more clearly demonstrated that it met the Standards. Therefore, a letter will be sent to the Hydrographic Service of the Bangladesh Navy requesting the submission of the revised documents indicated. Subject to the receipt and successful review of these documents, the Board will award the course recognition at Category B level.

3. Technical Course in Hydrography from the Portuguese Hydrographic Service

The course was awarded reaffirmation of Category B with Option 2. Option 1 will also be awarded upon written confirmation that certain topics are covered.

B. AGAINST M-8 (COURSES IN NAUTICAL CARTOGRAPHY)

1. Model Course in Nautical Cartography of the International Maritime Academy, Trieste (Italy)

Recognition at Category B level was awarded to this recently created course resulting from the close cooperation between IMA and IHO. The Board also felt that the course may be recognized at Category A, provided that certain indications and guidelines provided by the Board, in a letter addressed to IMA, are fulfilled. A resubmission would be necessary for this purpose.

It is to be noted that this course, together with the Course offered by the Dalian University (see below), are the first two courses in Nautical Cartography recognized by the Board.

2. Programme for Bachelor of Engineering Degree in Nautical Cartography from the Dalian University, China

The Advisory Board decided to award this course recognition at Category A upon written confirmation of some specific items that will be identified in a letter addressed to the authorities submitting the course.

8. Updating of Publications M-6, S-47 and M-8

The Board felt that M-6 "List of Reference Texts" was a valuable publication and that, although its maintenance required a professional approach and was time-consuming, it was important to achieve this target. It was therefore decided that the Board members would bring to the next meeting all the new entries and deletions that they considered important.

Also, the Board Members' contribution to the maintenance of S-47 "List of Courses in Hydrography and Nautical Cartography worldwide" would be much appreciated. The Board felt that amendments or updates to the M-8 were premature and that this point would be considered at the next meeting.

9. Other business

The Board considered draft presented by Mr. G. Johnston and Dr. L. Tsouilos about the establishment of a fee that may allow the Board to implement the present disposition laid down in item 3.2.2. of the present edition of the Standards :

3.3.2. The institution concerned should be prepared to allow an inspection party to visit, and meet staff and students involved. The members of the party are to be nominated by the Board

After lengthy discussion, the Board decided that the advice of the parent organizations should be sought before taking any decision about this topic.

10. Election of Chairman and Vice-Chairman

The Chairman explained that his term of three years had now come to an end and he therefore proposed that the Vice-Chairman, Captain Andy Armstrong (IHO), should take over the Chairmanship. Mr. Gordon Johnston (FIG) was then elected Vice-chairman for a 3-year term from 1 July 2004.

11. Date/Venue of the next meeting

Following the invitation of Dr. Lysandros Tsoulos, it was decided that the next meeting would be held in Athens (Greece) from 26 to 30 April 2005.

The Board also decided to programme in advance the meetings for the next 5-year period (including 2005) and it was decided as follows:

2005 – Athens (Greece)
2006 – Goa (India)
2007 – Hamburg (Germany)
2008 – Sydney (Australia)
2009 – Helsinki (Finland)

This schedule must be considered as provisional and will require confirmation every year.

12. Close of the meeting

The Chairman closed the meeting at 1300 on 9 May 2004.

APPENDIX I CHANGES MADE TO M-5

PREFACE

The ninth edition (2001) provides a better definition of the three levels of knowledge identified in the syllabus. Nautical Science was moved to the Basic Subjects, and was modified to reflect the minimum knowledge required by a hydrographic surveyor. This new edition contains a **more detailed** description of each subject, which have been divided into Category A / Category B and Category A-only learning objectives. The purpose of this change is to define the actions that hydrographic surveyors should be capable of performing, upon completion of the training process

SECTION 3.2

3.2 Documentation to be submitted

The following information must be included in all submissions:

3.2.1 Information about the programme infrastructure. Each item in the following list should be described in the first Chapter of the submission.

a) Programme identification:

Name of the Programme:

Institution submitting the Programme for recognition:

Recognition sought: Specify

Category A:

Category B:

Standard against which recognition is sought:

M5 Ninth Edition [2004]

M8 First Edition [2003]

M5 Options offered: 1 2 3 4 5 6 7

M8 Specialisms offered: 1 2 3

Language(s) in which the Course is given:

b) Aims of the programme:

(provide a narrative paragraph)

c) Entry requirements:

Qualifications required for entry:

Entry exemptions that may be given:

Alternative qualifications that may be acceptable for entry:

NOTE: For programmes seeking exemption of some or all the basic subjects, provide a clear indication of where students would previously have attained that knowledge, and a clear description of the formal procedures used to evaluate such exemptions. With regard to the pre-entry requirement for admission to any educational or training programme, the prospective student for a Category A programme should have a deeper theoretical ability in mathematics and applied physics than the candidate for a Category B programme.

c) Programme capacity:

Expected (actual) number of students beginning the programme each year.

For multi-year programmes, the expected total number of students progressing through the programme.

d) Staff list: For each instructor in the programme, provide a brief résumé, listing subjects in the programme, for which they are responsible;

Academic qualifications (degrees, etc.)
Hydrographic experience
Astorships

e) Facilities available to students:

Equipment: provide list

Software: list specific software (with emphasis on hydrographic and cartographic software packages)

Training aids:

Laboratories:

Training vessels:

Library. List:

- total number of volumes held,
- approximate number of hydrographically-relevant volumes,
- other media available (e.g. charts, maps, audio-visual resources)

f) Programme structure:

- Total duration of the Programme (in weeks or months or years).
- Table of programme modules (individual courses). For each module, identify where in the sequence of module it is to be taken by students,
- The duration (in weeks) of the module and
- The total number of lecture hours, supervised practical exercise hours, and unsupervised practical exercise hours (individual or team project hours) expected from an average student for that module.

3.2.1 Information about each module (course) in the programme.

- a. The programme being submitted should be described in more detail than the M-5 Syllabus (Section 6), with a tabulation of contact of hours devoted to M-5 Syllabus subjects. In the tabulation, a distinction should be made between lecture hours, guided exercise hours, and – if significant amounts of learning are expected to occur outside scheduled class hours – the estimated out-of-class hours. The M-5 Syllabus needs not to be considered as the most appropriate structure for a particular programme.
- b. Representative examination papers covering all subject areas from the previous two years, which are taken by students during the programme (i.e. not only the final examination), showing the marking scheme and pass marks. This should not be taken as precluding newly developed programmes not yet able to satisfy these items.
- c. A list of texts and reference material used for each subject area, with an indication of the editorial house/publisher, and year of publication.
- d. Details of Practical Exercises as detailed in 2.5.1.
- e. Details of Field Training Projects as detailed in 2.5.2.

3.2.2 Cross-reference Table.

This table is the most important information used by the Board to assess submitted courses? What this table contains is a map of the hours devoted to each topic in each course module described in 3.2.3, classified according to which M-5 Syllabus topic they are related to. A spreadsheet to be used as a template is provided on the IHO website. This template should be used and filled in by the submitting agency.

SECTION 3.3.

3.3 Procedure for Recognition of Programmes

- 3.3.1. Board members will review the material submitted and discuss their findings at their annual meeting. Institutions **are encouraged** to attend the Board meeting, to present their programme, and offer clarifications that the Board may seek.

SYLLABUS

B1.4 Matrix Algebra	PP	Describe types of matrices and perform basic matrix operations such as: addition, multiplication, and transposition and inversion. Solve simultaneous equations.	Perform simple matrix inversions. Calculate determinants and eigenvalues. Solve simultaneous equations
(b) Conventional aids to navigation	FF	Describe the principal types of buoys and day beacons, and their roles as aids to navigation. Explain the function of radio and radar beacons. Describe how vessel traffic management services systems (VTS) and automatic identification systems (AIS) operate. Describe the use of traffic separation schemes.	
d) Nautical Charts	PP	Explain the different uses of the nautical chart. Classify nautical charts according to scale, objectives, edition, and form (paper - digital). Describe the content of a nautical chart. Differentiate special purpose nautical charts. Use nautical chart for various applications. Recognize common charting symbols. Explain the following components of a nautical chart: datum, projection, scale.	Layout a route on a nautical chart. Plot fixes, identify navigational hazards, revise navigational plan as required. Describe the uncertainty indicators associated with nautical charts (e.g. source diagram, reliability diagram, zone of confidence, notes), and the nature of position and depth uncertainties that may exist.
E1.1 (g) Acoustic Devices	PF	Describe the purpose and operation of acoustic devices such as: transponders, pingers, tripping devices and sound speed meters, acoustic Doppler current profilers. Operate such acoustic devices.	
E1.2. (b) Recording	DP	Differentiate between analogue and digital recording systems and media. Interpret differences between digitized traces and grayscale images. Describe the principles of stylus design. Select appropriate range, scale and paper speed settings, for specific applications. Interpret echo-sounder records. Use a lead line.	
(c) Sounder calibration	DP	Calibrate an echo-sounder by bar check, lead-line, sound speed profile measurements and CTD measurements.	

E1.4 (a) Multibeam transducers.	FF	Explain the basic principles of multibeam sonar transmit and receive beam forming, and beam steering, shading and focussing, using flat or curved transducers.
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E3.1 Geodesy			
(a) Introduction to Geodesy	FF	Describe the shape of the Earth and explain the ellipsoid of revolution and it's relationship to the Geoid. Describe the principles of gravity models.	Describe the nature of the gravity field, how it is measured, monitored and modelled, together with associated uncertainties. Explain the role of the gravity field in hydrography.
(b) Co-ordinate Systems for Positioning	PF	Explain Describe geodetic, astronomic, orbital and geocentric systems. Define the celestial sphere and other astronomical terms including sidereal and solar time. Describe a co-ordinate reference system..	Calculate transformations between co-ordinate reference systems
(c) Satellite Positioning	DP	Classify Describe different satellite positioning systems and explain for each, their role (primary positioning system or overlay) and orbit geometry (e.g. inclination, ellipticity, altitude). Define satellite observables. Calculate satellite coverage and availability.	Specify and evaluate satellite positioning systems for positioning, navigation and altimetry.
(d) Map Projections	DP	Compare and classify the properties of cylindrical, zenithal and conic projections. Describe grids and graticules on projections. Transform between geographic and grid co-ordinates, compute convergence, scale factors and arc to chord corrections, using appropriate software	Verify values for a number of parameters including scale factor, convergence and arc to chord corrections. Select an appropriate projection for a specific application. Solve for a number of parameters including scale factor, convergence and arc to chord on common projections

E 3.2 (a) Horizontal Positioning Fundamentals	DP	Specify and plan horizontal control surveys. Differentiate between angular and distance methods Describe horizontal positioning procedures (e.g. intersection, resection, polar and traverse). Specify appropriate instruments. Understand economic and logistical aspects of providing control .	Plan the number and quality of observations required. Evaluate the geometric strength of figures
(e) Satellite positioning	DP	Explain the GNSS concept and principles. Describe the characteristics of various public and private DGNSS services (single baseline, network, state space). Define pseudoranging and carrier phase based modes of satellite positioning. Evaluate the performance of code vs. carrier; differential vs. autonomous modes; dual vs. single frequency; fixed vs. float ambiguity resolution. Operate GNSS and DGNSS equipment.	Determine which methods are capable of limiting positioning uncertainties to appropriate levels. Evaluate and select appropriate equipment, shore locations, and coverage areas, for specific applications..

(f) Acoustic positioning concepts	FF	Describe the principles of long, short and super-short baseline acoustic positioning system modes. Describe the deployment and calibration, signal structure , sources of error, and expected uncertainties for each mode.	Specify the deployment and calibration method, Predict and evaluate sources of error and expected uncertainties for each system and appropriate application (towed bodies, autonomous underwater vehicles, remotely operated vehicles).
E3.3 (a) Vertical positioning fundamentals	DP	Explain and describe the characteristics of height systems (e.g. dynamic, orthometric and geometric normal heights). Differentiate between geoidal gravity-related and spheroidal ellipsoidal heights.	
E5.4 (c) Electronic Chart.	FF	Describe Electronic Navigational Charts (ENC), and Electronic Chart Display and Information Systems (ECDIS) (concepts, components, status, impact on hydrography). Describe the process of preparing databases for ECDIS.	
O1.1 Coastal Topography	PP	Use GNSS-based and ground survey techniques to delineate coastline and attached cultural features. Describe how a coastline map can be created with aerial photographs. List uses of ground photography in the depiction of coastline topography. Explain how tidal datums and charted shorelines are related.	Explain the differences between and uses of color, black and white, color infrared, and black and white infrared film in coastline delineation from aerial photographs. Describe the process of orthorectification of aerial photographs. Describe the digital photogrammetric process. Explain the photogrammetric principles that allow the determination of topography from aerial photographs. Describe how LIDAR is used for shoreline mapping.
O1.6 Electronic Charts	PF	List the source publications for Describe the ENC and ECDIS standards, as well as raster nautical chart standards commercial electronic charting system. Describe other electronic chart systems (ECS) and formats. Explain the differences between these electronic charting products. Describe the ENC production process. Describe the data bases used in electronic charting products.	
Option 3: Offshore seismic geophysical surveying O3.1 Geomagnetic surveys	PF	Describe geomagnetic surveys principles and distinguish different aerial survey techniques and applications.	Use magnetometer.

O4.3 Fixed Offshore Platforms	FF	Describe gravity-based, pile-driven, guyed, floating , FPSO and tension-legged platforms.	
(g) Products	DF	Describe products (e.g. beach profiles, gradient diagrams, special charts, reports)	Specify data and formats for required products.
O6.4 Rapid Environmental Assessment (REA)	DF	Describe the processes involved in conducting REA (e.g. data collection, data fusion, data dissemination)	Use appropriate software to perform REA. Specify requirements for REA.
O6.5 Electronic chart	FF	Describe ENC electronic chart concepts as applied to military operations (e.g. additional military layers, Warship ECDIS). Differentiate between civilian and military layers.	Create military electronic chart products. Describe IHO/IMO specifications for ENCs. Differentiate between civilian and military layers
O7.2 Elevation models	FF	Explain methods and techniques for acquisition, processing and depiction of elevation data, as applied to hydrological and hydraulic applications.	

APPENDIX II
LIST OF MEMBERS OF THE ADVISORY BOARD

NAME	Country	ADDRESS	PHONE	FAX/ e-mail
Capt. Andy ARMSTRONG (IHO) Chairman	USA	University of New Hampshire Joint Hydrographic Center Océan Engineering Lab 24 Colovos Road Durham, NH 03824	(603) 862 4559	603 862 0839 andy.armstrong@unh.edu andy.armstrong@noaa.gov
Mr. Gordon JOHNSTON (FIG) Vice-Chairman	U.K.	67 Devon Road Cheam Surrey England, SM2 7PE	(44)(0) 208 661 1650	gordon.johnston1@orange.net
Capt. Federico Bermejo Secretary (IHB)	Monaco	International Hydrographic Bureau 4 Quai Antoine 1er BP 445 MC 98011 Monaco Cedex	(377)-93-108107	(377)-93-108140 fbermejo@ihb.mc
Dr. Delf EGGE (IHO)	Germany	Hamburg University of Applied Sciences Dept. of Geomatics Hebebrand str 1 D-22297 Hamburg	(49) (40) 428755366	(49) (40) 428755399 geomatik@rzcn.haw-hamburg.de
Mr Ron A FURNESS (ICA)	Australia	93 Ashworth Avenue Belrose 2085. Representative; Asia Pacific IIC Technologies Inc.	61 2 9451-9003 61 405 576 196 (mobile)	61 2 9975-3169 rfurness@ozemail.com.au
Commodore RB JAYARAMAN (IHO)	India	Joint Chief Hydrographer of India. Naval Hydrographic Office Post Box N° 75 107-A, Rajpur Road Dehra Dun – 248 001 Uttaranchel	91-135 274 8748	91 135 274 8373 pdoh@hydrobharat.org
Dr. Mohd RAZALI Mahmud (FIG)	Malaysia	Faculty of Geoinformation Science & Engineering University Teknologi Malaysia 81310 UTM Skudai Johor Darul Ta'zim	607 5530827	607 5566163 razali@fkg.utm.my
Dr. Luciano SURACE (IHO)	Italy	Istituto Idrografico della Marina Passo Osservatorio 4 16100 Genova	39 010 2443363	39 010 2443364 surace@dada.it

Dr. Lysandros TSOULOS (ICA)	Greece	Assoc. Professor NTUA Cartography Laboratory National Technical University of Athens 9 H. Polytechniou Zographou 15780 Athens Greece	30 210 7722730	30 210 7722734 lysandro@central.ntua.gr
Ms. Tiina TUURNALA (FIG)	Finland	Director Hydrographic Department Finnish Maritime Administration P.O. Box 171 FIN-00181 Helsinki Finland	(358) 204484426	358 204484620 Tiina.tuurnala@fma.fi
Dr. David WELLS (FIG)	Canada	Dept. of Geodesy & Geomatics Engineering University of New Brunswick P.O. Box 4400 or 538 Squires Street Fredericton New Brunswick E3B 5A3	(1)-506 4542650	(1)-506-4540352 dew@unb.ca

