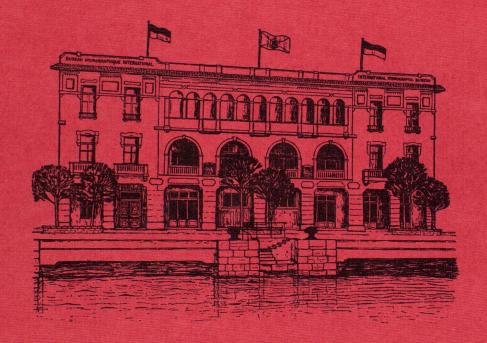
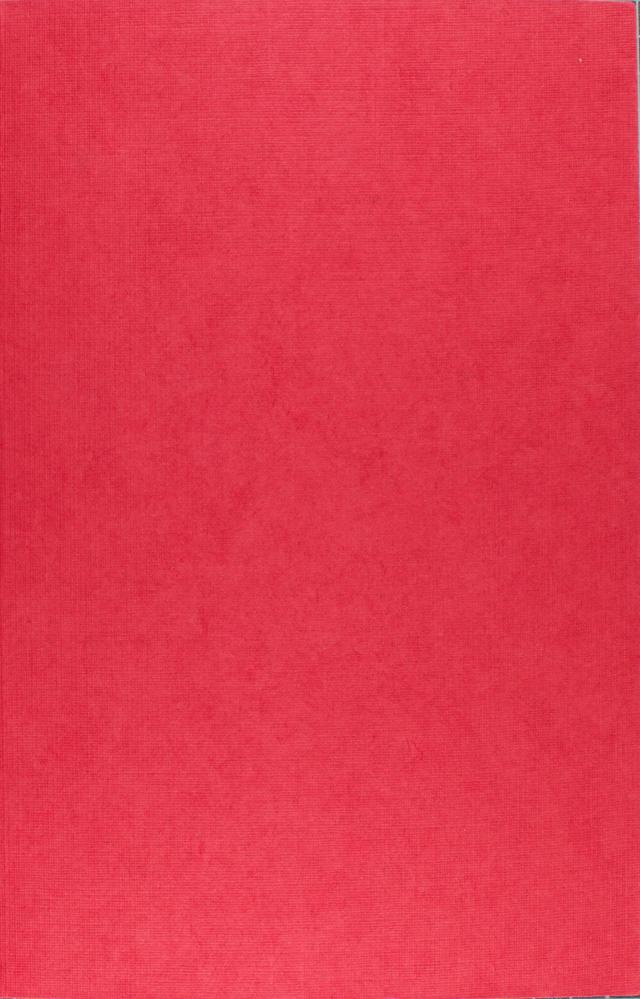
INTERNATIONAL HYDROGRAPHIC REVIEW



INTERNATIONAL HYDROGRAPHIC BUREAU MONACO

Vol. LXV No. 2

JULY 1988



Recently published by the International Hydrographic Bureau:

| PP-06 | Report of Proceedings of the XIIIth International Hydrographic Conference, May 1987 — Vol. 1 (English) | 75.00 FF |
|---------|---|----------|
| MP-005 | Standards of Competence for Hydrographic Surveyors. Part 1 (English, French, Spanish), 5th Edition, August 1987 | 15.00 FF |
| SP-44 | IHO Standards for Hydrographic Surveys Classification Criteria for Deep Ocean Soundings Procedures for Elimination of Doubtful Data 3rd Edition, November 1987 (English/French) | 50.00 FF |
| SP-50 | IHO Tidal Constituent Bank - Station Catalogue, 1st Edition, January 1988 (English/French) | 30.00 FF |
| MP-008 | List of Sheets of 'Chart Symbols and Abbreviations' published by Various Maritime Countries, 6th Edition, November 1987 (English/French) | 15.00 FF |
| BP-0004 | Information Concerning Recent Bathymetric Data — List No. 17, December 1987 (English/French) | 25.00 FF |
| PP-05 | IHO Yearbook 1988 — particulars and addresses of Hydrographic Services throughout the world (English/French) | 60.00 FF |

The following is soon to be released by the International Hydrographic Bureau:

| PP-06 Report of Proceedings of the XIIIth International Hydrographic | | |
|--|---|----------|
| | Conference, May 1987 — Vol. 2 (English) | 75.00 FF |

The following publications are in the process of preparation:

| 1 | |
|--------|---|
| MP-004 | Chart Specifications of the IHO (in 6 sections) Price to be announced |
| SP-32 | Hydrographic Dictionary, 4th Edition |
| SP-47 | Training and Technical Assistance in Hydrography, 2nd Edition |

A complete List of all IHB Publications for 1988 can be obtained gratis by writing to the

INTERNATIONAL HYDROGRAPHIC BUREAU
BP 445
7 avenue Président J.F. Kennedy
MC 98011 MONACO CEDEX

Bathymetric charts available from the International Hydrographic Bureau:

| General Bathymetric Chart of the Oceans (GEBCO), 5th Edition (1:10M), | |
|---|----------|
| series of 18 sheets | |
| Price per sheet | 35.00 FF |

N.B. — All IHB prices are subject to periodic review.

The following Information Papers are available free from the International Hydrographic Bureau:

- No. 1 The International Hydrographic Organization (September 1987)
- No. 2 The FIG/IHO International Advisory Board on Standards of Competence for Hydrographic Surveyors (November 1987)
- No. 3 IHO Special Publication No. 39: Precise Positioning Systems for Hydrographic Surveying (Series 1977) (December 1982)
- No. 4 IHO Tidal Constituent Bank (February 1986)
- No. 5 The IHB's Views on Proposals for a World Chart Series (November 1987)
- No. 6 Technical Assistance (November 1987)
- No. 8 GEBCO (July 1987)
- No. 9 The INT Chart Concept (March 1985)



THE INTERNATIONAL HYDROGRAPHIC ORGANIZATION

an intergovernmental organization also publishes the

INTERNATIONAL HYDROGRAPHIC BULLETIN

(PP-03)

A monthly journal published by the International Hydrographic Bureau for the benefit of the world hydrographic community, in a bilingual edition (English and French), 21×30 cm in size, with an average of 45 pages per issue, and comprising :

- SECTION I IHO Notes: News from Hydrographic Offices; Appointments of Hydrographers; New Membership of the IHO; Description of new survey vessels; Recent developments in hydrographic instrumentation; Operational assessments of equipment; Reports of international commissions, committees and other bodies; Training programmes in hydrographic surveying, marine cartography and other relevant courses; Conferences scheduled; Comments on general events at the Bureau and its personnel; List of recent publications produced by the Bureau and future plans; Reports on surveys carried out or projected by Member States or non-Members.
- SECTION II Hydrographic Commentary: Comments on the work of other organizations of interest to hydrographers; On various published articles; On international marine developments; Notes devoted to hydrography and related sciences; and 'From the Chartroom': notes on charts and nautical documents.
- SECTION III New Charts and New Editions: Listing of new charts and new editions published by Member States, with reference number, title, limits, scale and date of publication. Charts and new editions in preparation are also listed. Status catalogue of International Charts in the International Set of Charts, with International reference number, title, limits, scale, date of publication, and the names of the producer and any printer nations.

 Publication and new editions of Sailing Directions, Lists of Lights, Tide and Current Tables, Radio Signals, Radio Aids to Navigation, Chart Catalogues.
- SECTION IV Bibliography: Lists of selected recent publications and articles concerning hydrography and allied disciplines.

Hydrographers will be interested in: Includes summaries of annual reports by Member States' Hydrographic Offices and other relevant organizations as well as reviews of some recent publications of particular interest to hydrographers.

The International Hydrographic Bulletin is distributed free to the Hydrographic Office of governments belonging to the International Hydrographic Organization.

It is also available for sale to the public on yearly subscription (price 140 French Francs) or per copy (14.50 French Francs) plus postage.

Conditions of sale of International Hydrographic Bureau Publications

Prices are quoted in French Francs. IHB invoices will be expressed in French Francs or in US dollars at current exchange rates, as appropriate. Packing and postage or shipping expenses will be added to invoices. Payments may be made to the International Hydrographic Bureau by bank transfer or by cheque.

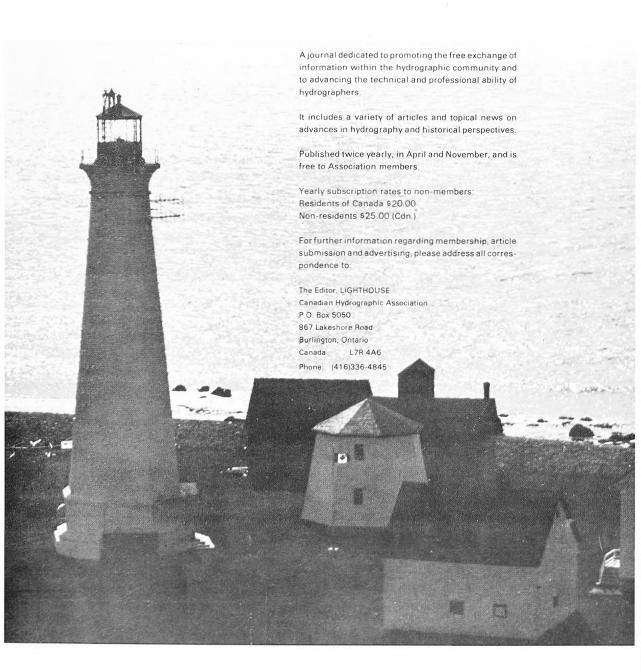
No credit can be allowed on unwanted publications unless returned immediately.

Orders can be sent either to a bookseller or direct to :

International Hydrographic Bureau, B.P. 445, 7, avenue Président J.F. Kennedy MC 98011 MONACO CEDEX, Principality of Monaco.
Teleph.: 93.50.65.87 — Teleg.: BURHYDINT, Monaco Telex: (France) 479164 MC INHORG

Lighthouse

JOURNAL OF THE CANADIAN HYDROGRAPHIC ASSOCIATION



Due to a mistake by the binders, the address which should appear at the foot of the page was inadvertently cut off. It is therefore given here:

Krupp Atlas Elektronik GmbH - P.O. Box 44 85 45 - D-2800 Bremen 44 - FRG - Phone(421)457-0 Telefax(421)457-2900 - Telex 2 457 46-2 ka d

Performance and Style



Hydrographic Research Systems
Integrated Navigation · Research-Echosounders · Data Processing

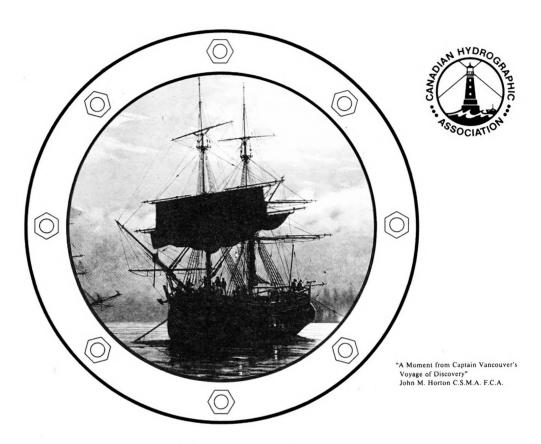


Hydrographic Survey Systems
Precision Equipment for Position and Depth Determination
Hydrographic Data Processing

® KRUPP ATLAS ELEKTRONIK

A Sound Decision





PLAN NOW TO ATTEND

THE CANADIAN HYDROGRAPHIC CONFERENCE 1989 VANCOUVER, BRITISH COLUMBIA, CANADA

The Canadian Hydrographic Conference theme provides a link with the voyage of Captain Vancouver.

MARCH 6-10, 1989

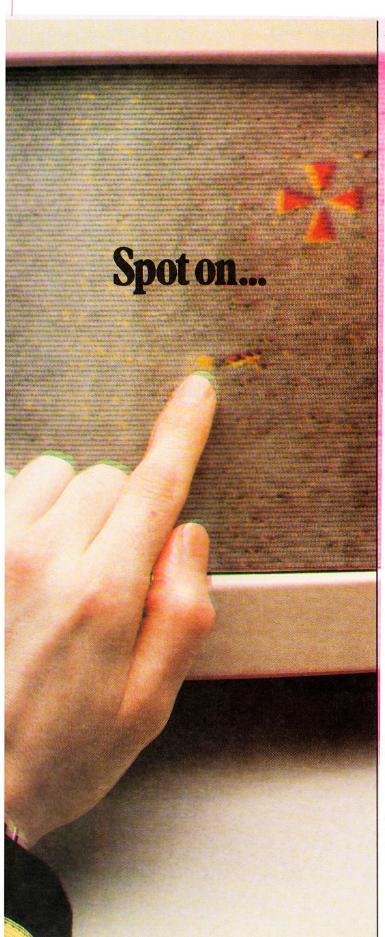
Technical Program: Keynote speakers and technical papers will chart the course of Hydrography from the 1980's to the 1990's.

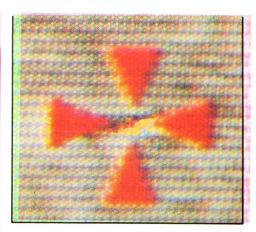
Exhibits: An extensive exhibit of hydrographic products and services will be located in the Vancouver Trade and Convention Centre adjacent to the conference sessions.

Electronic Chart Workshop: A separate registration is available.

Assistance from the N.O.S. and the Hydrographic Society, Seattle Chapter.

For Information Write to: The Canadian Hydrographic Conference 1989 8911-152nd St., Surrey, B.C. Canada V3R 4E5 1-(604)-588-8541





...on the spot sonar based mine & debris surveillance.

QASAR – Qubit's proven system for the full and automatic integration of sonar and position, giving real time targeting and analysis for mine and debris surveillance, search and salvage and underwater engineering tasks.

Both point and linear data is acquired direct by the sonar operator via a touch screen, with the navigation computer plotting co-ordinates onto plotter or video, enabling plot analysis to be undertaken immediately.

QASAR functions with all current side scan sonars, and together with the Qubit TRAC IV or other portable integrated navigation systems, offers a low entry cost to MCM or other underwater surveillance activities.

Qubit is an internationally established group of companies. They manufacture high specification navigation, data acquisition and processing equipment for maritime and defence use.



Australia
Tel (09) 430 4446 Telex AA 10714815
Canada
Tel (902) 422-9570 Telex 01921828
Italy
Tel (39) 10 318314 Telex 282540
UK
Tel (0428 77) 585 Telex 858593
USA

Tel (301) 468 3682 Telex 3746623



FRENCH INSTITUTE OF NAVIGATION

3. Avenue Octave-Gréard — 75007 PARIS

Publishes a Technical Review on Maritime, Aerial and Spatial Navigation entitled:

NAVIGATION

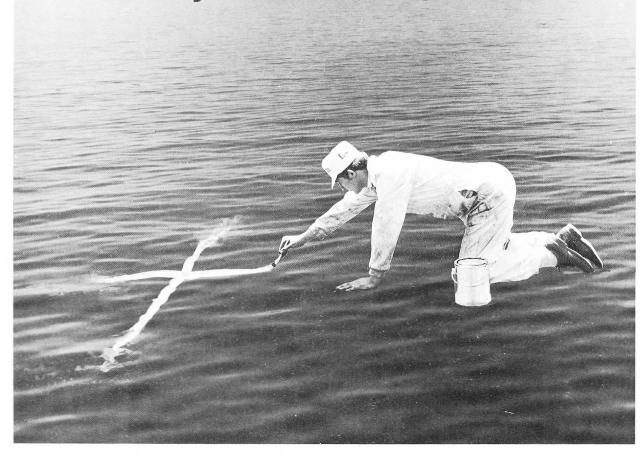
which is issued quarterly (January, April, July, October)



- Registration. Applications for registration should be addressed to the Secretary-General. Membership of the French Institute of Navigation and dispatch of the review NAVIGATION are acquired for the full year from 1st January.
- Annual Dues. 1988 :

- Payment. Preferably by bank transfer or postal payment to the Association's Postal Order Account: I.F.N. 1581-32 N Paris.
- •Bank cheques only in French francs, payable in Paris; bank charges for the subscriber.

How do you mark the spot at sea?



With Today's Raydist Precise Radiopositioning Systems.

As a pioneer and world leader in radiopositioning technology, Raydist, through research, evaluation, ar development, has continued to incorporate new technology into its established and time-proven system Today's Raydist systems represent the very best, most reliable, and economical short-to-long range preciradiopositioning systems available.

Raydist provides up to four independent, computer-verified lines of position. Raydist delivers maximu real-time information for vessel guidance and position verification.

Raydist has over ten years of highly specialized computer integration technology incorporated into today systems. All systems hardware is designed and built to meet and exceed the most demanding environment

Raydist is available for lease or purchase, for a variety of world-wide applications. For information regarding Raydist systems and the complete line of Raydist accessories, please contact us:

**TELEDYNE HASTINGS-RAYDIST

Teledyne Hastings-Raydist P.O. Box 1275 Hampton, Virginia 23661 U.S.A.

Telephone: (804) 723-6531

FAX: (804) 723-3925 TWX: (710) 882-0085 EASYLINK 62300280

JOIN THE NAUTICAL INSTITUTE AND PROMOTE THE NAUTICAL PROFESSION



The Nautical Institute is a professional body for qualified mariners devoted to promoting high standards of nautical competence and knowledge. It is directed by a Council of whom the majority must be actively employed at sea. Membership is open to qualified mariners of all nationalities, based on the following classes:

MEMBERSHIP CLASSES

FELLOWS (F.N.I.)

Must have held positions of superior professional responsibility, been a member for five years and made a significant contribution to the profession.

MEMBERS (M.N.I.)

Must hold (a) Class 1 (deck) Master Mariner's Certificate of Competency or a similar qualification, (b) the appropriate ship command examination in the seaman specialisation of the Royal Navy, (c) a First Class Licence issued by a recognised Pilotage Authority and three years' experience as a first class pilot.

ASSOCIATE MEMBERS (A.M.N.I.)

Must hold (a) Class 3 (deck) certificate of Competency or its equivalent, (b) a Royal Naval Bridge Watchkeeping Certificate with an Ocean Navigation certificate or a similar qualification approved by council.

ASSOCIATES

To: The Nautical Institute

A non-voting grade of membership for holders of Class 4 and Class 5 Certificates of Competency or their equivalent.

COMPANIONS

Any person such as a naval architect, marine engineer or yachtsman, not being a qualified member of the Nautical profession, who satisfies council that his association with the Institute will promote the general advancement or application of Nautical Science.

STUDENTS

At least 17 years of age who are undergoing a course of training approved by the council and intend to become Associate Members of the Institute.

ENTRANCE FEES AND ANNUAL SUBSCRIPTION

| Class | Annual subscription | Entrance fee | Transfer fees |
|-------------|---------------------|--------------|------------------|
| Hon. Fellow | Nil | Nil | Nil |
| Fellow | £45 | Nil | Nil |
| Member | £40 | £5 | £5 |
| Associate | | | |
| member | £38 | £5 | £5 |
| Associate | £35 | £5 | £5 |
| Companion | £40 | 25 | £5 |
| Student | £20 | ٤1 | Nil |

Members can take advantage of specially reduced prices for publication and conference fees and can participate in the activities of branches in the UK and overseas. The monthly journal SEAWAYS is provided free to all members and would cost £30 pa to an outside subscriber. In the UK the membership subscription is allowable for tax purposes.

| APPLICATION FOR MEMBERSHIP | | |
|--|----------------------------------|-----|
| Surname (BLOCK LETTERS) N | Christian Names | В |
| Style (Captain, Mr, etc) | Present Position | с |
| Date of Birth | Nationality | sc |
| Home Address (BLOCK LETTERS) | | |
| | (f) Tel: | (0) |
| Certificate of Competency held(r) | Where and When issued and Number | (s) |
| Professional Experience | | (p) |
| If Pilot state Licensing Authority Other Qualifications | | |
| I enclose herewith cheque for £5 payable to the Nautical Institute being the | Signed | |
| entrance fee required in the Bye-Laws. | Date | |

202 Lambeth Road, London SE1 7LQ



15-17 NOVEMBER 1988

HYDRO 88

AMSTERDAM RAI Congress Centre



Sixth Biennial International Symposium of The Hydrographic Society presenting the latest developments in the hydrographic profession supported by an exhibition of equipment and services.

Organised by

The Hydrographic Society NETHERLANDS BRANCH

Co-sponsored by

The International Federation of Surveyors - FIG The International Hydrographic Bureau Lloyd's List







The Hydrographic Society

NORTH EAST LONDON POLYTECHNIC + LONGBRIDGE ROAD + DAGENHAM ENGLAND - TELEPHONE: 01-597 1946 - TELEX: 665080 SSEX RM8 2AS

AUSTRALASIA

DENMARK

2204 FRVSKA DK

NETHERLANDS

UK

OXFORD ==== THE JOURNAL OF NAVIGATION



Editor: Professor J F Kemp

The Journal of Navigation publishes authoritative papers on every aspect of navigation—air, land, sea and space—and papers of every type—scientific, historical and narrative. It also features book reviews and keeps a 'record' of current Navigation work.

Some important articles appearing in the Journal of Navigation . . .

An Evil So Pregnant With Mischief (Some Ups and Downs in the Development of Navigation Equipment and Practice) **A E Fanning**

Operation Considerations and Constraints in Ship-Based Weather Routeing Procedures R Motte

The Integration of GPS and Loran-C W L Polhemus

Turbulence at the Shelf Break M Richey

Air Navigation Systems 1919-1969 J E D Williams

ISSN 0373-4633, three issues a year

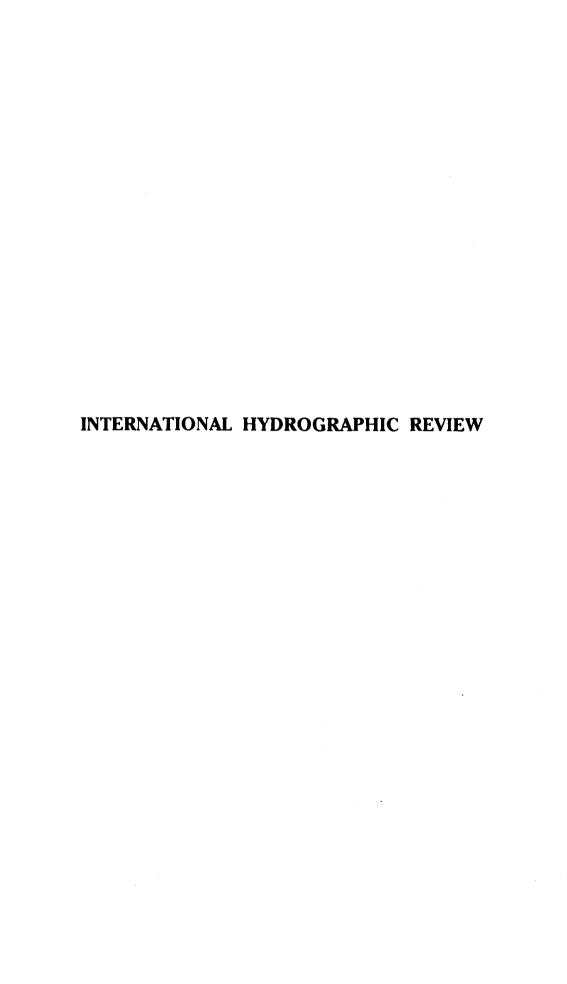
Subscription Rates for Volume 41, 1988

Subscriptions: UK £47.00, N. America US\$100.00, Elsewhere £59.00 Single Issues: UK £17.00, N. America US\$36.00, Elsewhere £21.00

Order Form

| Please complete and return (with remittance enclosed) to Journals Subscription Department, Oxford University Press, Walton Street, Oxford OX2 6DP UK |
|---|
| Enter my subscription to Volume 41 of the Journal of NavigationPlease send a free sample copy |
| I enclose my remittance of |
| Name (please print) |
| Address |
| |
| I wish to pay by Access/Visa/American Express/Diners (delete as appropriate) |
| My card number is |
| Expiry dateSignature |

JOURNALS



FOREWORD

The International Hydrographic Review is published twice a year (January and July) in separate English and French editions.

Original articles are welcomed on hydrography, oceanography, cartography, photogrammetry, geodesy, navigation and allied subjects, radio aids, automation, new instruments, equipment and hydrographic vessels, as well as on the history and organization of hydrographic offices.

The latest date for receipt of manuscripts is:

— 1 August for the January issue.

— 1 February for the July issue,

but earlier submission greatly facilitates the work of preparing translations.

Articles should be addressed to: The Directing Committee, International Hydrographic Bureau, B.P. 445, MC 98011 MONACO Cedex (Principality of Monaco).

Up to 50 reprints per article can be supplied free to the author(s). They must be ordered prior to publication, and may be in either language or a proportion in each. Further copies ordered are charged at cost price, plus postage.

The Directing Committee does not hold itself responsible for statements or opinions expressed by contributors to the Review.

Notes for contributors

Papers should be as concise as possible for maximum reader value, and an abstract of up to 150 words is desirable. Uncommon expressions or constructions should be avoided since a large proportion of readers are necessarily reading the Review in a language that is not their mother tongue.

Any permission needed to incorporate material published elsewhere is the responsibility of

authors, and it will be assumed that such permission has been obtained.

Texts should be submitted in English or French (or both), though by special arrangement articles in Spanish, Italian or German could be accepted for translation in the Bureau.

Two copies of the article are required, typed in double spacing with adequate margins and on one side of the paper only. Authors should check manuscripts very carefully as no responsibility can be taken for errors of fact or presentation.

Bibliographic references should be listed at the end of the article in the standard Harvard form. Footnotes should be kept to a minimum, and metric measures used throughout.

Illustrations, already numbered and titled, should be supplied ready for reproduction by the offset method and for reduction to 12.5 x 21 cm, the effective size of a Review page. Positive or negative transparencies (repromats) are preferred. Photographs should be black and white glossy prints and be limited to those necessary for an understanding of the text.

As the Review is a two-language publication a minimum of wording should be shown on the illustrations themselves, explanations being confined to the legend beneath.

Printer's proofs are corrected in the Bureau and are not normally sent to authors.

INTERNATIONAL HYDROGRAPHIC REVIEW

Vol. LXV



No. 2

(No. 123 OF THE SERIES)

PUBLISHED AND PRINTED BY

THE

INTERNATIONAL HYDROGRAPHIC BUREAU

B.P. 445 — 7, avenue Président J.F. Kennedy

MC 98011 MONACO Cedex

PRINCIPALITY

JULY 1988

INTERNATIONAL HYDROGRAPHIC ORGANIZATION

57 MEMBERS OF THE IHO

ARGENTINA **AUSTRALIA** BELGIUM **BRAZIL** CANADA CHILE CHINA CUBA DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA DENMARK DOMINICAN REPUBLIC ECUADOR **EGYPT** FIJI **FINLAND FRANCE GERMAN** DEMOCRATIC REPUBLIC GERMANY, FEDERAL REPUBLIC OF GREECE **GUATEMALA ICELAND** INDIA **INDONESIA** IRAN ITALY **JAPAN** MALAYSIA MONACO **NETHERLANDS**

NEW ZEALAND NIGERIA NORWAY OMAN PAKISTAN PAPUA NEW GUINEA **PERU PHILIPPINES POLAND PORTUGAL** REPUBLIC OF KOREA REPUBLIC OF SOUTH AFRICA SINGAPORE **SPAIN** SRI LANKA **SURINAME SWEDEN** SYRIAN ARAB REPUBLIC **THAILAND** TRINIDAD AND TOBAGO TURKEY UNION OF SOVIET SOCIALIST REPUBLICS UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN **IRELAND** UNITED STATES OF AMERICA **URUGUAY VENEZUELA** YUGOSLAVIA ZAIRE

INTERNATIONAL HYDROGRAPHIC BUREAU

DIRECTING COMMITTEE

President: Rear Admiral Sir David W. HASLAM, KBE, CB, FRICS, Royal Navy (UK) (Retd.)

Directors: Rear Admiral A. CIVETTA, Italian Navy (Retd.)

Mr Adam J. KERR, MSc. (Canada)

Price 125.00 French Francs. For conditions of sale see List of Publications 1988.

CONTENTS

| _ | The French State and Nautical Cartography (J. BOURGOIN) | 7 |
|---|---|-----|
| _ | Survey, Wreck Search, and Research Vessel Atair (German Hydrographic Institute) | 17 |
| | State of the Art in Swath Bathymetry Survey Systems (C. de MOUSTIER) | 25 |
| _ | Swath Mapping Data Management within the National Oceanic and Atmospheric Administration (D.R. HERLIHY, S.P. MATULA and C. ANDREASEN) | 55 |
| | Processing 'Large' Data Sets from 100% Bottom Coverage 'Shallow' Water Sweep Surveys — A New Challenge for the Canadian Hydrographic Service (R.G. BURKE, S. FORBES and K. WHITE) | 75 |
| | Data Management of Swath Sounding Systems (A. MIDTHASSEL, E. SOLVBERG and F. POHNER) | 91 |
| _ | Application of the DTM-Program TASH for Bathymetric Mapping (H. CLAUSSEN and I. KRUSE) | 117 |
| _ | Swathe Sounding Data Base Management (R.L. CLOET) | 127 |
| _ | New Charting Technology in Australia — The Laser Airborne Depth Sounder (J.S. COMPTON and M.A. HUDSON) | 145 |
| _ | Oceanographic Study in four Sections of the Strait of Gibraltar (A. RUIZ CAÑAVATE, P. VILLANUEVA GUIMERANS, F. MORALES CANTERO and H. BRYDEN) | 159 |
| _ | Fifty Years Ago | 169 |